TÉCNICAS ENDOVASCULARES
VOLUMEN XIV • NÚMERO 1 • ENERO-ABRIL 2011

SITE 2011

9th Simposio Internacional sobre Terapéutica Endovascular

9th International Symposium on Endovascular Therapeutics

SITE

TÉCNICAS ENDOVASCULARES
VOLUMEN XIV • NÚMERO 1 • ENERO-ABRIL 2011

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*Una nueva edición del SITE nos espera en una **nueva ubicación**. Por motivos logísticos hemos trasladado el escenario al **Palacio de Congresos de Catalunya**. Estamos convencidos que el **SITE 2011** incrementará su calidad y confort con la nueva sede.*

*El **programa científico**, como siempre, será el centro de atención para todos los asistentes. Mantendremos nuestro compromiso de actualizar el conocimiento y experiencia en terapéutica endovascular, con una mirada atrevida hacia el futuro. La nueva edición incluirá sesiones científicas dedicadas a revisar las futuras tecnologías diagnósticas y terapéuticas, la actualidad en revascularización de extremidades inferiores, controversias en el tratamiento endovascular de la aorta abdominal y torácica, ramas viscerales y troncos supraórticos.*

*Como novedad, además de las clásicas sesiones-competición dotadas con atractivos premios para la mejor presentación libre y al mejor póster, este año se añade una **nueva sesión-competición** para casos problema en terapéutica endovascular que contengan elementos educativos. Un jurado internacional y la propia audiencia seleccionarán a los ganadores. Para dar más holgura al denso programa científico, también será novedad la disposición de una sala paralela al auditorio central, que durante toda una mañana revisará los aspectos más actuales, innovadores y controvertidos, relacionados con patología venosa, malformaciones arteriovenosas y accesos vasculares.*

*Al igual que en anteriores ediciones, no nos olvidaremos de los recién iniciados ofreciendo **talleres endovasculares** de realidad virtual que dispondrán de un área destacada con agenda propia. Los **simposios paralelos** completarán el intenso programa científico.*

*Como siempre, contaremos con un **panel de ponentes** de contrastada reputación internacional y nacional. Todos ellos dispuestos a trasmitirnos información de extrema actualidad y asequibles a nuestros comentarios y preguntas. Como en ediciones anteriores, uno de ellos será homenajeado por su especial contribución al desarrollo de las técnicas endovasculares. Pero mantendremos el secreto, por el momento.*

*Una vez más, vuestra **participación** es crucial. Vuestras opiniones críticas y discusiones pragmáticas enriquecerán las conclusiones del Simposio. Esperando poder saludaros personalmente en Barcelona.*

Dr. V. Riambau
SITE Director

Symposium Co-Chairs: **M. de Blas, J.M. Egaña, X. Montañá**
Program Advisors: **M. Castellá, G. Espinosa, C. García-Madrid, J. Macho, G. Mestres, M. Sabaté**
Scientific Committee: **P. Gaines, F. Moll, J. Goicolea, E. Ros, S. Trimarchi**

A new Edition of SITE is waiting for us in a new location. For logistic reasons we have moved the setting to the Palau de Congressos de Catalunya (the Catalonia Congress Palace). We are convinced that with this new venue ***SITE 2011*** *will enhance its quality and comfort.*

The ***scientific programme****, as always, will be the highlight for all those who attend. We will maintain our promise to update knowledge and experience in endovascular therapeutics with a daring look into the future. This new edition will include scientific sessions dedicated to revising future diagnostic technologies and therapies, the current news in lower limb revascularization, controversies in endovascular treatment of abdominal and thoracic aorta, visceral vessels and supra-aortic trunks.*

As well as the classic competition-sessions offering interesting prizes for the best oral free paper and best poster, this year we are adding the novelty of a ***new competition-session*** *for challenging cases in endovascular therapeutics which contain educational elements. Moreover, both an international jury and the audience will vote for the winners. To accommodate the dense scientific programme this year we will also offer a room parallel to the plenary auditorium which, throughout an entire morning will be home to sessions that will review the most current, innovative and controversial aspects related to venous pathology, arterial-venous malformations and vascular accesses.*

As in previous editions we won't forget the recently recruited and will feature virtual reality ***endovascular workshops*** *which will be set apart in a reserved area and will have their own schedule. Finally, the* ***parallel symposia*** *will complete the intense scientific programme.*

As always, we will have the pleasure of being able to count on a ***panel of expert speakers*** *of national and international repute. All of whom will bring cutting-edge information as well as being open to our comments and queries. Once again, we will pay tribute to one of our prestigious speakers for his/her outstanding contribution to the development of endovascular techniques, but we will only reveal the secret on the day.*

Once again your ***participation*** *is crucial. Your critical opinions and pragmatic discussions will enrich the conclusions of the Symposium. Looking forward to greeting you personally in Barcelona.*

Dr. V. Riambau
SITE Director

Programa día a día / Program at a glance

	Miércoles / Wednesday 4		Jueves / Thursday 5		
	Sala A Room A	Sala H2 Room H2	Plenaria H3+J Plenary H3+J	Sala A Room A	Sala H2 Room H2
07.30			Secretaría inscripciones / *Registration opens*		
08.00			Sesión I *Session I*		
08.30					
09.00			Sesión II *Session II*		
09.30					
10.00					
10.30	Secretaría inscripciones / *Registration opens*		Pausa Café y Visita Pósters / *Break & Poster viewing*		
11.00			Sesión III *Session III*		Taller de Simulación I *Simulation Workshop I*
11.30				Casos Problema I + II *Challenging Cases I + II*	
12.00			Sesión IV *Session IV*		
12.30					
13.00					
13.30			Comida Simposio I Medtronic *Lunch Symposium I*	Comida Simposio II ev3 *Lunch Symposium II*	Comida Simposio III ATRIUM GRIFOLS *Lunch Symposium III*
14.00					
14.30					
15.00			Sesión V *Session V*	Sesión EV-1 *Session EV-1*	
15.30					
16.00					
16.30	Secretaría inscripciones / *Registration opens*			Café y Visita Pósters / *Break & Poster Viewing*	
17.00			Café y Visita Pósters *Break & Poster Viewing*	Sesión EV-2 y 3 *Session EV-2 and 3*	Taller de Simulación II *Simulation Workshop II*
17.30	Simposios Satélites *Satellite Symposia*	Simposios Satélites *Satellite Symposia*	Sesión VI *Session VI*		
18.00					
18.30			Simposios Satélites *Satellite Symposia*	Simposios Satélites *Satellite Symposia*	Simposios Satélites *Satellite Symposia*
19.00					

	Viernes / Friday 6			Sábado / Saturday 7
Sala H1 Room H1	Plenaria H3+J Plenary H3+J	Sala A Room A	Sala H2 Room H2	Plenaria H3+J Plenary H3+J
	Secretaría inscripciones / *Registration opens*			
	Sesión VII *Session VII*			Sesión XIII *Session XIII*
		Casos Problema III *Challenging Cases III*		
	Pausa Café y Visita Pósters / *Break & Poster viewing*			
	Sesión VIII *Session VIII*			Sesión XIV *Session XIV*
			Taller de Simulación III *Simulation Workshop III*	
				Sesión XV *Session XV*
	Sesión / *Session IX*	Casos Problema IV *Challenging Cases IV*		
	Sesión / *Session X*			
Comida Simposio IV SIEMENS *Lunch* *Symposium IV*	Comida Simposio V GORE *Lunch* *Symposium V*	Comida Simposio VI grupo cardiva *Lunch* *Symposium VI*	Comida Simposio VII COOK MEDICAL *Lunch* *Symposium VII*	Sesión / *Session XVI* Clausura / *Adjournment*
	Sesión XI *Session XI*			
	Sesión Pósters *Poster Session*	Pausa Café / *Coffee Break*		
	Sesión XII *Session XII*		Taller de Simulación IV *Simulation Workshop IV*	
		Casos Problema V *Challenging Cases V*		
	Simposios Satélites *Satellite Symposia*	Simposios Satélites *Satellite Symposia*	Simposios Satélites *Satellite Symposia*	

IX SITE Simposio Internacional sobre Terapéutica Endovascular

4-7 Mayo 2009 • Barcelona (Spain)

Programa / Programme

Miércoles 4 de Mayo de 2011 / Wednesday, 4th May 2011

08:00-20:00 h	Montaje exhibición / *Exhibit set up*
10:30-11:30 h	Inscripción / *Registration*
16:30-20.00 h	Inscripción / *Registration*
17:30-19.00 h	SIMPOSIOS SATÉLITE / *SATELLITE SYMPOSIA*

Jueves 5 de Mayo de 2011 / Thursday, 5th May 2011

07:30-18.00 h	Inscripción / *Registration*
07:55-08.00 h	Bienvenida e introducción / *Welcome and introduction*
08:00-9:07 h	Sesión I / *Session I*: ENDOREVASCULARIZACIÓN DE EXTREMIDADES INFERIORES (I) *LOWER LIMB ENDO-REVASCULARIZATION (I)* Moderador / *Moderator*: **P. Gaines** Panelistas / *Panelists*: **F. Vermassen, J. Palmero**
08:00-08:16 h	Controversia: La revascularización endovascular debe ser la primera opción terapéutica en isquemia crítica *Controversy: Endovascular revascularization should be the first option for critical limb ischemia* 08:00 h **Pro D. Scheinert** 08:08 h **Con H. Sillesen**
08:16-08:23 h	Cómo recanalizar las lesiones TASC D del sector ilíaco: Material, métodos y trucos *How to recanalyze aorto-iliac TASC D lesions: Material, methods and triks* **M. Maynar**
08:24-08:31 h	Cómo negociar con las oclusiones totales de femoral superficial: Material, métodos y trucos *How to deal with CTO in the superficial femoral: Material, methods and triks* **J. Bleyn**

Jueves 5 de Mayo de 2011 / Thursday, 5th May 2011

08:32-08:39 h — Cómo recanalizar oclusiones totales de los troncos tibiales: Material, métodos y trucos
How to recanalyze total occlusions in tibial vessels: Material, methods and triks
D. Scheinert

08:40-08:47 h — Como recanalizar arcos plantares ocluidos: Material, métodos y trucos
How to recanalyze total occluded plantar vessels: Material, methods
M. Manzi

08:47-09:00 h — Discusión / *Discussion*
Comienza con / *Starts with* **F. Gómez Palonés**

09:00-09:05 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

Idioma oficial: Inglés y Español (traducción simultánea disponible) / *Official Languaje: English & Spanish (Simultaneous translation will be provided)*

09:05-09:07 h — Mensajes para llevar a casa / *Take home messages*

09:08-10:30 h — Sesión II / *Session II*:
ENDO-REVASCULARIZACIÓN DE EXTREMIDADES INFERIORES (II)
LOWER LIMB ENDO-REVASCULARIZATION (II)

Moderador / *Moderator*: **P. Peeters**
Panelistas / *Panelists*: **M. de Blas, J.R. March**

09:08-09:15 h — Visión coste-eficacia en el tratamiento endovascular de la isquemia crítica
The cost-effectiveness view for endovascular techniques in critical limb ischemia
F. Vermassen

09:16-09:23 h — El beneficio de los balones impregnados con droga
The benefits of drug eluting balloons
C. Rabbia

09:24-09:31 h — ¿Son mejores los stents liberadores de droga en la femoral superficial?
Are drug eluting stents in the SFA better?
P. Peeters

09:32-09:39 h — Actualización sobre los stents bio-degradables para la revascularización de las extremidades inferiores
Update in bio-absorbable stents in lower limb revascularization
D. Scheinert

09:40-09:47 h — El concepto “outpatient” en el tratamiento endovascular de las extremidades inferiores: Condiciones y cuidados
The outpatient concept in endovascular treatment of lower limb: Conditions and cautions
J. Bleyn

09:48-09:55 h — Como tratar las reestenosis intra-stent: Las mejores estrategias para una permeabilidad más prolongada
How to deal with instent restenosis: The best strategies for a longer patency
J. van den Berg

Jueves 5 de Mayo de 2011 / Thursday, 5th May 2011

09:56-10:03 h — Actualización en angiogénesis terapéutica en isquemia crítica
Update in therapeutic angiogenesis in critical limb ischemia
S. Nikol

10:04-10:11 h — Importancia del tratamiento adyuvante en revascularización endovascular de las extremidades inferiores
How important is the coadjuvant pharmacological therapy in endovascular revascularization in lower limb
E. Puras

10:12-10:23 h — Discusión / *Discussion*
Comienza con / *Starts with* **I. Blanes**

10:24-10:27 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

10:28-10:30 h — Mensajes para llevar a casa / *Take home messages*

10:30-11:00 h — Pausa café / *Coffee break*
Discusión a pie de póster / *Poster viewing and discussion*

11:00-12:00 h — Sesión III / *Session III*:
CIENCIA BÁSICA Y MÁS ALLÁ EN TERAPIA ENDOVASCULAR
BASIC SCIENCE AND BEYOND ON ENDOVASCULAR THERAPY

Moderador / *Moderator*: **C. Liapis**
Panelistas / *Panelists*: **J. van den Berg, J. Goicolea**

11:00-11:07 h — Vasos artificiales para determinación de las propiedades biofísicas de nuevos dispositivos endovasculares
Bio physical property assessment of new endovascular devices in artificial vessels
M. Balcells

11:08-11:15 h — ¿Qué es lo próximo en la tecnología de los stents?
What is next in stent technology?
J. Palmaz

11:16-11:23 h — Inhibición de la reestenosis sin compromiso de la reendotelización
Inhibition of restenosis formation without compromising reendothelialization
S. Nikol

11:24-11:31 h — Actualización sobre el stent multicapas en el tratamiento de aneurismas periféricos
Update on multilayer stents in peripheral aneurysm
C. Rabbia

11:32-11:39 h — Introducción al análisis computacional para fluidos-sólidos-remodelación en simulación cardiovascular
Introduction to computational analysis for fluid-solid-growth modeling in cardiovascular simulations
C.A. Figueroa

11:39-11:52 h — Discusión / *Discussion*
Comienza con / *Starts with* **M. Miralles**

11:52-11:57 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

11:57-12:00 h — Mensajes para llevar a casa / *Take home messages*

Jueves 5 de Mayo de 2011 / Thursday, 5th May 2011

11:00-12:30 h — SIMULATION WORKSHOP I (See specific program). Sala / Room H2

11:30-13:30 h — SESIONES DE CASOS PROBLEMA: C-1, C-2 (ver programa específico)
CHALLENGING SESSIONS: C-1, C-2 (see specific program)

12:00-13:30 h — Sesión IV / *Session IV*:
COMUNICACIONES ORALES (los 6 mejores abstracts)
ENDOVENOUS FORUM (top 6 abstracts)
(presentaciones de 8' seguidas de 3' de discusión) / *(8' talks followed by 3' discussion)*

Moderador / *Moderator*: **E. Ros**
Panelistas / *Panelists*: **A. Mansilha, M. Cairols**

12:00-12:11 h **TBD**
12:12-12:23 h **TBD**
12:24-12:35 h **TBD**
12:36-12:47 h **TBD**
12:48-12:59 h **TBD**
13:00-13:11 h **TBD**

13:12-13:20 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

13:30-15:00 h — COMIDAS SIMPOSIO / *LUNCH SYMPOSIA*

Comida Simposio I / *Lunch Symposium I* (**MEDTRONIC)**
(Sala / *Room* Plenaria H3+J)
Nuevas alternativas terapéuticas endovasculares: Una visión al futuro
New endovascular alternatives: A look into the future

Comida Simposio II / *Lunch Symposium II* **(EV3)**
(Sala / *Room* A)

Comida Simposio III / *Lunch Symposium III* **(ATRIUM, GRIFOLS)**
(Sala / *Room* H2)
¿A qué retos se enfrentan en la región aórtica, ilíaca y renal?
Which challenges do you face in the aortic, iliac and renal region?

Comida Simposio IV / *Lunch Symposium IV* **(SIEMENS)**
(Sala / *Room* H1)

15:00-18:30 h — FORUM ENDOVENOSO: SESIONES EV-1, 2 Y 3 (ver programa específico)
ENDOVENOUS FORUM: SESSIONS EV-1, 2 AND 3 (see specific program)

15:00-17:00 h — Sesión V / *Session V*:
NOVEDADES DESDE EL CORAZÓN
NEWS FROM THE HEART

Moderador / *Moderator*: **M. Sabaté**
Panelistas / *Panelists*: **J. Mulet, M. Castellá**

15:00-15:07 h — Evolución de los stents coronarios: De los BMS a los VRT
Coronary stent evolution: From BMS to VRT
S. Brugaletta

Jueves 5 de Mayo de 2011 / Thursday, 5th May 2011

15:08-15:15 h — Actualización en válvulas pulmonares percutáneas
Update on transcatheter pulmonary valves
J. Suárez

15:16-15:23 h — Actualidad sobre los dispositivos de cierre percutáneo transeptal y más allá
Update on transeptal closure devices and beyond
C. Nienaber

15:24-15:31 h — Actualización sobre la reparación percutánea de las fugas periprotésicas valvulares
Update on transcatheter perigraft endoleak repair
E. García

15:32-15:39 h — Actualización sobre el cierre percutáneo del apéndice auricular
Update on transcatheter atrial appendix closure
A. Bethencourt

15:40-15:47 h — Nuevas técnicas en cardiopatías estructurales: Clips mitrales y más allá
New developments in structural cardiopathies: Mitral clips and beyond
P. Denti

15:48-15:55 h — Válvulas autoexpandibles son preferibles para el abordaje percutáneo
Selfexpandable valve is preferable for percutaneous approach
C. Morís

15:56-16:03 h — Recambio valvular transcatéter: Diez años de historia
Ten years history of transcatheter aortic valve replacement
H. Eltchaninoff

16:04-16:11 h — El recambio valvular transapical es más seguro: Una perspectiva de cirujano
Transapical aortic valve replacement is safer: A surgeon's perspective
A. Van Linden

16:04-16:11 h — Controversia: Es hora de extender las indicaciones de la TAVI
Controversy: It is time to expand indications for TAVI
16:12 h **Pro H. Eltchaninoff**
08:08 h **Con J.L. Pomer**

16:27-16:52 h — Discusión / Discussion
Starts with **C. Barriuso**

16:52-16:57 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

16:57-17:00 h — Mensajes para llevar a casa / *Take home messages*

17:00-17:30 h — Pausa café / *Coffee break*
Discusión a pie de póster / *Poster viewing and discussion*

17:00-18:30 h — SIMULATION WORKSHOP I (See specific program). Sala / Room H2

Jueves 5 de Mayo de 2011 / Thursday, 5th May 2011

17:30-18:30 h — Sesión VI / *Session VI*:
TEMAS CLAVE EN INTERVENCIONISMO VISCERAL
KEY POINTS IN VISCERAL INTERVENTIONS

Moderador / *Moderator*: **J. Palmaz**
Panelistas / *Panelists*: **I. Lojo, D. Scheinert**

17:30-17:37 h — ¿Las conclusiones del estudio ASTRAL es el fin de la angioplastia renal?
Do ASTRAL conclusions represent the end of RAS?
C. Rabbia

17:38-17:45 h — Radiofrecuencia periarterial renal: Indicaciones, técnica y resultados clínicos iniciales
Periarterial renal radiofrequency: Indications, technique and early clinical results
D. Id

17:46-17:53 h — Seguimiento con eco Doppler de los procedimientos endovasculares viscerales
Surveillance of visceral endovascular interventions by Duplex
R. Gilabert

17:54-18:01 h — Los mejores consejos para el éxito clínico en angioplastia y stenting en la isquemia crónica del tronco celíaco y arteria mesentérica superior
The best recommendations for a clinical success in angioplasty and stenting for chronic ischemia of celiac trunk and superior mesenteric arteries
C. Rabbia

18:02-18:09 h — Selección de paciente y de materiales en la reparación endovascular de los aneurismas viscerales
Patient and device selection for endovascular repair of visceral aneurysms and dissections
J. van den Berg

18:10-18:17 h — Angiografía con dióxido de carbono para procedimientos endovasculares abdominales en pacientes con insuficiencia renal crónica
Carbon dioxide angiography for endovascular abdominal procedures in patients with chronic renal insufficiency
E. Criado

18:17-18:26 h — Discusión / *Discussion*
Comienza con / *Starts with* **A. Clará**

18:26-18:29 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

18:29-18:30 h — Mensajes para llevar a casa / *Take home messages*

18:30-19:30 h — SIMPOSIOS PARALELOS
PARALLEL SYMPOSIA

11:30-13:30 h — REUNIÓN DE LA SCACVE. MESA REDONDA.
Infecciones en Cirugía Vascular
SCACVE MEETING. PANEL DISCUSSION.
Infections on vascular surgery

Viernes 6 de Mayo de 2011 / Friday, 6th May 2011

7:30-18:00 h — Inscripción / *Registration*

08:00-09:30 h — Sesión VII / *Session VII*:
TEMAS CLAVES EN TERAPÉUTICA ENDOVASCULAR EN TRONCOS SUPRAÓRTICOS (I)
KEY POINTS ON ENDOVASCULAR TREATMENT IN SUPRAORTIC TRUNKS (I)

Moderador / *Moderator*: **H. Sillesen**
Panelistas / *Panelists*: **S. Macdonald, M. Matas**

08:00-08:15 h — Controversia: La recanalización endovascular debe ser la primera opción terapéutica en las lexiones proximales
Controversy: Endovascular recanalization should be the first option for proximal lesions
08:00 h **Pro C. Rabbia**
08:08 h **Con H. Sillesen**

08:16-08:23 h — Tratamiento endovascular del síndrome del opérculo torácico: Ventajas y limitaciones
Endovascular repair in toracic outlet syndrome: Benefits and limitations
E. Criado

08:24-08:31 h — Consejos clave para evitar complicaciones en el tratamiento endovascular de las arterias vertebrales
Key recommendations on endovascular techniques for vertebral artery lesions
J. Macho

08:32-08:39 h — Revisión de la evidencia actual sobre CAS para pacientes sintomáticos
Current evidences review on CAS for symptomatic patient
G. Fraedrich

08:40-08:47 h — ¿Deben los resultados del CREST animar a los defensores de CAS?
Should CREST results encourage CAS defenders?
F. Criado

08:48-08:55 h — La evidencia presente no afecta mi práctica en pacientes sintomáticos
Current evidence does not affect my practice in symptomatic patients
P.G. Cao

08:56-09:03 h — Revisión de los ensayos recientes CAS (ICSS y CREST) y la interpretación de los intervencionistas
Review recent CAS trials (ICSS and CREST) and give an interventionists appraisal of them
P. Gaines

09:04-09:11 h — No hay duda: La endarterectomía es la primera elección para pacientes sintomáticos en el momento actual
No doubt: Endarterectomy is the first choice for symptomatic carotid stenosis nowadays
J. Fernandes e Fernandes

09:12-09:19 h — Hoy pienso que si tuviera una estenosis sintomática de carótida preferiría...
To my mind today: If i would have a symptomatic carotid stenosis I would prefer...
F. Veith

Viernes 6 de Mayo de 2011 / Friday, 6th May 2011

09:20-09:45 h — Discusión / *Discussion*
Comienza con / *Starts with* **C. Liapis**

09:45-09:55 h — Sistema electrónico de respuesta de la audiencia / *Audience response system*

09:55-10:00 h — Mensajes para llevar a casa / *Take home messages*

09:00-10:00 h — SESIONES DE CASOS PROBLEMA: C-3 (ver programa específico)
CHALLENGING SESSIONS: C-3 (see specific program)

10:00-10:30 h — Pausa café / *Coffee break*
Discusión a pie de póster / *Poster viewing and discussion*

11:00-12:30 h — SIMULATION WORKSHOP II (See specific program). Sala / Room H2

12:30-13:30 h — SESIONES DE CASOS PROBLEMA: C-4 (ver programa específico)
CHALLENGING SESSIONS: C-4 (see specific program)

10:30-11:45 h — Sesión VIII / *Session VIII*:
TEMAS CLAVES EN TERAPÉUTICA ENDOVASCULAR EN TRONCOS SUPRAÓRTICOS (II)
KEY POINTS ON ENDOVASCULAR TREATMENT IN SUPRAORTIC TRUNKS (II)

Moderador / *Moderator*: **G. Biasi**
Panelistas / *Panelists*: **C. Liapis, F. Criado**

10:30-10:37 h — Los actuales dispositivos de protección embólica no son suficientes todavía
Current embolic protective device are not yet enough
S. Macdonald

10:38-10:45 h — Implicaciones en las lesiones cerebrales: Endarterectomía vs CAS
The brain injury implications: Endarterectomy vs CAS
L. Capoccia

10:46-10:53 h — El stenting carotídeo transcervical con flujo reverso reduce los fenómenos embolígenos
Transcervical carotid stenting with carotid flow reversal reduces embolic events
E. Criado

10:54-11:01 h — Actualización sobre el estudio ACST-2
ACST-2 update
A. Halliday

11:02-11:30 h — Controversia: La estenosis asintomática de carótida superior al 70% debería ser tratada...
Controversy: Carotid stenosis >70% shoul be treated...

11:02-11:09 h — Sólo farmacológicamente
Pharmacologically only
A. Halliday

11:10-11:17 h — Farmacológicamente más CAS
Pharmacologically plus CAS
C. Setacci

11:18-11:25 h — Faramacológicamente más endarterectomía
Pharmacologically plus endarterectomy
D. Raithel

11:26-11:33 h — Dependiendo de las características ultrasónicas de la placa
According to the plaque ultrasound characteristics
G. Biasi

11:34-11:41 h — Desmenuzando el CREST
Spinning of CREST
F. Veith

11:42-11:50 h — ¿Son las guías clínicas de la ESVS todavía válidas?
Are ESVS guidelines on carotid intervention still valid?
C. Liapis

11:51-11:55 h — Discusión / *Discussion*
Comienza con / *Starts with* **A. Giménez Gaibar**

11:56-11:58 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

11:59-12:00 h — Mensajes para llevar a casa / *Take home messages*

12:00-12:45 h — Sesión IX / *Session IX*:
NOVEDADES DESDE EL CEREBRO
NEWS FROM THE BRAIN

Moderador / *Moderator*: **M. Doblas**
Panelistas / *Panelists*: C. **A. Figueroa, L. Sanromán**

12:00-12:08 h — Análisis computacional de la dinámica de fluidos de los aneurismas cerebrales: Aplicaciones diagnósticas y terapéuticas
Computational fluid dynamics of cerebral aneurysms: Diagnostic and therapeutic
A. Frangi

12:09-12:17 h — Concepto de diversión de flujos: Stents en Y y stents divisores de flujo
Flow diversion concept: Y stenting and flow divider stents
J. Macho

12:18-12:26 h — Clasificación y cuantificación de aneurismas cerebrales a través de la imagen computacional
Image-based computational modelling and quantification of cerebral aneurysms
A. Frangi

12:27-12:35 h — Nuevas herramientas en el tratamiento de aneurismas intracraneales
New devices in the intracraneal aneurysm treatment
J. Macho

12:35-12:50 h — Discusión / *Discussion*
Comienza con / *Starts with* **J. Blasco**

12:50-12:55 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

12:55-13:00 h — Mensajes para llevar a casa / *Take home messages*

Viernes 6 de Mayo de 2011 / Friday, 6th May 2011

13:00-13:30 h

Sesión X / *Session X*:
CEREMONIA DE HOMEHAJE
HOMAGE CEREMONY

Chairmen: **X. Montañá, V. Riambau**
Introducción / *Introduction*: **F. Criado**

Conferencia plenaria: **Propiedades del vino para la salud crdiovascular**
Plenary Lecture: ***Wine properties for cardiovascular health***
J. Palmaz

13:30-15:00 h

COMIDAS SIMPOSIO / *LUNCH SYMPOSIA*

Comida Simposio V / *Lunch Symposium V* (**GORE)**
(Sala / *Room* Plenaria H3+J)
Avances en tratamientos endovasculares
Advances in endovascular treatments

Comida Simposio VI / *Lunch Symposium VI* **(GRUPO CARDIVA)**
(Sala / *Room* A)
Anaconda®: Presente y futuro
Experiencia y novedades: La nueva endoprótesis fenestrada
Anaconda®: Present and future
Experience and news: The new fenestraded endograft

Comida Simposio VII / *Lunch Symposium VII* **(COOK)**
(Sala / *Room* H2)
Novedades en Zenith AAA y TAA
Developments in Zenith AAA and TAA

15:00-16:30 h

Sesión XI / *Session XI*:
TEMAS CLAVES SOBRE EVAR (I)
KEY POINTS ON EVAR (I)

Moderador / *Moderator*: **G. Coppi**
Panelistas / *Panelists*: **A. García de la Torre, M. Makaroun**

15:00-15:07 h — Qué debemos aprender de los últimos estudios aleatorizados:
Lo que sigue para el futuro de la reparación de AAA
What should we learn from the latest randomized trials: The next for the future of AAA repair
R. Greenhalgh

15:08-15:15 h — ¿Deberían ser repetidos los estudios EVAR, DREAM y OVER con la nueva tecnología y experiencia?
Should EVAR, DREAM and OVER be re-edited with the new technology and experience?
I. Loftus

15:16-15:23 h — EVAR no está justificado para los pequeños aneurismas todavía
EVAR for small aneurysm is not yet justified
P.G. Cao

15:24-15:31 h — EVAR para los AAA rotos: Actualización del estudio IMPROVE
EVAR for rAAA: IMPROVE update
J. Powell

15:32-15:39 h — No es necesario ningún estudio sobre AAA rotos: La experiencia mundial acumulada ya es suficiente
A trial about rAAA is not necessary: World accumulated experience is enough
F. Veith

15:40-15:47 h — EVAR vs cirugía abierta para AAA rotos: Una revisión sistemática actualizada
EVAR vs open surgery for rAAA: An update systematic review
M. van Sambeek

15:48-15:55 h — La influencia del estrés de pared en el crecimiento de los AAA y sus biomarcadores
The influence of wall stress on AAA growth and biomarkers
M. van Sambeek

15:56-16:03 h — Análisis dinámico de las imágenes y sus implicaciones en el tratamiento EVAR y su seguimiento
Dynamic imaging analysis and its implications in EVAR treatment and follow-up
F. Moll

16:04-16:11 h — Análisis computacional para investigar la estabilidad posicional de las endoprótesis abdominales
A computational framework for investigating the positional stability of abdominal endografts
C.A. Figueroa

16:12-16:19 h — Actualización sobre realidad virtual y robótica en la planificación y tratamiento de AAA
Virtual reality and robotics update in AAA planning and treatment
N. Cheshire

16:19-16:25 h — Discusión / *Discussion*
Comienza con / *Starts with* **F. Gómez Palonés**

16:25-16:29 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

16:29-16:30 h — Mensajes para llevar a casa / *Take home messages*

16:30-17:00 h — SESIÓN DE PÓSTERES. Los mejores 6 pósteres (ver programa específico)
POSTERS SESSIONS. The 6 best posters (see specific program)

16:30-17:00 h — Pausa Café / *Coffee Break*

17:00-18:30 h — SIMULATION WORKSHOP I (See specific program). Sala / Room H2

17:00-18:40 h — Sesión XII / *Session XII*:
TEMAS CLAVE SOBRE EVAR (II)
KEY POINTS ON EVAR (II)

Moderador / *Moderator*: **R. Greenhalgh**
Panelistas / *Panelists*: **J. Maeso, M. Ferreira**

17:00-17:15 h — Controversia: El abordaje totalmente percutáneo para EVAR es la mejor técnica
Controversy: Total percutaneous approach for EVAR is the best way
17:00 h **Pro G. Torsello**
17:08 h **Con J. Brunkwall**

17:16-17:23 h EVAR en mujeres: El género hace la diferencia
EVAR in women: Gender makes the difference
M. van Sambeek

17:24-17:31 h Mejoras deseables de las endoprótesis para EVAR
Desired improvements for EVAR devices
M. Makaroun

17:32-17:39 h La importancia de dispositivos de bajo perfil en EVAR
The importance of low profile devices in EVAR
T. Resch

17:40-17:47 h Las endoprótesis fenestradas precargadas pueden simplificar el procedimiento para los AAA yustarrenales
Pre-loaded fenestrated devices can simplify the procedure for justarenal AAA
K. Ivancev

17:48-17:55 h La mayoría de los AAA yusta o suprarrenales pueden ser tratados con la técnica de la chimenea: Trucos y consejos
The majority of justa and suprarenal AAA can be treated with chimney techniques: Tricks and tips
A. Lobato

17:56-18:03 h Utilidad de las endosuturas Aptus en EVAR
The usefulness of Aptus endostapling for EVAR
J.P. de Vries

18:04-18:11 h ¿Cómo tratar las endofugas tipo I en endoprótesis fenestradas?
How to deal with type I endoleaks in fenestrated endografts?
S. Haulon

18:12-18:19 h Conversión abierta del EVAR: Trucos y consejos
Open conversion after EVAR: Tricks and tips
G. Coppi

18:20-18:27 h Lo más relevante de las guías clínicas para AAA de la ESVS
The highlights from ESVS guidelines for AAA management
F. Moll

18:28-18:33 h Discusión / *Discussion*
Comienza con / *Starts with* **S. Sultan**

18:34-18:36 h Sistema electrónico de respuesta de la audiencia /
Audience response system

18:37-18:40 h Mensajes para llevar a casa / *Take home messages*

17:30-18:30 h SESIONES DE CASOS PROBLEMA: C-5 (ver programa específico)
CHALLENGING SESSIONS: C-5 (see specific program)

18:30-19:30 h SIMPOSIOS PARALELOS / *PARALELL SYMPOSIA*

Sábado 7 de Mayo de 2011 / Saturday, 7th May 2011

08:00-10:00 h — Sesión XIII / *Session XIII*:
TEMAS CLAVE SOBRE TEVAR (I) (Presentaciones de 7')
KEY POINTS ON TEVAR (I) (7 min talks)

Moderador / *Moderator*: **P. Taylor**
Panelistas / *Panelists*: **G. Fraedrich, C. Paré**

08:00-08:07 h — Todo lo que necesitamos saber de la historia natural de las disecciones tipo B asintomáticas: Implicaciones terapéuticas
All we need to know about the natural history of asymptomatic acute type B dissection: Therapeutic implications
S. Trimarchi

08:08-08:15 h — Todo lo que debemos saber sobre la historia natural de los PAU y IMH: Implicaciones terapéuticas
All we need to know about the natural history of PAU and IMH: Therapeutic implications
A. Evangelista

08:16-08:23 h — Ecocardiograma transesofágico: La utilidad real en el diagnóstico y tratamiento de la disección tipo B
Transesophageal echo cardiogram: The real usefulness in type B dissection diagnosis and management
M. Azqueta

08:24-08:31 h — TC y RMN dinámicos: Para entender mejor los cambios morfológicos y hemodinámicos en la disección tipo B
Dynamic CT and MRI: To better understand morphologic changes and hemodynamics in type B dissection
F. Moll

08:32-08:39 h — Actualización sobre el estudio ADSORB
ADSORB update
J. Brunkwall

08:40-08:47 h — Tratamiento con endoprótesis de la aorta ascendente: La nueva frontera para la disección tipo A y más allá
Ascending aorta endografting: The next frontier for type A Standford dissection and beyond
I. Loftus

08:48-08:55 h — Trompa de elefante congelada para la disección tipo I de DeBakey: Dificultades y beneficios
Frozen elephant trunk for DeBakey type I dissection: Challenges and benefits
C.A. Mestres

08:56-09:11 h — Controversia: Las disecciones tipo B crónica son una buena indicación para su reparación endovascular
Controversy: Chronic type B dissections are a good indication for endovascular repair
08:56 h **Pro C. Nienaber**
09:04 h **Con H. Safi**

09:12-09:19 h — Soluciones endovasculares para la luz falsa residual más allá del extremo de la endoprótesis
Endovascular solutions for residual false lumen beyond the stentgraft edge
F. Criado

Sábado 7 de Mayo de 2011 / Saturday, 7th May 2011

09:20-09:27 h — Limitaciones de las endoprótesis actuales para el tratamiento de las disecciones tipo B: ¿Cuán lejos de la endoprótesis ideal nos encontramos?
Limitations of current endografts for type B dissection treatment: How far arre we from the ideal endografts?
G. Melissano

09:28-09:35 h — ¿Es todavía el tratamiento endovascular la primera elección para los traumatismos aórticos agudos?
Does thoracic endografting still remain the first option for acute trauma?
M. Makaroun

09:36-09:43 h — Análisis computacional de la dinámica de flujos en el tratamiento y pronóstico de las disecciones tipo B
Computational analysis of flow dynamics in type B dissection management and prognosis
H. Rousseau

09:43-09:52 h — Discusión / *Discussion*
Comienza con / *Starts with* **V. Fernández-Valenzuela**

09:53-09:58 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

09:58-10:00 h — Mensajes para llevar a casa / *Take home messages*

10:00-10:30 h — Pausa Café / *Coffee Break*

10:30-12:00 h — Sesión XIV / *Session XIV*:
TEMAS CLAVE SOBRE TEVAR (II)
KEY POINTS ON TEVAR (II)

Moderador / *Moderator*: **H. Safi**
Panelistas / *Panelists*: **M. Josa, C. Vaquero**

10:30-10:37 h — Anatomía y distensibilidad del arco: ¿Juega un papel en el tratamiento endovascular con endoprótesis?
Arch anatomy and compliance: Does it play a role in endografting treatment?
F. Moll

10:38-10:45 h — ¿Cómo actúan las fuerzas de desplazamiento pulsátiles en las endoprótesis torácicas?
Pulsatile displacement forces acting on thoracic aortic endografts
C.A. Figueroa

10:46-10:53 h — Transposición de troncos supraórticos y tratamiento con endoprótesis para los aneurismas que comprometen el arco: Trucos y recomendaciones
Supraortic debranching and endografting for aneurysms involving the arch: Tricks and tips
G. Melissano

10:54-11:01 h — Técnicas con chimeneas en el arco: Lo más simple y seguro
Chimney techniques in the arch: The simplest and safest
F. Criado

11:02-11:09 h — Fenestración in situ en el arco aórtico: ¿Por qué no?
In situ fenestration in the aortic arch: Why not?
M. Malina

11:10-11:17 h — Reparación endovascular completa del arco: Las endoprótesis con ramas lo hacen fácil
Total endovascular repair of the arch: Branched endograft makes it easy
K. Ivencev

11:18-11:25 h — Cómo solucionar los problemas de conformabilidad del arco
How to solve the apposition problems in the arch
F. Cochennec

11:26-11:33 h — Cómo tratar las complicaciones y desastres del TEVAR: Técnicas y lecciones aprendidas
Managing TEVAR complications and disasters: Techniques and lessons learn
P. Taylor

11:34-11:41 h — Predictores de morbilidad y mortalidad en el TEVAR
Predictors of morbidity and mortality on TEVAR
M. Makaroun

11:41-11:53 h — Discusión / *Discussion*
Comienza con / *Starts with* **J. Serrano**

11:53-11:58 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

11:58-12:00 h — Mensajes para llevar a casa / *Take home messages*
Refrescos y café hasta las 12:30 / *Refreshment nad coffee will be available until 12:30*

12:00-13:30 h — Sesión XV / *Session XV*:
TEMAS CLAVE SOBRE TEVAR (III)
KEY POINTS ON TEVAR (III)

Moderador / *Moderator*: **F. Criado**
Panelistas / *Panelists*: **S. Sultan, G. Melissano**

12:00-12:07 h — La cirugía abierta es la primera opción para los aneurismas toraco-abdominales: Pero, ¿hay espacio para el tratamiento endovascular?
Open surgery is the first option for thoraco-abdominal aneurysm repair: But, is there any place for endovascular repair?
H. Safi

12:08-12:15 h — Requerimientos para crear un centro de la aorta en Europa
Requirements to become an aortic center in Europe
M. Jacobs

12:16-12:23 h — Imagen para la anatomía de la médula espinal: ¿Es útil para la reparación de aneurismas toraco-abdominales?
Spinal cord anatomy imaging: Is it useful for thoraco-abdominal aneurysm repair by open or endovascular surgery
P. Matute

12:32-12:39 h — Tratamiento de las complicaciones neurológicas del TEVAR
Treatment of neurological complications in thoracic stentgrafting
P. Taylor

Sábado 7 de Mayo de 2011 / Saturday, 7th May 2011

12:40-13:03 h — Alternativas a la cirugía abierta para los aneurismas tóraco-abdominales: La controversia continúa
Alternatives to open surgery for thoraco-abdominal aneurysms: The controversy continues

12:40-12:47 h — Abordaje combinado: Lo mejor y lo peor
Hybrid approach: The best and the worst
N. Cheshire

12:48-12:55 h — Técnicas de chimenea y sandwich: Plan y resultados clínicos
Chimney and sandwich techniques: Planning and clinical results
A. Lobato

12:56-13:03 h — Endoprótesis con ramas: Resultados clínicos y la nueva plataforma en depósito
Branched endografts: Clinical results and new off the shelf platform
S. Haulon

13:04-13:11 h — Complicaciones y soluciones en casos complejos de TEVAR toracoabdominal
Complications and solutions in complex thoraco-abdominal endografting
M. Ferreira

13:12-13:25 h — Discusión / *Discussion*
Comienza con / *Starts with* **G. Espinosa**

13:25-13:29 h — Sistema electrónico de respuesta de la audiencia /
Audience response system

13:29-13:30 h — Mensajes para llevar a casa / *Take home messages*

13:30-14:00 h — Sesión XVI / *Session XVI*:
CEREMONIA DE ENTREGA DE PREMIOS
AWARDS CEREMONY

Moderador / *Moderator*: **V. Riambau**
Panelistas / *Panelists*: **X. Montañá, J.M. Egaña, M. de Blas**

Competiton Awards
Premio **GRIFOLS** a la mejor Comunicación Oral
GRIFOLS *Award to the best Oral Communication*

Premio **BOSTON SCIENTIFIC** al mejor Caso Problema
BOSTON SCIENTIFIC *to the best Challenging Case*

Premio **AMPLATZER** al mejor Póster
AMPLATZER *Award to the best Poster*

14:00 — CONCLUSIONES Y FIN DEL SIMPOSIO
CONCLUSIONS AND ADJOURNMENT
V. Riambau

Fórum Endovenoso / Endovenous Forum

Jueves 5 de Mayo de 2011 / Thursday, 5th May 2011

15:00-16:30 h	Sesión EV-I / *Session EV-I*: TRATAMIENTO ENDOVASCULAR DE LAS VARICES *ENDOVASCULAR TREATMENT OF VARICOUS VEINS* Moderador / *Moderator*: **C. García-Madrid** Panelistas / *Panelists*: **E. Puras, M. Whiteley**
15:00-15:07 h	Ablación venosa con vapor: Técnica y resultados *Venous steam ablation: Technique and results* **R. Milleret**
15:08-15:15 h	Ablación térmica segmentaria: Influencia de la energía liberada en diámetro de la VSI *Thermal segmental ablation: Influency of the supplied energy on the GSV diameter* **C. García-Madrid**
15:16-15:23 h	Nueva modalidad de ablación endovenosa: El sistema ClariVein™ *A new endovenous ablation modality: The ClariVein™ system* **J.P. de Vries**
15:24-15:31 h	Escleroterapia con espuma: ¿Cómo evitar riesgos? *Foam esclerotherapy: How to avoid risks?* **F. Fernández**
15:32-15:39 h	Técnicas de ablación venosa para incompetencia de perforantes: Métodos y resultados *Ablation techniques for perforator veins incompetence: Methods and results* **M. Whiteley**
15:40-15:47 h	La ablación térmica es un método primitivo para el tratamiento del reflujo venoso superficial *Termal ablation is a primitive way of managing superficial vein reflux* **S. Sultan**
15:48-15:55 h	Evidencia médica en el tratamiento intervencionista de la insuficiencia venosa: Cirugía abierta, láser, radiofrecuencia, espuma, etc. *Current evidence in venous insufficiency interventional treatment: Open surgery, laser, rediofrequency, foam, etc.* **I. Loftus**
15:56-16:03 h	Actualización sobre endo-reconstrucción valvular del sistema venoso profundo *Update on deep venous valve endo-reconstruction* **J.P. de Vries**
16:04-16:11 h	Síndrome de congestión pélvica: Diagnóstico y tratamiento endovascular *Pelvic congestion syndrome: Diagnosis and endovascular treatment* **J. Leal Monedero**
16:12-16:19 h	Flebo-TC en el diagnóstico de insuficiencia venosa compleja *Flebo-CT in complex venous insufficiency diagnosis and treatment* **J.F. Uhl**
16:19-16:28 h	Discusión / *Discussion* Comienza con / *Starts with* **E. Roche**
16:28-16:30 h	Mensajes para llevar a casa / *Take home messages*
16:30-17:00 h	Pausa Café / *Coffee Break* DISCUSIÓN A PIE DE PÓSTER / *POSTER VIEWING AND DISCUSSION*

Jueves 5 de Mayo de 2011 / Thursday, 5th May 2011

17:00-17:30 h — Sesión EV-2 / *Session EV-2*:
MALFORMACIONES ARTERIOVENOSAS
ARTERIO-VENOUS MALFORMATIONS

Moderador / *Moderator*: **P. Zamboni**
Panelistas / *Panelists*: **R. Bofill, P. Gaines**

17:00-17:07 h — Angiografía y RMN en el diagnóstico de las malformaciones vasculares ¿Cómo mejorar su rendimiento?
MRI and angiography in vascular malformation diagnosis: How yo improve their imaging definition?
J. van den Berg

17:08-17:15 h — Flebo-TC en el diagnóstico de las malformaciones venosas congénitas
Flebo-CT in congenital venous malformations diagnosis
J.F. Uhl

17:16-17:23 h — Novedades en el tratamiento endovascular de las malformaciones vasculares
What is new in endovascular treatment of vascular malformations?
B.B. Lee

17:23-17:29 h — Discusión / *Discussion*
Comienza con / *Starts with* **V. Martín Paredero**

17:29-17:30 h — Mensajes para llevar a casa / *Take home messages*

17:30-18:30 h — Sesión EV-3 / *Session EV-3*:
MISCELÁNEA ENDOVENOSA
ENDOVENOUS MISCELLANEA

Moderador / *Moderator*: **G. Mestres**
Panelistas / *Panelists*: **B.B. Lee, F. Lozano**

17:30-17:37 h — Tratamiento endovascular de la esclerosis múltiple: Justificación y técnica
Endovascular treatment for multiple sclerosis: Rational and technique
P. Zamboni

17:31-17:45 h — Tratamiento endovascular del acceso vascular en riesgo: Indicaciones, técnicas y resultados.
Endovascular treatment for vascular access at risk: Indications, techniques and results
A. del Río

17:46-17:53 h — Cirugía venosa con láser de 1470 nm: Experiencias iniciales
Endolaser vein surgery with the 1470 nm laser: Early experiences
C. Miquel

17:54-18:01 h — Tratamiento endovascular del síndrome de Budd-Chiari
Endovascular treatment for Budd-Chiari syndrome
B.B. Lee

18:02-18:09 h — Filtros de VCI: Ventajas de los nuevos diseños
Inferior vena cava filters: Advantages of the new designs
M. de Gregorio

18:10-18:17 h — Tratamiento quirúrgico y endovascular del síndrome de Pagett-Schroetter
Surgical and endovascular treatment of Pagett-Schoetter syndrome
P. Lozano

18:17-18:28 h — Discusión / *Discussion*
Comienza con / *Starts with* **J.R. Escudero**

18:28-18:30 h — Mensajes para llevar a casa / *Take home messages*

Sesiones de Casos Problema / Challenging Case Sessions

Jueves 5 de Mayo de 2011 / Thursday, 5th May 2011

11:30-12:30 h

Sesión C-I / *Session C-I*:
CASOS PROBLEMAS EN EXTREMIDADES INFERIORES
CHALLENGING CASES IN LOWER LIMB
Moderador / *Moderator*: **I. Blanes, P. Gaines, F. Vermassen**

12:30-13:30 h

Sesión C-2 / *Session C-2*:
CASOS PROBLEMAS EN TRONCOS SUPRAÓRTICOS
CHALLENGING CASES SUPRAORTIC TRUNKS AND CAROTIDS
Moderador / *Moderator*: **S. Macdonald, J. Macho, G. Viasi**

Viernes 6 de Mayo de 2011 / Friday, 6th May 2011

09:00-10:00 h

Sesión C-3 / *Session C-3*:
CASOS PROBLEMAS EN EVAR Y TEVAR
CHALLENGING CASES IN EVAR AND TEVAR
Moderador / *Moderator*: **I. Loftus, J.Palmero, G. Espinosa**

12:30-13:30 h

Sesión C-4 / *Session C-4*:
CASOS PROBLEMAS EN INTERVENCIONISMO CARDÍACO
CHALLENGING CASES IN CARDIAC INTERVENTIONISM
Moderador / *Moderator*: **M. Castellà, M. Masotti, E. García**

17:30-18:30 h

Sesión C-5 / *Session C-5*:
CASOS PROBLEMAS MISCELÁNEA
MISCELLANEOUS CHALLENGING CASES
Moderador / *Moderator*: **M. Malina, M. Maynar, M. Ferreira**

Sesión de Pósteres / Poster Session

Viernes 6 de Mayo de 2011 / Friday, 6th May 2011

16:30-17:00 h

SESIÓN DE PÓSTERES (presentaciones de 3' + 2' de discusión)
POSTER SESSION (3 min. presentations + 2 min. discussion)

Moderador / *Moderator*: **J.M. Egaña, S. Sultan, J. Busquet**

16:30-16:35 h **TBD**
16:35-16:40 h **TBD**
16:40-16:45 h **TBD**
16:45-16:50 h **TBD**
16:50-16:55 h **TBD**
16:55-17:00 h **TBD**

PONENTES / FACULTY

Azqueta, M. Spain
Balcells, M. USA
Barriuso, C. Spain
Bethencourt, A. Spain
Biasi, G. Italy
Blanes, I. Spain
Blasco, J. Spain
Bleyn, J. Belgium
Bofill, R. Spain
Brugaletta, S. The Netherlands
Brunkwall, J. The Netherlands
Busquet, J. France
Cairols, M. Spain
Cao, P.G. Italy
Capoccia, L. Italy
Castellá, M. Spain
Cheshire, N. UK
Clará, A. Spain
Cochennec, F. France
Coppi, G. Italy
Criado, E. USA
Criado, F. USA
De Blas, M. Spain
De Gregorio, M. Spain
De Vries, J.P. The Netherlands
Del Río, A. Spain
Denti, P. Italy
Doblas, M. Spain
Egaña, J.M. Spain
Eltchaninoff, H. France
Escudero, J.R. Spain
Espinosa, J. Spain
Evangelista, A. Spain
Fernandes, J. Portugal
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Fernández-Valenzuela, V. Spain
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Endovascular revascularization should be first option for critical limb ischemia

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Critical limb ischemia (CLI) is a clinical condition resulting from insufficient blood flow to the lower limb. Either rest pain and/or non-healing wounds/gangrene accompanies CLI. Another definition of CLI is when the systolic ankle pressure index is below 50 mmHg or below the toe pressure is below 30 mmHg.

Traditionally, open surgery has been the option of choice for these patients since they most often will present with long occlusions or multiple stenoses located somewhere between the infrarenal aorta to the ankle. Treatment of arterial obstruction proximal to inguinal ligament is today dominated by endovascular techniques and results are in most cases very good. Only in cases with severe bilateral disease or unilateral occlusion from the aorta to the femoral artery may the primary treatment choice be open surgery.

In case of good inflow to the femoral artery, but with severe obstructive disease peripheral to the groin, bypass surgery, especially using autologous vein, has been shown to be a good treatment option in patients with CLI. When no vein is available an artificial graft may be used. Again, in case of good inflow there will either a long occlusion of the femoral/popliteal artery or multiple stenoses/occlusions in order to cause CLI. Only one randomized controlled trial has tested whether an open surgical or endovascular first approach benefits patients best with respect to survival without amputation – the BASIL trial. In this trial, patients with CLI, who was considered treatable with either open or endovascular surgery were randomized to either of the 2 techniques as the initial approach. The primary end-point was neutral at 2 years, however, patients living more than 2 years and those having bypass using autologous vein did better than those who underwent endovascular treatment.

The BASIL trial randomized patients almost 10 years ago and especially endovascular techniques have improved during this time period. Never balloons and stents have been marketed mean while.

For years, endovascular approaches have been tried as an alternative to classical open surgery; subintimal angioplasty in the superficial femoral artery being the first alternative to be introduced by Bolia et al (ref). This technique was reported to have great immediate success rates and very good efficacy in terms of preventing amputation (ref). However, the enthusiastic results reported initially could not be reproduced by other groups (ref). Endoluminal revascularization has been favored by the majority.

The result of endoluminal treatments for obstructive disease has improved dramatically over the last decades. High success rates are reported and many uncontrolled series show good patency and limb salvage rates. However, very often there is no control group simply because those suited for surgery were operated and vice versa. Nonetheless, in some regions there has been a shift towards an endovascular treatment first approach. However, as in many other situations, the lack of strict evidence addressing the issue in question is not the same of the current practice is the best.

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Cómo recanalizar las lesiones TASC D del sector ilíaco: material, métodos y trucos

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Las oclusiones del sector iliaco han sido originalmente tratadas mediante cirugía abierta y aptando en algunos, según criterio, mediante bypass aorto-bifemoral.

Desde la aparición de la cirugía endovascular y la evolución de los materiales usados para estas técnicas, el método terapéutico ha ido cambiando hasta permitir que pacientes con un síndrome de Leriche puedan ser recanalizados, con restauración del flujo, por métodos endovasculares con la posibilidad de usar un implante bifurcado por medio de la cirugía endovascular.

Las primeras indicaciones de revascularización iliaca se hicieron mediante paso de guía y posterior dilatación, lo que llevaba a:

• Una oclusión temprana, dependiendo de la longitud de la iliaca,

• Embolia distal, debido a trombo dentro de la oclusión

• Rotura, sin disponer en aquella época, de stents cubiertos.

Posteriormente la evolución nos llevó a la recanalización y colocación de stent primario, con lo que se evitó los embolismos distales.

Otra técnica, usada en esta evolución, ha sido la fibrinólisis "in situ" para conseguir resolver la oclusión desde el punto de vista trombótico y delimitar el segmento a tratar lo que en un pequeño porcentaje de casos evita la colocación de stent. (ver. figuras).

En los casos de iliacas primitivas bilateralmente ocluidas, se comenzó el tratamiento por medio de stents descubiertos mediante la técnica "Kissing stenting", que dejaba la parte proximal dentro de la aorta y la distal en las respectivas iliacas. No obstante existen dos problemas para esta técnica:

• Competitividad de flujos, que puede llevarnos a una reoclusión y que en el caso de usar stent cubiertos sería más útil el usar un cubierto y un descubierto.

• Muchos de estos pacientes son ateromatosos, no solo con lesiones del sector iliaco, sino de aorta distal por lo que la colocación simplemente de stents en la bifurcación iliaca no solucionaría el problema a largo tiempo.

Por ello si bien tradicionalmente estos pacientes han sido operados mediante un bifurcado antes mencionado, en la actualidad y mediante cirugía endovascular podemos hacer la corrección completa de aorta y bifurcación iliaca, mediante una prótesis bifurcada que en general precisará de material que tenga flexibilidad y conformabilidad.

Material

Se precisa todo tipo de material endovascular para resolver el problema de la oclusión iliaca.

• Aguja de punción e introductores.

• Guías con gran capacidad distal floppy, tipo Bentson.

• Guías con capacidad de ser manipuladas y conducidas a través de oclusión (con torque).

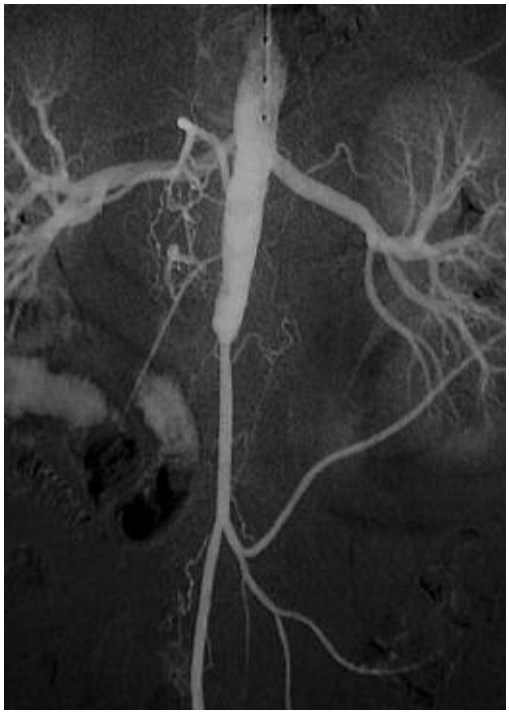

Fig. 1. Se observa síndrome de Leriche con oclusión de la aorta abdominal por debajo de la salida de la arteria mesentérica inferior.

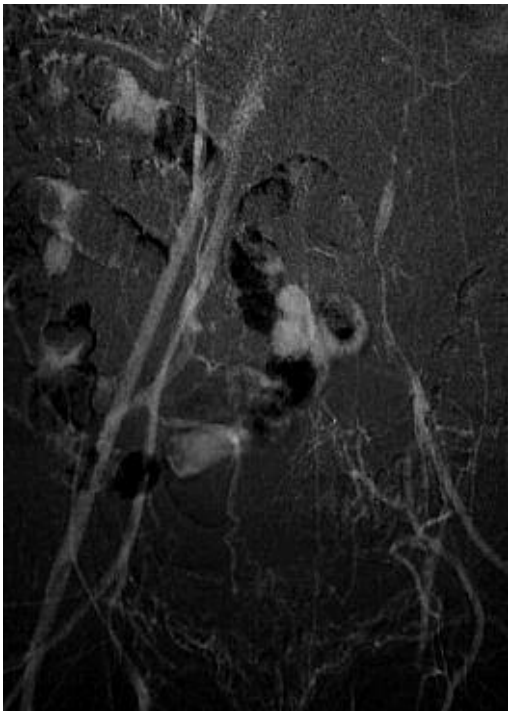

Fig. 2. Recanalización a nivel de bifurcación a. ilíaca derecha (interna/externa) y a nivel de la a. femoral común izq. La ilíaca interna izquierda se rellena a través de colaterales.

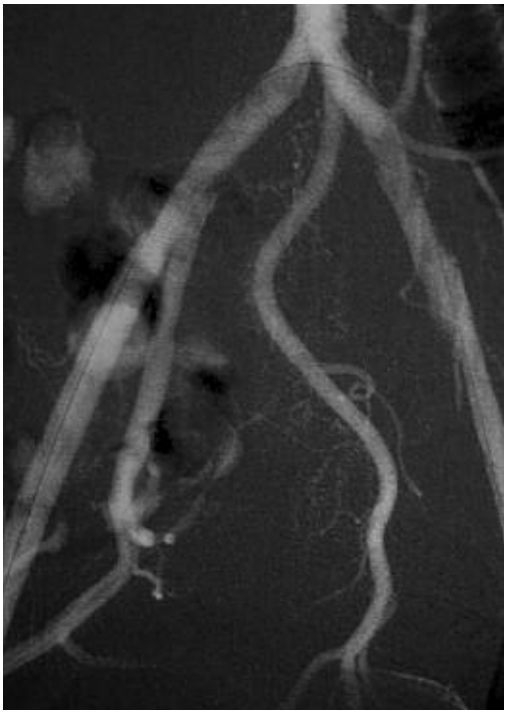

Fig. 3. Se observa completa permeabilidad del eje aorto-ilíaco mediante tratamiento de fibrinólisis "in situ" (urokinasa) y angioplastia.

• Guías stiff para dar más soporte al avance de las prótesis a través de la lesión.

• Catéteres con agujeros laterales, que permitan la introducción de contraste sin extraer la guía, para comprobar el lugar de revascularización.

• Catéteres con diferentes morfologías como: multipropósito, jota o Simmons entre otros.

• Balones de angioplastia con diferentes diámetros y longitudes.

• Sistemas de perfusión para lisis "in situ".

• Stent descubiertos.

• Stent cubiertos para aquellos casos en los que aparezca una fuga.

• Endoprótesis bifurcada con características antes mencionadas.

• Un recuperador de cuerpos extraños.

• Un sistema percutáneo de cierre, si no se ha realizado disección arterial.

• Medicación adecuada pre, durante y post tratamiento: Antibioterapia, heparina, antiagregación.

• Monitorización.

Métodos

En caso de no considerarse la introducción de una prótesis bifurcada, se puede realizar todo el estudio de forma percutánea si bien nuevos diseños permitirán hacerlo.

Las arterias iliacas pueden ser revascularizadas de forma retrograda anterograda.

Con suficiente longitud permeable en el lugar de punción, se puede optar por punción ipsilateral y retrograda. En caso de no conseguir conectar con la luz verdadera se puede recanalizar la obstrucción de forma anterograda a través de una punción contralateral y usando un catéter tipo "J". En caso de conectar con la femoral común ipsilateral a la lesión se realiza una técnica de "through and through" para la posterior dilatación/colocación de stent de la lesión.

En caso de ser oclusión bilateral, se puede también recanalizar por vía braquial usando catéteres guías que facilitarán el posicionamiento en el lugar de entrada de la obstrucción y darán soporte a las maniobras de recanalización. Una vez pasada las obstrucciones se valorar: fibrinólisis, angioplastia, stent primario, endoprótesis bifurcada o combinación.

En caso de la colocación de una endoprótesis bifurcada, se realiza una arteriotomía uni o bilateral. El cuerpo de la prótesis se avanza a través de la arteriotomía mientras que la pata contralateral se puede colocar a través de una punción percutáneo o de una arteriotomía según las consideraciones del operador. En casos aislados el diámetro de las arterias iliacas externas no permiten el avanza de una endoprótesis a pesar de una dilatación progresiva. En estos casos puede ser necesario un acceso iliaco retroperitoneal. La recanalización del orificio de la pata contralateral puede ser de forma anterograda a través de un acceso braquial o desde la arteriotomía contralateral ya que generalmente se observa un colapso del orificio debido al calibre de la aorta.

Trucos

Ante toda recanalización TASC D, se precisa experiencia. El principal truco de esta técnica es creer y conocer que una prótesis bifurcada por técnica endovascular se puede usar en aortas con síndrome de Leriche y sin lesión aneurismática.

En los casos de obstrucciones completas y sin obtener un pulso femoral palpable, un "road mapping" contralateral o a través del brazo nos ayudará a la punción de la a. femoral común.

Debemos reconocer como se ha conseguido la revascularización: Luz principal o subintimal.

Es de máxima importancia conocer cuando se puede perforar la arteria, ya que estamos en un territorio retro-peritoneal, sin protección a la fuga, y con la necesidad de ser diagnosticada inmediatamente para ser ocluida y evitar complicaciones que nos puedan llevar al fallecimiento del paciente. Para ello tendremos controlado la aproximación a la lesión, tanto desde la aorta, como desde la femoral común.

A través de un "through and through" femoro-femoral se puede dilatar la lesión desde el acceso contralateral a la lesión. De esta forma – en caso de rotura del vaso – se deja el balón inflado (clampaje interno) mientras a través del acceso femoral ipsilateral se introduce una prótesis cubierta.

Usaremos, en el comienzo, balones de pequeño calibre (3-4 mm) para en caso de fuga, esta sea mínima, teniendo siempre preparado un stent cubierto, cuando las sospechas de posible rotura sean importantes, a saber: cronicidad de la lesión, calcificación severa, múltiples colaterales y un dolor desproporcionado cuando se usan los balones de bajo calibre. En estos casos un stent cubierto primario puede ser una alternativa.

La dilatación debe ser progresiva para evitar la rotura empezando con balones de bajo calibre hasta un diámetro que se considere adecuado.

En caso de oclusiones agudas con alto riesgo de pérdida de la extremidad por embolia, el stent primario recuperando el flujo y sin remover el trombo, puede darnos una solución inmediata.

En los pacientes con la bifurcación iliaca muy cerrada y con gran cantidad de calcio, cuando usemos la ruta contralateral, nos podemos beneficiar de los introductores no colapsables y que crean un tracto continuo y sin rozamiento al paso de los materiales.

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Are drug eluting stents in the SFA better?

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Abstract

Neointimal hyperplasia is the most decisive factor on results post-stenting in SFA. Stents themselves contribute to intimal hyperplasia in ways which are becoming more predictable and potentially remediable in the near future. The applications of a drug coating on a stent surface, inhibits the inflammatory response and smooth muscle cell proliferation in the vessel wall during a certain period and delays the process of intimal hyperplasia. Thus, drug-eluting stent (DES) technology was developed to prevent early thrombosis and late luminal loss to potentially improve long-term patency rates. Because DES with active stent coatings have shown to be beneficial in the treatment of coronary artery disease[1-3], the applicability of these drug coatings for the treatment of femoro-popliteal (FP) lesions has also been tested.

Favorable DES results have recently become available with the Zilver® PTX™ and STRIDES studies. But next to the clinical value of DES, also the cost for society and health care systems have to be considered. In this respect, a hypothetical cost calculation based on the data that is currently available learns us that DES, despite the fact that it works in the SFA, is not cost-effective for implantation in de novo SFA lesions. Particularly in times of economic recession, and already steeply rising healthcare costs, ethical considerations have to be made when implementing a high-cost treatment modality that does not improve the

clinical results after 1 year. It is our opinion that DES will not be the treatment of choice in de novo SFA lesions, due to the comparable results in TASC A&B lesions with non-DES stent and in TASC C&D lesions with bypass surgery.

However, DES might play an important role for treatment of in-stent restenosis and in high-risk surgical patients, such as elderly people and diabetics, who present with TASC C or D FP lesions. It is clear that this specific patient subset will benefit from a minimally invasive approach that can offer satisfying results. In this respect, a randomized trial in this patient subgroup is warranted comparing DES implantation versus other endovascular treatment modalities.

How to deal with in-stent restenosis: the best strategies for a longer patency

Van den Berg, J.

The problem of elastic recoil, flow-limiting dissection and residual stenosis in the treatment of superficial femoral artery disease has been resolved with stentin g, and by using stents the primary technical result can be optimized (this is especially of importance in treating patients with critical limb ischaemia).

However, restenosis is still major drawback in all territories (especially SFA and BTK). PTA as stand-alone therapy will not work due to the sponge-like behaviour of neointimal hyperplasia, leading to early recoil. Given the increasing number of stents being used in the SFA/popliteal and to a lesser extent BTK the problem of patients presenting with in-stent restenosis will increase in the future. Since an endovascular commitment to patient has been made, and the patient in general will be older and less amenable to surgery when presenting with restenosis, endovascular therapy should be considered as first line therapy.

Treatment options:
- Stand-alone PTA
- Debulking
- Rotational/orbital atherectomy
- Directional atherectomy
- Laser debulking
- Debulking in combination with
- DEB
- Covered stents
- Brachytherapy
- Drug-eluting stents

In-stent restenosis should probably be treated at an early stage (even when patient is asymptomatic (cf. surveillance of surgical bypass). Treatment of in-stent restenosis is also less complex as compared to treatment of a totally occluded stent.

Debulking is essential in treatment of in-stent restenosis. Currently only laser-debulking has been approved for treatment of in-stent restenosis, although rotational and directional atherectomy has been applied to treat in-stent restenosis as well.

Problem with these techniques is that stent integrity can be hampered. Treatment of in-stent restenosis with laser debulking is feasible and safe, but long-term results have to be awaited.

Update in therapeutic angiogenesis in critical limb ischemia

Nikol, S.

Results of the TAMARIS angiogenesis gene therapy trial

For angiogenesis gene therapy, mixed results in phase I/II trials werde followed by a negative result in a very large phase III trial (TAMARIS).

The results of the Phase III TAMARIS trial evaluating the investigational angiogenic therapy NV1FGF (riferminogen pecaplasmid) were presented at the American Heart Association scientific sessions November 2010. The results of the phase III study did not confirm the phase II study findings and highlighted the complexity of the development of innovative biological compounds like NV1FGF in a challenging disease such as critical limb ischemia. Despite recent advances in surgical and vascular techniques, a large number of patients suffering from this disease are not eligible for revascularization procedures and face amputation as their ultimate treatment option.

526 patients from 30 countries with CLI and skin lesions, unsuitable for standard revascularization, were included in the TAMARIS trial. Disease characteristics are similar by geographic region. In addition, when patients reach the end stage disease, there does not seem to be a difference between patients with diabetes or without, with regards to the vascular disease.

The mechanism of action for NV1FGF was proven in a phase I clinical trial where NV1FGF was administered intramuscular (IM) which lead to local expression of FGF1 in muscle cells of CLI patients which promotes local angiogenesis by stimulating cell migration and cell growth and appears to induce the formation of new blood vessel networks (PM105 study, reference Baumgartner, 2009). The TAMARIS trial hypothesis was that, local expression of the angiogenic growth factor FGF1 will translate into a meaningful clinical benefit, such as prevention of amputation in CLI patients. This hypothesis was based on a positive phase II finding (-63% reduction of major amputation on the secondary endpoint of TALISMAN study).

There was no difference in baseline demographics between groups in the study (randomization was stratified by country and diabetes status). Endpoints were appropriate, especially, amputation free survival is a "hard endpoint", clinically meaningful in this disease. An independent adjudication committee adjudicated amputations and confirmed that all major amputations in the trial were justified showing the robustness of the investigators judgment TAMARIS was well powered.

TAMARIS results did not confirm the preliminary efficacy findings that were observed in the phase II findings. These results confirm the importance of conducting large phase III studies with innovative biological compounds like NV1FGF, particularly in a complex disease like critical limb ischemia where, despite recent advances in surgical and vascular techniques, a large number of patients are not eligible for revascularization procedures and face amputation as their ultimate treatment option.
The event rates (of major amputations and deaths) within the trial were as expected in the sample size assumptions, confirming that the trial was powered appropriately.

This demonstrates that large placebo-controlled randomized trials are a prerequesite

to exclude statistical errors before a novel therapy can be established and widely distributed.

Overview of actual stem cell trials for peripheral artery disease

Stem cell therapy still has to prove any benefit in the treatment of peripheral arterial disease. Until today published clinical trials were too small, had too short follow-up periods, in some cases unsuitable endpoints, were mostly uncontrolled and if they were controlled, then they were either not randomized or not blinded. The large number of published pilot trials may suggest beneficial effects, yet, we are still far from an established new therapy. Most of these trials published to date are level 4 trials, few are level 1b or level 2 trials.

Importancia del tratamiento adyuvante en la revascularización endovascular de las extremidades inferiores

Puras, E

A lo largo de los últimos años hemos asistido a un progresivo cambio en la sistemática de tratamiento de los pacientes con isquemia de miembros inferiores (MMII), hacia terapias basadas en abordajes y dispositivos endovasculares. Lamentablemente los progresos en estas terapias no se ha visto acompañado de estudios científicos prospectivos relacionados con la aplicación y evaluación de las mejores terapias médicas (antitrombóticas, anticoagulantes o antiproliferativas) y por ello, hemos ido tomando los resultados de la experiencia en Cardiología intervencionista, aplicando según arte muchas veces personal, estas terapias a los pacientes tratados por isquemia de MMII. No existen consensos universalmente aceptados para el manejo de pacientes sometidos a tratamiento de lesiones TASK A-D en los sectores ilíaco femoral o popliteo distal. Por ello las necesidades actuales relacionadas con estas terapias médicas obligan a responder dos tipos de preguntas:

A) Cuáles son las mejores terapias coadyuvantes para mejorar el resultado del procedimiento de revascularización?:

1. Tipo de terapia y dosis de fármacos antiagregantes con los que un paciente debe ser manejado antes, durante y después de un procedimiento de revascularización de MMII.

¿Cuánto tiempo debemos mantener estas terapias?

A pesar de la evidencia convincente que indica que el tratamiento antiagregante plaquetario reduce la incidencia de episodios vasculares en los pacientes con isquemia de MMII, es frecuente que exista un trata-

miento insuficiente en los pacientes que sufren este trastorno. Así, en el programa PARTNERS[1], tan sólo un 54% de los pacientes con arteriopatía de MMII con enfermedad conocida y un 33% de los que tenían arteriopatía de MMII de nuevo diagnóstico recibían un tratamiento antiagregante plaquetario, en comparación con el 71% de los pacientes con accidentes cerebrovasculares.

En España los datos de un registro de pacientes atendidos en consulta de cirugía vascular demuestran que de los 928 pacientes incluidos inicialmente en el estudio y con antigüedad media de diagnóstico de la claudicación de 3,5 años, sólo el 43,8% recibían antiagregantes plaquetarios, existiendo un porcentaje importante de pacientes que, a pesar de haber sido diagnosticados, no se trataban correctamente[2].

Muchas instituciones han adoptado el uso de tienopiridinas (clopidogrel) en procesos de revascularización de MMII con colocación de stents o endoprótesis.

El estudio CAPRIE[3], demostró que el clopidogrel, tenía un efecto más beneficioso en los 6452 pacientes incluidos con isquemia de MMII, con una disminución del riesgo relativo de estos eventos, del 23,8% (CI 8,9-36,2; p= 0,0028) frente a la aspirina.

Los efectos beneficiosos de clopidogrel fueron especialmente evidentes en el subgrupo de pacientes con isquemia de MMII y diabetes Estos datos han guiado la recomendación sobre el uso del clopidogrel en pacientes isquemia de MMII en las guías de la ACC/AHA[4] y de la ADA (American Diabetes Association)[5].

En la actualidad la terapia dual con aspirina y clopidogrel está aceptada como el Standard en el tratamiento[6], tanto de la angioplastia carotídea con stent como en la angioplastia y stenting de arterias periféricas, si bien estos tratamientos no poseen estudios clínicos en los que basarse y sólo se aceptan como la extrapolación de los resultados en estudios coronarios como el CURE y el CREDO.

La duración óptima de esta terapia post stenting no está clara. Parece que al menos 1 mes es recomendable, aunque la práctica actual tiende a prolongar este tiempo en función del tipo de paciente y material utilizado. A pesar de los efectos beneficiosos asociados al tratamiento con clopidogrel en estos contextos de alto riesgo, las experiencias clínicas y de laboratorio han permitido identificar algunas de sus limitaciones, la más relevante de las cuales es la amplia variabilidad existente en la respuesta inhibitoria plaquetaria. En esta variabilidad de la respuesta al clopidogrel se han involucrado diferentes factores clínicos, genéticos y celulares. En el momento actual no existe un consenso aceptado sobre como manejar esta situación de "resistencia" al clopidogrel. Una opción válida puede ser la de incrementar las dosis tanto de carga inicial como de mantenimiento.

Diversos autores como Muller y cols.[7], han demostrado que, una dosis de carga de 600mg de clopidogrel, con una dosis de mantenimiento de 150 mg. en combinación con aspirina resultó en una inhibición plaquetaria mucho mayor que la dosis habitual de 300mg de carga y 75 mg. de mantenimiento (p=0,01).

También nuevos inhibidores del los receptores de ADP, tales como el prasugrel, han demostrado tener menor variabilidad y ser más potente inhibidor plaquetario que clopidogrel, aunque con un claro incremento en el riesgo de sangrado[8]. En estos momentos otros antagonistas de receptores de ADP, tales como el ticagrelor o el cangrelor están en fase de investigación clínica en pacientes sometidos a intervencionismo coronario, con el objeto de lograr una acción antiplaquetaria mayor y más consistente[9].

2. Dosis de Heparina que debe ser administrada en el manejo endovascular de sectores iliaco-femorales o popliteo- distal. Nivel de anticoagulación óptimo y control intraprocedimiento.

La medicación anticoagulante debe ser suspendida previamente a la realización de pro-

cedimientos donde se desee una hemostasia normal. La vida media de la heparina no fraccionada permite volver a una situación de hemostasia normalizada después de cortos periodos de suspensión (2-3 horas después de suspender una infusión continua).

Diferente es la situación con la Heparina de bajo peso molecular (HBPM), que requiere 12h de suspensión previa en dosis profilácticas y al menos 24h de suspensión si las dosis eran terapéuticas.

No existe una recomendación firme acerca de la dosis a utilizar de heparina en los procedimientos endovasculares. Las intervenciones de alto riesgo (sector infrapoplíteo) pueden beneficiarse de administrar dosis de 75 a 100 U/Kg, mientras que situaciones menos complejas como una angioplastia iliaca sólo requieren dosis entre 25-50U/Kg.

Las HBPM aunque presentan perfiles de seguridad y eficacia altos no han conseguido introducirse en esta indicación terapéutica por carecer de un método sencillo de control de anticoagulación.

3.Conocimiento de nuevas medicaciones anticoagulantes, ¿mejoran el perfil de riesgo/beneficio de la heparina?

Al contrario que la inhibición indirecta de la trombina generada por la heparina los inhibidores directos son más específicos contra la trombina soluble o la ligada a trombo.

La bivaliridina, ha sido más extensamente estudiada en procedimientos cardiológicos mostrando en muchos estudios una reducción muy significativa del los end points de muerte, infarto o hemorragia mayor.

El estudio Approve[10], demostró un alto nivel de eficacia y seguridad para la bivalirudina cuando se aplico como único anticoagulante en el tratamiento endovascular de pacientes con isquemia de MMII.

Su aplicación en práctica clínica no ha tenido mucho éxito a pesar de este buen perfil muy probablemente ligado a su elevado coste económico.

Otras sustancias como el argatroban o la lepiridina carecen de estudios en revascularización periférica.

4. Terapia antilipemiante con la que un paciente debe ser dado de alta. ¿ Son precisas en todos los casos?

La hipercolesterolemia es un factor de riesgo modificable que a menudo no es tenido suficientemente en cuenta en los procesos de revascularización endovascular de MMII. Las estatinas no sólo disminuyen el colesterol sino que también poseen un efecto antinflamatorio, antiproliferarivo, antitrombogénico y mejoran la función endotelial. Por todo ello su prescripción es esencial en todo estos procesos de revascularizacion .

B ¿ Qué otras medicaciones son necesarias para disminuir el riesgo de eventos cardiovasculares futuros en pacientes tratados de isquemia de MMII?.

Los estudios epidemiológicos sobre los enfermos con Enfermedad Arterial Oclusiva de MMII, demuestran que en general, el pronóstico de la enfermedad con respecto a la extremidad es relativamente benigno, ya que sólo el 5% de los pacientes necesitarán intervenirse y sólo entre el 1 y 2% llegarán a precisar una amputación mayor. Sin embargo, el pronóstico vital de estos enfermos es significativamente peor, con una mortalidad a 5 años entre 2 y 3 veces superior a la de individuos de la misma edad en la población general; las principales causas de muerte en la EAO son la isquemia miocárdica (50%) y el ictus cerebral (15%)[11, 12, 13].

Existen diferentes tratamientos farmacológicos utilizados en pacientes con isquemia de MMII. El objetivo primario del tratamiento es doble: prevenir los episodios cardiovasculares futuros y adoptar medidas de prevención secundaria máxima mediante tratamiento antiagregante, deshabituación tabáquica y tratamiento de la hipertensión, la hiperlipidemias y la diabetes mellitus[13].

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Biophysical property assesment of new endovascular devices in artificial vessel

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There is increasing concern that the local delivery of anti-proliferative drugs is accompanied by thrombosis, a consequence of endothelial dysfunction and delayed restoration[1] that lead to loss of vasoreactivity, high levels of platelet aggregation[1], and induction of tissue factor expression[3, 4]. Sirolimus, for example, inhibits smooth muscle cell (SMC) proliferation and intimal hyperplasia presumably by effects on signaling within the mammalian target of rapamycin (mTOR) pathway[5, 6]. Prolonged exposure to sirolimus partially inhibits Akt activation and smooth muscle cell proliferation[7]. But sirolimus also induces tissue factor expression[3,4] and dysfunction in endothelial cells

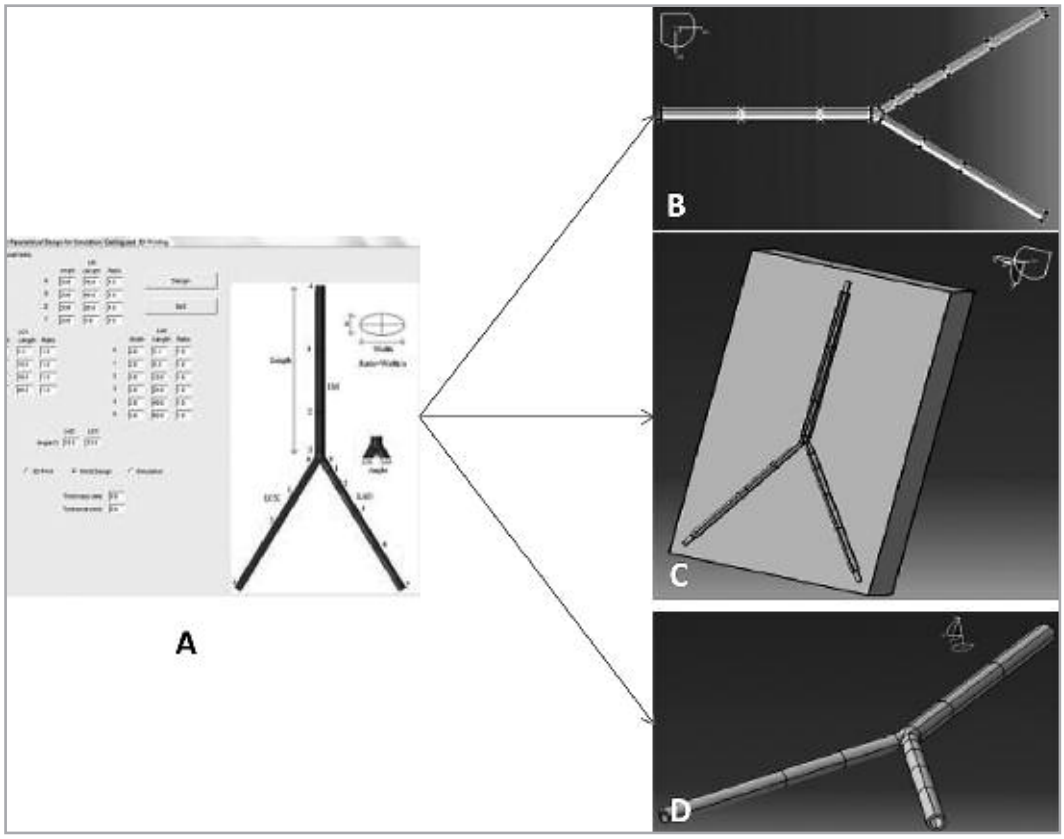

Fig. 1. *A user friendly software platform (A) allows entering key geometric parameters of a given geometry and to model the geometry for flow simulations (B), to cast molds of it (C) and to 3D print scaffolds.*

(EC). Innovative in silico[8, 9] and in vivo[10, 11] studies have shown how drug tissue distribution after release correlates with the pattern of thrombosis, intimal hyperplasia, smooth muscle proliferation and inflammation, but have not examined the impact on endothelial cells. EC are especially flow-sensitive and altered hemodynamics may disrupt endothelial health and vessel balance[12].

We aimed to develop a tool to study and predict device outcome after implantation in complex geometries. Computational modeling and tissue engineering of vessel-like structures exposed to physiological flow regimes were used to study tissue factor distribution along the arterial wall after stent deployment, to map monocyte adhesion on stent struts and to describe mechanisms of repair after intervention.

A user-friendly Visual Basic® 2008 interface (cf. Fig 1A) was designed to create a model of any realistic arterial bifurcation in Catia®.v5. The interface uses several Catia v5 workbenches available from Part Design for solids, Generative Shape Design to produce complex surfaces and CNC Machine Tool Simulation to generate the code for CNC machine. The program, based on Kolachalama et al.[13] C code, has three different applications: fluid dynamics simulation, mold design and scaffold's direct 3D Print that share the exact same geometry, which is defined by 44 parameters divided in lengths, diameters, ratios and angles. The program generates a macro able to design the geometry to export an IGES file for flow simulations (cf. Fig 1B), four macros to create molds (cf. Fig 1C) to manufacture through Computer Numeric Control

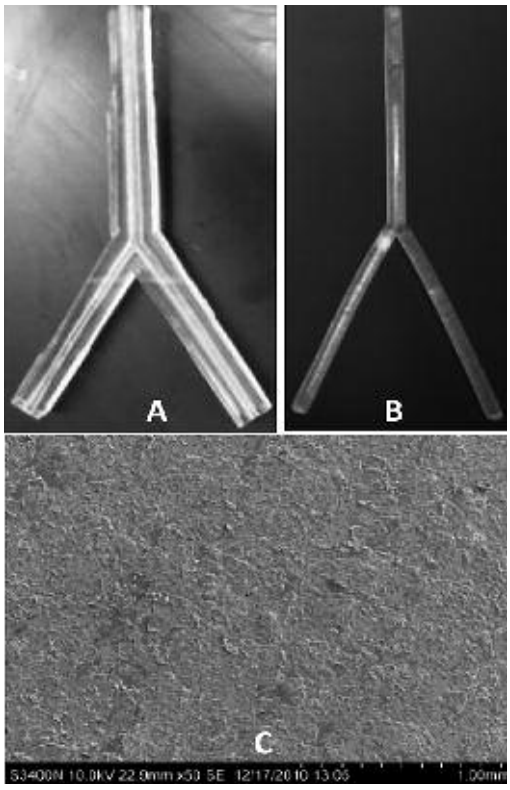

Fig. 2. *Polydimethylsiloxane (A) and polyurethane acrylate (B) bifurcated scaffolds used to seed vascular cells layer-by-layer. (C) SEM image of endothelial cells adhered to the scaffold surface.*

(CNC) or one macro to export STL files (cf. Fig 1D) to manufacture the geometry with a 3D printer able to photo-polymerize with UV light the raw material.

Teflon manufactured as described above to recapitulate the exact lumen of a given bifurcated geometry served as a negative template to produce polyurethane molds that were injected with liquid water soluble wax. Once solidified polydimethylsiloxane (PDMS, Dow Corning) was allowed to cure around the water soluble wax structure (Fig 2A). In parallel, polyurethane acrylate scaffolds were manufactured using 3D printing (Object) (Fig 2B). Prior to cell seeding, 3D printed scaffolds were extracted for 6h with toluene in order to eliminate unreacted species that were proven toxic to cells. Thereafter, both PDMS-made and 3D printed scaffolds were washed in 0.2% sodium dodecyl sulphate solution for 20min, rinsed twice with distilled water for 20min and steam sterilized. Scaffolds were coated with 20µg/ml fibronectin (Sigma) in PBS for 2h, while rotating at 10rph at 370C.

Sequential layering of human aortic adventitial fibroblasts, followed by application of smooth muscle cells and thereafter endothelial cells followed produced a tri-layer vessel-like constructs (Fig 2C).

Vessel-like constructs were stented with 7-cell stainless steel NIR stents (3.5x16mm, Medinol) and kept under static conditions or culture media perfused at a given flow regime in a perfusion bioreactor developed by Balcells et al[14]. Re-endothelization degree was measured 3 days after deployment and flow exposure. At day 3 vessel-like constructs were exposed to freshly isolated monocytes for 24h and their effect on endothelial recovery quantified by fluorescence imaging after DAPI staining of cell nuclei. Tissue factor expression by smooth muscle cells proximal and distal from the stented section was measured using mouse anti-Tissue Factor (American Diagnostica) diluted 1:50 in PBS-BSA and goat anti-mouse Alexa Fluor® 647 (1:100 in PBS-BSA) as secondary antibody.

Our system has enabled us to better understand vascular response to altered flow regimes and injury provoked by stent deployment. Tissue factor expression by vascular smooth muscle cells exposed to oscillatory flow conditions was 2.5-fold that measured under steady flow exposure. Endothelial cells among stent struts suffered extensive denudation. After 3 and 4 days of exposure to physiological flow regime endothelial cells coverage was 6.2cell/mm2 and 11.7cell/mm2, respectively. Adhesion of monocytes to the injured endothelium on day 3 significantly enhanced endothelial proliferation (99.7 cell/mm2 vs 11.7cell /mm2 when no monocytes were present).

Our flow system holds the potential to track not only tissue factor expression and re-endothelialization but up and down stream

signaling molecules and to identify critical pathways and screening of different drugs that interfere with them and its most efficient delivery mode.

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What is next in stent technology?: Enhanced endothelialization by engineered surface microtopography

Palmaz, J.

Rationale

Endothelialization of prosthetic surfaces has been recognized as an important factor in the orderly healing of vascular implants.

Among the many important functions of healthy endothelium are resistance to cellular adhesion molecules platelet and monocyte attachment. By colonizing a prosthetic surface, endothelial cells (EC) effectively compete with platelets and white cells for binding sites on the protein matrix and set up mechanisms for inhibition of proliferation, chemotaxis and migration of pro-inflammatory cells, largely responsible for intimal build-up and eventual failure of vascular conduits.

Endothelialization of prosthetic surfaces has been attempted by various mechanisms, including seeding, grafting of adhesive peptides such as RGD and binding antibodies to CD-34, a receptor present on the surface of circulating progenitor endothelial cells. Although these attempts are laudable, vascular endothelium is abundant and quite adapted to readily cover a surface provided the right conditions are met. Minutes after a gap on the endothelium layer is created, boundary EC change their phenotype and become migratory, sending filopodia and lamellipodia on the leading edge pulling the cell out of their stationary binding. A forward motion is established by the cell rolling like a tumble-weed in the wind (the blood stream). Attachment receptors linked to the cytoskeleton are expressed on the ventral surface of the cell seeking a mating contact with a complementary binding site (cellular adhesion molecule ligand). If attachment occurs, the cell pulls itself to the site by contraction of the actin fiber bundle connected to the receptor. This pulls the cell membrane and cytoplasm forward while attachment sites are released on the trailing edge. The motion of the migrating EC is not random as the cell is sensitive to topographical features and seeking places with high concentration of binding sites. Although EC migration is largely in the direction of flow, it tends to deviate sideways in a zig-zag pattern as it seeks contact with other cells. Upon a cell collision, the migrating EC slows down temporarily (contact inhibition). If many collisions ensue, the EC prepares itself for change to a stationary phenotype. Unimpeded, EC migrate relatively fast. Under normal flow shear the rate of migration is approximately one cell length per hour. Contact inhibition, topography sorting and tentative movement slows down EC migration on surfaces which otherwise could have proper characteristics for endothelialization.

Since endothelialization can be considered a competitive race for the surface with platelets and monocytes, faster EC coverage represents less opportunities for thrombus and intimal formation to form.

Surface engineering of prosthetic surfaces

By lap microphotography of cells migrating under flow, it is evident that EC are sensitive to linear surface features. Upon encountering an edge commensurate with the size of the cell, EC will follow the edge at a speed related to the orientation of the edge relative to the flow (maximal speed along the flow, minimal at 90 degree angle). EC migrating on a surface covered with parallel microgrooves do it at a rate more than double than on a flat and otherwise identical surface. From comparative studies we have determined the ideal groove shape, dimensions and interval for maximal response. Using laminar flow chambers with prescribed shear rate, we have found that the EC guidance effect of microgrooves is independent of the type of material. We found biological effects other than cell movement and migration. By focal adhesion kinase (FAK) assays, EC migrating on grooved surfaces (GS) expressed more FAK than those on control flat surfaces. Likewise we found increased nitric oxide (NO) and proliferating cell nuclear antigen (PCNA) on EC on GS. These findings suggest enhanced metabolic activation of EC on GS probably triggered by outside-inside signaling pathways involving the adhesion and tubular apparatus mediating activation of the cyclin pathway and DNA transcriptional initiation. In vivo, we confirmed the increased speed of endothelialization on microgrooved carotid and coronary stents and we found a corresponding decrease in intimal area and thickness in response to placement of stents using a pig injury model.

Conclusion

The rate of endothelialization of prosthetic materials can be enhanced with resulting decrease in intimal hyperplasia using microgrooves on the blood-contacting surfaces. The creation of the microgrooves can be achieved using micro and nanotechnologies compatible with current standards of vascular prosthetic manufacturing.

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Inhibition of restenosis formation without compromising reendothelialization

Nikol, S.

Percutaneous transluminal angioplasty is routinely used revascularization techniques for patients with coronary or peripheral artery disease. Depending on the arterial location, more than 50% of patients undergoing angioplasty may develop a renarrowing of the treated vessel, called restenosis, even following bare metal stent implantation, in fewer cases even after drug-eluting stent implantation.

On the one hand, drug-eluting technologies, both stent- and balloon-based have been developed successfully in the past years. However, such rather unselective technologies to the arterial endothelium also lead to a delayed endothelial repair of the vessel wall, which affords long-term dual platelet inhibition at risk for acute or subacute artery occlusions even after many months.

Alternatively, gene therapy emerged as a potential means for the prevention of restenosis for arteries. Gene modification aims to produce a localized specific effect on certain relevant cells and thus to reduce proliferation or matrix formation, however, without compromizing re-endothelialization. The process of inflammation or cell proliferation, major players in restenosis, may be halted selectively at the extracellular level, which includes certain growth factors, or in cells themselves, where signal transduction leads to activation of the cell cycle and thus to cell division. Novel and more potent vectors including liposomes are still being developed for gene transfer which may improve the clinical potential of this novel strategy.

Also, certain catheters developed for local perivascular gene delivery appeared to be useful avoiding systemic side effects to a certain extent. Using conventional drugs such as paclitaxel, local adventitial applications may inhibt restenosis without compromizing endothelial repair.

Several approaches have reached clinical evaluation in studies performed in the United States and in Europe.

Introduction to computational analysis for fluid-solid-growth modeling in cardiovascular simulations

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Since the 1970s, we as a research community have come to appreciate the fundamental importance of biomechanical factors in regulating normal vascular biology and physiology and similarly in impacting the progression of many diseases as well as their responses to clinical intervention. In the specific area of endovascular therapy, aortic neck dilation in response to excessive device oversizing is a clear example of maladaption in response to changes in the biomechanical environment of the aorta.

Although the factors regulating vascular adaptation clearly involve coupled effects between the flowing blood, vascular wall, and perivascular tissues, that is, fluid–solid–solute interactions, research in vascular biomechanics has traditionally advanced along separate lines – biofluid mechanics, biosolid mechanics, and biotransport phenomena. There is, therefore, a pressing need to move toward coupled problem formulations and solutions.

Moreover, it is well known that most physiologic, pathophysiologic, and reparative processes in the vasculature manifest over periods of days to weeks, months, or even years. Yet, most attention in vascular biomechanics has focused on behaviors during a cardiac cycle or, at best, at select time points during the progression of a disease or response to a treatment or injury. Clearly, there is also a pressing need to understand better the underlying processes that are responsible for the conspicuous changes in structure and function that occur over long periods, changes that likewise depend strongly on the biomechanics.

This work is motivated by these needs, indeed, the need for a new paradigm to address diverse biomechanical problems of the vasculature by accounting for coupled fluid–solid-transport over long periods of vascular adaptation and maladaptation[1]. Hence, in this paper we show how computations of complex fluid–solid interactions (FSI) during a cardiac cycle can be linked to detailed analyses of the solid mechanics of the vascular wall as well as descriptions of the kinetics of biological growth and remodeling (G&R) which can depend strongly on solute transport. We refer to this new approach as fluid–solid-growth (FSG) modeling. Toward this end, we build primarily on four separate advances by our groups: biomechanics of growth and remodeling[2], a coupled momentum method for fluid–solid interactions during a cardiac cycle[3], a theory of small on large for coupling biosolid and biofluid mechanical models[4], and improved approaches for modeling fluid boundary conditions in complex vascular systems[5].

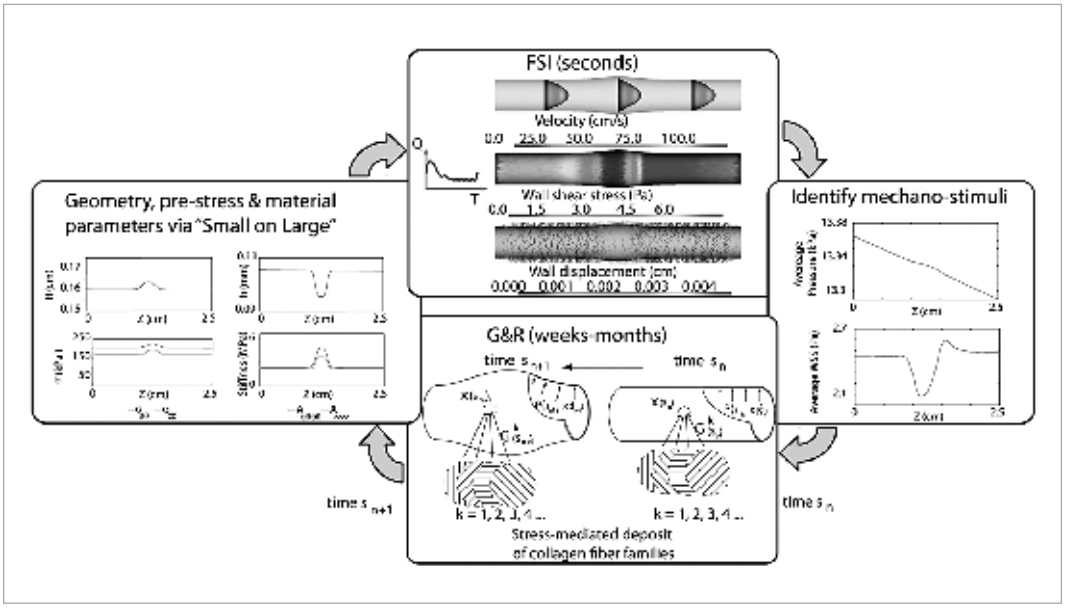

Fig. 1. Iterative loop and information transferred in the coupling between the FSI and G&R parts of the FSG framework.

The FSG framework utilizes a loose coupling between the short term FSI simulations and the long-term G&R simulations. This coupling is illustrated by the loop depicted in Fig. 1. In this loop, at a given time s_n defined over long-time scales, the FSI analysis calculates hemodynamic loads acting on the arterial wall during the cardiac cycle, extracts the mechanical stimuli that affect vascular wall G&R, and then transfers the information to the G&R formulation. The G&R analysis then simulates the evolution of the arterial wall over multiple G&R time steps. The arterial wall is represented as a constrained mixture of amorphous elastin matrix, collagen fibers and smooth muscle (see Fig. 2). When changes in vessel wall geometry and/or structure are significant, the loop returns to the FSI analysis with updated information about the geometry, pre-stresses, and material properties.

In this study, we restrict our illustrative results to a simple situation – influence of pressure-induced intramural stress and flow-induced wall shear stress on the evolution of shape and properties of a basilar artery following an initial concentric loss of a portion of the elastin within the wall (see Fig. 3). Notwithstanding the complexity of the associated biomechanical and biochemical processes, which will certainly require further research to identify more complete constitutive relations for the growth and remodelling kinetics, we submit that the simple illustrative examples herein reveal both the need for and the great potential of fluid–solid-growth modeling in basic research, industrial R&D, and clinical applications.

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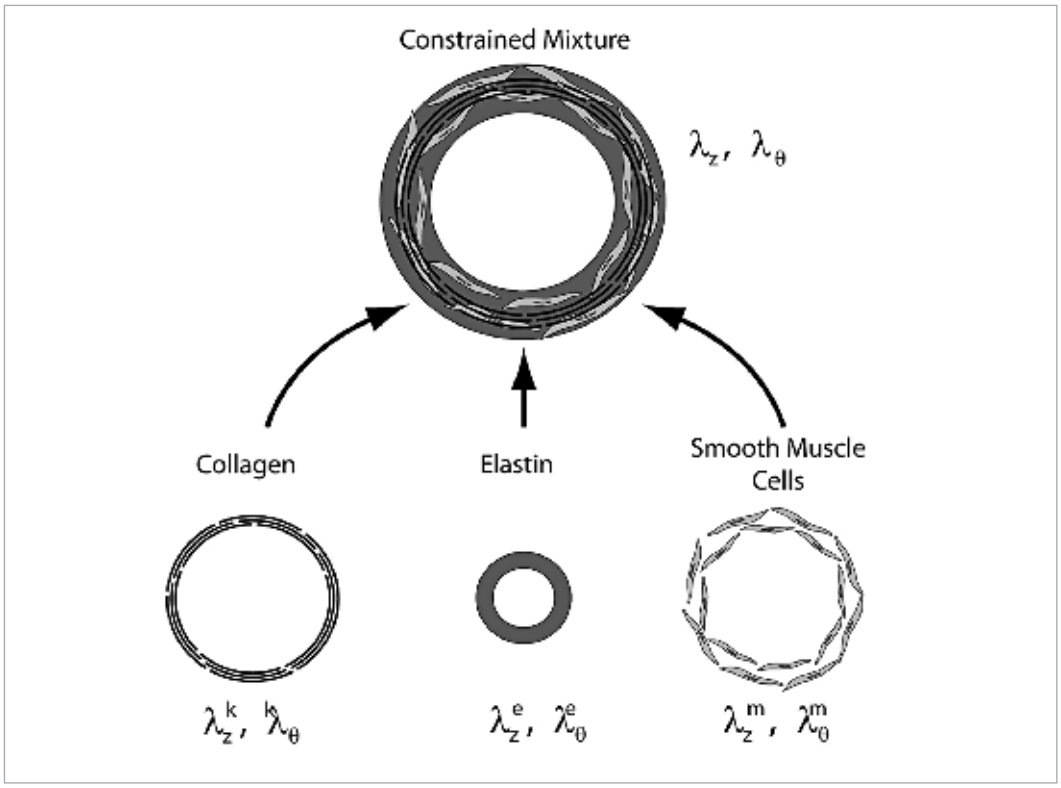

Fig. 1. *Arterial wall as a constrained mixture of amorphous elastin matrix, collagen fibers and smooth muscle.*

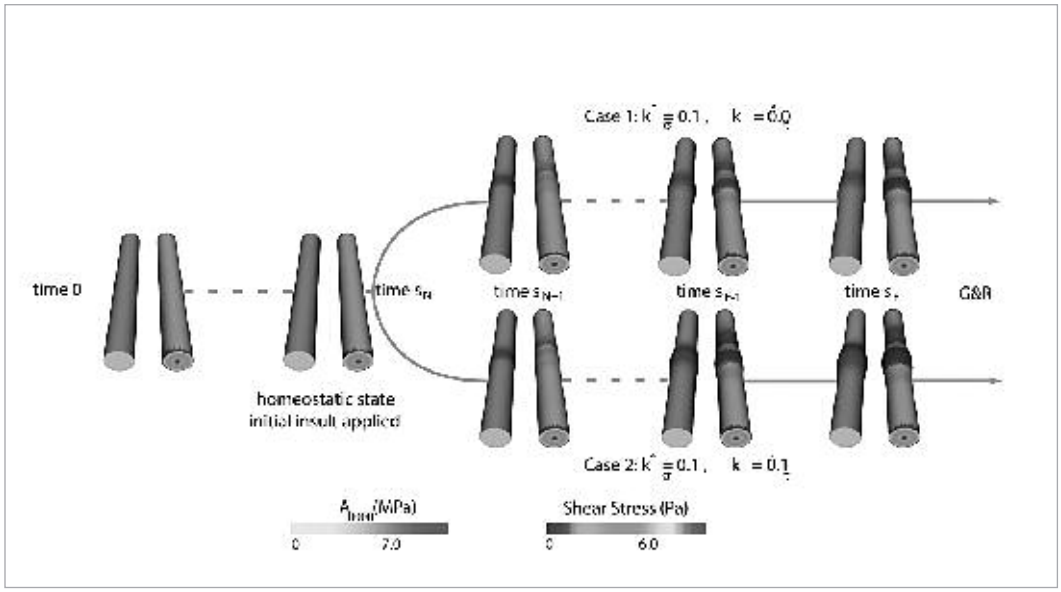

Fig. 1. *Schematic representation of the FSG problem considered. In the first stage of the analysis, we grow the artery until it reaches a homeostatic equilibrium at time s_N. We then introduce an insult in the vessel wall that results in a local concentric loss of the elastin matrix, and perform two different FSG simulations: in Case 1, the arterial growth and remodeling is mediated by tensile stress only, whereas in Case 2, the growth is mediated by tensile and wall shear stress. For illustrative purposes, we show the evolution of the linearized circumferential component of the stiffness A (left) and the vessel wall shear stress (right) for each time step of the analysis.*

Coronary stent evolution: from bare metal stent to vascular restoration therapy

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In 1964, Charles Theodore Dotter and Melvin P. Judkins described the first angioplasty[1] and thirteen years later, Andreas Gruntzig performed the first balloon coronary angioplasty, that lead to the birth of a new specialty, called interventional cardiology[1].

The "plain old balloon angioplasty" (POBA) was a pioneering treatment, whose success was hindered by the problems of acute vessel closure and restenosis[3, 4]. These problems lead to the development of a second revolutionary treatment, the metallic coronary stent, which was first implanted by Sigwart in 1986[5]. Although the initial stents proved to be effective as "bailout" devices in cases of abrupt or threatened vessel closure, thereby reducing rates of emergency coronary artery bypass[6], development was ultimately hampered by the risk of subacute thrombotic coronary artery occlusion (up to 18% of cases within 2 weeks after implantation)[7]. In addition, the use of these metallic devices required the use of complex anticoagulation regimens, associated with increased bleeding and prolonged hospitalization[8]. Overall, the early success and complication rates seen with these initial coronary metallic stents were not always competitive with those of routine POBA[9].

Coronary stenting only became a widely accepted technique after the BENESTENT (Belgian Netherlands Stent) trial[10] and the STRESS (Stent Restenosis Study)[11], indicating that stenting was safe in the absence of anticoagulation therapy with the use of dual antiplatelet therapy and/or adequate stent deployment[12, 13]. By 1999, coronary stenting was then performed in 84.2% of PCI procedure[14]. However, despite obvious advantages, there were raised other concerns: an iatrogenic problem emerged in the form on in-stent neointimal hyperplasia[15-17]. In particular, the intrastent growth of scar tissue, which was the result of proliferation and migration of vascular smooth muscle cells, directly linked to stent implantation, resulted in restenosis rate of 20-30%[18]. The attempts to minimize this in-stent neointimal hyperplasia and thereby reduce rates of repeat revascularization lead to the development of another treatment, the drug-eluting stent (DES). The first human DES implant was performed by J. Eduardo Sousa in Sao Paulo in December 1999 at the start of the 2 first-in-man studies recruiting a total of 45 patients and reporting minimal in-stent neointimal proliferation through to 12-month follow-up[19-20]. The dramatic reduction of the restenosis rate with DES, compared with BMS, was the major driving force behind the exponential growth of PCI as a treatment for patients with coronary artery disease[21-23]. In addition, as there was an increased confidence to use PCI, DES use expanded also to lesions subsets that were only previously considered suitable for coronary artery by-pass[24-25].

In 2006 concerns were raised over the safety profile of DES, resulting in an imme-

TABLE III. BIORESORBABLE SCAFFOLDS TESTED IN HUMAN

STENT	DRUG (concentration [u/cm²])	DRUG MECHANISM	POLYMER	STRUT THICKNESS (um)	RELEASE KINETICS 28 DAYS	METAL
Cypher	Sirolimus (140)	Inhibits mTOR, cytostatic	Polyethelyne co-vinyl acetate and poly-n-butyl methacrylate	140	80%	Stainless Steel
Taxus Express	Paclitaxel (100)	Microtubule inhibitor, cell cycle arrest in G0/G1 and G2/M	Poly(styrene-b-isobutylene-b-styrene	132	<10%	Stainless Steel
Taxus Liberté	Paclitaxel (100)	Microtubule inhibitor, cell cycle arrest in G0/G1 and G2/M	Poly(styrene-b-isobutylene-b-styrene	97	<10%	Stainless Steel
Endeavor	Zotarolimus (100)	Inhibits mTOR, cytostatic	Phosphorylcholine	91	95%	Cobalt Chromium
Xienve V	Everolimus (100)	Inhibits mTOR, cytostatic	Polyvinylidene fluoride cohexafluoropropylene and poly-n-butyl methacrylate	81	80%	Cobalt Chromium

diate world-wide downturn in their use[26-27]. However, these concerns proved a vital stimulus to focus research and have ultimately lead to the development of newer stents and improved safety, resulting in a resurgence in the use of DES. While the initial coronary stents were composed of 316L stainless steel, radio-opaque and providing adequate radial strength, for the second generation DES cobalt chromium, which exhibits superior radial strength and improved radio-opacity, allowing for thinner stent struts, was used[28]. Thinner struts also lead to a reduction in device profile and, hence, an improvement in stent deliverability to the target lesion (Table 1).

Evidence from animal and human studies suggested also that nonerodable polymers can cause persistent arterial wall inflammation and delayed vascular healing, both of which may subsequently have a role in stent thrombosis and delayed restenosis[29-31]. These findings accelerate the development of new DES coated with biodegradable polymers, which offer the attractive combination of controlled drug eluting in parallel with biodegradation of the polymer into inert monomers: once the biodegradation is complete, a bare metal stent remains, thereby reducing the long-term risks associated with the presence of a permanent polymer[32]. In recent times, an extension of this concept has been the development of DES completely free of polymer and of BMS coated in novel coatings[33] (Table 2).

Finally, completely biodegradable scaffold have been developed, which completely disappear once vascular healing has taken place (Table 3). The Abbott Vascular everolimus-eluting bioresorbable vascular scaffold (BVS) is the only drug-eluting bioresorbable scaffold currently undergoing clinical trials. The BVS has a backbone of poly-L-lactic acid, which is subsequently coated with a thin layer of a 1:1 mixture of an amorphous matrix of poly-D,L-lactide (PD-

TABLE II. NEW STENTS WITH BIODEGRADABLE OR NOVEL COATING OR POLYMER-FREE

BIODEGRADABLE COATING
• Biomatrix/Nobori (abluminal poly-L-lactide)
• Nevo (Reservoir Technology)
• Supralimus
• Axxess
• XTENT
• Excel
• Elixir
• Infinnium
• JACTAX
• Synergy
• Combo
• etc
POLYMER-FREE
• Yukon
• Biofreedom
• VESTAsyn (hydroxyapatite)
• Amazonia Pax (crystallized PTX)
• etc
STENT WITH NOVEL COATING
• Catania (Nano Thin Polyzene-F)
• Tita-2-stent (titanium-nitride oxide)
• Genous Bio-engineered R-stent (EPC capture CD34
• etc

LLA) and 8.2 g/mm of the antiproliferative drug everolimus. The PDLLA enables controlled release of everolimus, such that 80% is eluted by 30 days. The first BVS device had a strut thickness of 150m and consisted of circumferential out-of-phase zigzag hoops, with struts linked directly together or by thin and straight connections. The scaffold had to be kept stored below -20°C to prevent physical aging of the polymer. The safety and feasibility of this BVS was assessed in 30 low-risk patients in the prospective, open-label, multicenter ABSORB A study[34-35]: this study demonstrated an angiographic late loss of 0.44 mm, comparable to values from the early DES studies, and the clinical safety of the BVS with only one ischemic driven major adverse event (nonQ wave myocardial infarction) during the 42 month follow-up.36 The reduction in hyper-echogenicity, the change in plaque composition on IVUS-VH, the disappearance of the polymeric struts by OCT and the return of vasoactivity following administration of methylergometrine maleate or acetylcholine were important findings, supporting the occurrence of bioresorption and the concept of "vascular restoration therapy". Importantly, at 6-month, the late loss of this device represented a combination of neointimal hyperplasia and a reduction in scaffold area, a phenomenon called late scaffold shrinkage. The late scaffold shrinkage, which occurs as a consequence of the loss of radial strength with bioresorption, represented a new phenomenon not previously observed with conventional metallic stents[37], which leads to important design modifications to the device.

The second-generation device, BVS 1.1, utilizes the same polymer, but a change in the manufacturing process was made in order to maintain the mechanical integrity of the device up to 6 months. The new design has in-phase zigzag hoops linked by bridges, which allow for a more consistent drug application. From a practical perspective, the scaffold can now be stored at room temperature. The BVS 1.1 is currently being assessed in the ABSORB Cohort B trial, enrolled 101 patients. Currently, data from the 6-month follow-up showed a late loss considerably lower than that seen with the BVS 1.0 (0.19 mm) with strong reduction of the late shrinkage phenomenon[38]. Longer-term follow-up is ongoing. In the pipeline for the future is the pivotal non-inferiority trial of the BVS vs. a metallic DES[39].

In conclusion, it is easy to think that no single stent design and polymer type is suitable for all patients and lesion types. With regards to this, a more individualized choice of stent, taking into account patient's (ability to take long-term double antiplatelet therapy) and lesion's (bifurcation, myocardial infarction, etc) characteristics, would be

TABLE I. FIRST AND SECOND GENERATION DRUG ELUTING STENT

SCAFFOLDS	STRUT MATERIAL	COATING MATERIAL	DESIGN	ABSORPTION PRODUCTS	DRUG ELUTION	DEPLOYMENT	TOTAL STRUT THICKNESS (STRUT+ COATING)	DURATION RADIAL SUPPORT	ABSORPTION TIME
Igaki Tamai	Poly-L-lactic acid	Nil	Zig-zag helical coils with straight bridges	Lactic acid CO2 and H2O	Nil	Self expanding with heated balloon	170	6 mo	2 y
AMS-I	Metal magnesium alloy	Nil	Sinusoidal in-phase hoops linked by straight bridges	Not applicable	Nil	Balloon	165	Days or weeks	<4 mo
AMS-II	Metal magnesium alloy	Nil		Not applicable	Nil	Balloon	125	Weeks	>4 mo
AMS-II	Metal magnesium alloy	Nil		Not applicable	Nil	Balloon	125	Weeks	>4 mo
REVA	Poly-tyrosine-derived polycarbonate polymer	Nil	Side and look	Amino acid, ethanol, CO2	Nil	Balloon	200	3-6 mo	2y
BTI	Polymer salicylate+linker	Salicylate + different linke	Tube with laser-cut voids	Salycilate CO2 and H2O	Sirolimus salicylate	Balloon	200	3 mo	6 mo
BVS 1.0	Poly-L-lactic acid	Poly-D,L-lactide	Out of phase sinusoidal hoops with straight and direct links	Lactic acid CO2 and H2O	Everolimus	Balloon	156	Weeks	2y
BVS 1.1	Poly-L-lactic acid	Poly-D,L-lactide	In-phase hoops with straight links	Lactic acid CO2 and H2O	Everolimus	Balloon	156	3 mo	2y

an important factor influencing stent selection.

The technology of the bioresorbable scaffolds, which allows a "vascular restoration therapy", following their bioresorption, is also of value and will grow in the next years.

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Mitraclips and beyond

Denti, P.

Mitral regurgitation (MR), is the most prevalent valve disease in the western population[1-3]. When MR is severe, freedom from events and life expectancy are reduced[2,4-6]. According to guidelines, symptomatic patients with severe MR should be submitted to surgery[7,8].

Euro Heart survey showed that up to 50% of symptomatic patients hospitalized with the diagnosis of severe MR, are not referred to surgery due to the perceived risk of the procedure [1]. To reduce the invasiveness of the surgical approach, different types of trans-catheter procedures are becoming available (table 1). The MitraClip procedure (Abbott Vascular Inc. Menlo Park, CA) is yet the only catheter based procedure available in clinical practice at the moment. This device is designed to resemble a technique originally introduced by Alfieri (9), the double orifice repair. This is a surgical method to treat MR that has been used to treat either DMR (Degenerative) or FMR (Functional) [9-12] with excellent results.

Indication and timing of intervention is a crucial step in the diagnostic-therapeutic pathway of patients with mitral regurgitation. Since Mitraclip is avaible selection between surgical and interventional treatment is an emerging clinical challenge. Overall decision making is strongly influenced by anatomical and clinical factors (table 2). Generally, MitraClip is effective in treating either type II or IIIb dysfunction. On the other hand, type IIIa mitral dysfunction is a contraindication for the MitraClip procedure due to the risk of inducing mitral stenosis.

The Mitraclip device has been evaluated in a number of preclinical studies, registries and in FDA approved clinical trials. (EVEREST trial, ACCESS-EU trial) [13-16].

Degenerative mitral regurgitation (DMR) is the most common etiology of organic MR and the most common pathology treated by surgeons according to Euroheart survey. Valve repair is the gold standard surgical treatment of chronic degenerative MR with mitral valve replacement being exceptional today in high volume centers[17].When repair is successfully performed, functional recovery and life expectancy are restored and are comparable to the general population.

Soon after the first in man experience (2003), the Endovascular Valve Edge-to-Edge REpair Study (EVEREST) was initiated in the United States. Although the this trial suggested that MitraClip is superior to surgery in terms of safety and non-inferior in terms of efficacy, the results are still not convincing enough to advocate MitraClip treatment in low risk patients with DMR. In our clinical practice patients with DMR accounts for 19/62 pts (31%) treated with MitraClip. Despite the suboptimal MR reduction in 20% of patients, clinical improvement was obtained in the majority of patients, including those with residual MR. According to it, MitraClip therapy is indicated in those DMR patients with high surgical risk and ideal anatomy for clip implantation (according to EVEREST criteria). In selected patients with high surgical risk and suboptimal anatomical criteria the procedure can be undertaken, but realizing that it could be unsuccessful or suboptimal. However, in these patients it is not uncommon to observe a significant improvement of symptoms even in case of sub-optimal result (residual MR grade 2+ or 3-4+). This mismatch between hemodynamic result and clinical benefit could be related to the inaccuracy of the current semiquantitative methods of assessment of residual MR.

TABLE I. PERCUTANEOUS DEVICES FOR MITRAL VALVE REPAIR

LEAFLET REPAIR
• MitraClip (Abbott Vascular)
• Mobius (Edwards)
• Neochord
• Percu-Pro (leaflet spacer)
• Thermocool (leaflet ablation)
DIRECT ANNULOPLASTY
• Mitralign
• Guidant
• Guided delivery systems
• ValtechCardio - Cardioband
• Millipede
CHINCHING DEVICES
• PS^3 (Ample Medical)
• I-Coapsys
RADIOFREQUENCY BASED REMODELING
• Q-care (Quantum Cor)†
• ReCor
CORONARY SINUS ANNULOPLASTY
• Monarc (Edwards Lifesciences)
• Percutaneous transvenous mitral annuloplasty (PTMA) (Viacor)
• Carillon - Cardiac Dimensions
• St Jude
MITRAL VALVE REPLACEMENT
• Endovalve-Herrmann prosthesis (Right mini-thoracotomy)
• CardiaAQ (Transseptal)
• Mitraltech (transseptal)
• Medtronic (unknown)
• Lutter prosthesis (Transapical)

Differently from DMR, in FMR there are not intrinsic valve lesions: MR is the effect of left ventricular dysfunction and deformation. Surgical correction of FMR is usually obtained by simply over-reducing the annular dimensions with undersized rings. The addition of edge-to-edge suture to undersized annuloplasty has been associated with increased durability and reduced risk of recurrent mitral regurgitation (18) This concept has been used as a background for the use of MitraClip in FMR. Unfortunately, surgical treatment of FMR is associated with significant operative and 30 days mortality risk. Trans-catheter valve interventions lower the risk and carry the potential for an earlier approach, compared to surgery. In our clinical practice patients with FMR accounts for 69% of all 62 patients treated with MitraClip. FMR is currently the main indication for MitraClip for a variety of reasons. The procedure is technically less demanding and it is offered to patients who are often denied surgery, being the operative risk of surgery well above 5% for depressed left ventricular function.

Since its introduction in Europe, data have been collected in the ACCESS post-market registry. The enrollment is ongoing and limited data is available at the moment. Initial reports[19] suggest that risk profile of patients currently treated in Europe is different from the patients enrolled in the EVEREST trial. Average Euroscore is around 20%, and most patients have low ejection fraction and FMR. Also the risk of the procedure remains low (hospital mortality 3%) despite most patients treated have severely depressed left ventricular function.
Although the initial results of MitraClip are very encouraging, we are left with several open issues. Little is known about durability, particularly in patients with suboptimal anatomy. These patients have not been studied in the EVEREST trial and the data from ACCESS, although useful for hypothesis generation, will not be as reliable as those of the trial, since they are not core lab adjudicated. Other issues include the feasibility of mitral repair at a later stage if recurrent MR occurs, the clinical benefit in FMR, as well as the relative role of MitraClip compared to the other heart failure treatments (medical therapy, CRT, ventricular assist devices). But the most critical issue at this moment, when evaluating the role of the percutaneous treatment of MR,

TABLE II.

EVEREST KEY INCLUSION CRITERIA

- Candidate for mitral valve repair or replacement surgery
- Moderate to severe (3+) or severe (4+) chronic mitral valve regurgitation and symptomatic with LVEF >25% and LVID-s ≤55 mm or asymptomatic with 1 or more of the following:
  - -LVEF >25% to 60%
  - -LVID-s ≥40 to 55 mm
  - -New onset of atrial fibrillation
  - -Pulmonary hypertension defined as pulmonary artery systolic pressure >50 mm Hg at rest or >60 mm Hg with exercise.

EVEREST KEY EXCLUSION CRITERIA

- Recent myocardial infarction
- Any interventional or surgical procedure within 30 days of the index procedure
- Mitral valve orifice area <4 cm^2
- Renal insufficiency, endocarditis, rheumatic heart disease
- Previous mediastinal surgery in the first 27 patients

EVEREST KEY AUTOMATICAL CRITERIA

- Flail gap > 10 mm
- Flail width < 15 mm
- Coaptation deth < 11 mm
- Coaptation length ≤ 2 mm

Indications criteria for inclusion in the EVEREST I and II pivotal trials, from Feldman et al. JACC 2009.(16) LVEF = left ventricular ejection fraction; LVID-s = left ventricular internal diameter-systole.

is that only MitraClip is available to correct MR in clinical practice. Due to the strict anatomical criteria, several patients cannot be treated percutaneously at the moment. In particular the lack of a reliable annuloplasty device is probably the most important limitation to the expansion of the percutaneous mitral valve intervention field. The addition of annuloplasty is associated with more durable surgical results[20]. When percutaneous annuloplasty will become available, most patients will become amenable to percutaneous interventions (from a pure anatomical standpoint). But more devices are under evaluation (Table 1), and will further expand the indications for transcatheter interventions. Neochordae implantation, as an example, will further expand the reparability of complex myxomatous valves with multiscallop disease. Also new devices for percutaneous ring implantation are under evaluation. Finally, transcatheter mitral valve implantation will be developed in the next future to complete the therapeutic portfolio, potentially expanding the indications to patients with rheumatic disease and to those with anatomy unsuitable for repair. There are still several obstacles to the development of a reliable device for transcatheter mitral valve implantation. Compared to the aortic valve, the mitral valve anatomy is more complex, and far from a cylindrical geometry. Moreover, the larger size of the annulus compared to the aortic valve prevents the use of conventional stent technology. Anchoring of the implant is another challenge, since radial force cannot be applied

for the large dimensions of the valve and because a real annulus does not exist, neither is usually calcified, as for the aortic valve. Using radial force would be suboptimal also due to the risk of impingement into the aortic valve. The anatomy of the mitral valve is totally asymmetric, therefore mitral implantation devices should be designed to accommodate this feature. In particular, the anterior leaflet of the mitral valve is directed towards the left ventricular outflow tract. A mitral implant should take care of the anterior leaflet and should not protrude in the outflow tract to avoid obstruction. Last but not least, if perivalvular leaks are tolerated in the aortic position, they will not be acceptable in the mitral position, since they will be more hemodynamically significant and may induce severe hemolysis.

For all these reasons, it will be take a while before mitral valve implantation will become available and will provide reliable results. In the meanwhile, percutaneous mitral valve repair will evolve with the potential to become a real alternative to surgery.

Conclusions

A relevant number of patients in need of MR reduction do not undergo surgery because of a high perioperative risk. To date, MitraClip therapy has only been assessed in trials where patients with a normal surgical risk and stringent valvular and ventricular suitability criteria were enrolled. However, current practice suggests that higher risk patients can be treated with reasonable risk profile.

The procedure is quite predictable in patients with favorable anatomy according to the EVEREST criteria. In patients with suboptimal anatomy, if the risk of surgery is too high, MitraClip is indicated, but at the cost of higher risk of complications and with less chance of a successful implant. The introduction of additional technologies will expand the indications of percutaneous mitral interventions, and will further improve the therapeutic options for patients with MR.

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Periarterial renal radiofrequency: indications, technique and early clinical results

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The sympathetic nervous system via its effect on the kidney maintains a key role in blood pressure regulation and in the pathogenesis of hypertension. In turn, the kidney receives a dense innervation of afferent sympathetic fibers allowing it to effectively modulate the sympathetic tone. Hence, the kidney can be both culprit and victim of increased sympathetic activity. In addition, conditions such as congestive heart failure, chronic renal failure or the metabolic syndrome are associated with an increased sympathetic activity whether or not hypertension is present.

On this account, both the sympathetic nervous system and the kidney were identified as potential therapeutic targets in the treatment of hypertension and other conditions associated with a high sympathetic tone. Initial investigations focused on surgical removal of the sympathetic trunk, unfortunately accompanied by operative mortality and major side effects. More specific methods of disrupting interactions between the sympathetic nervous system and the kidneys were subsequently explored including the removal of diseased kidneys and, more recently, minimally invasive severance of the renal sympathetic nerves. Currently, most hypertensive patients can be treated by effective antihypertensive drugs. Notwithstanding, a small group of hypertensive patients remains suboptimally controlled despite identification of potential causes and appropriate treatment. In this group an elevated sympathetic tone may be a significant contributor to treatment resistance and selective renal sympathectomy may be beneficial.

The kidney regulates arterial pressure and volume by pressure natriuresis. By this principle, changes in sodium and volume intake are counterbalanced by adjustments in tubular sodium reabsorption. Likewise, blood pressure changes mediated, for example, by variations in peripheral arterial resistance are counterbalanced by appropriate changes in sodium reabsorption. This mechanism is intrinsic to the kidney and occurs in the absence of extrinsic neurohormonal influences. The feedback response is set such that the blood pressure will remain largely unaffected by variations in sodium and volume intake or by changes in peripheral arterial resistance.

In addition, renal juxtaglomerular epithelioid cells synthesize renin, the key enzyme of the renin-angiotensin-aldosterone cascade. It is released into the intravascular space and interstitium by afferent arterioles. Renin converts angiotensinogen to angiotensin I which is converted to angiotensin II in the lungs and elsewhere. Angiotensin II is one of the most potent direct vasoconstrictors and, via enhancement of mineralocorticoid hormone production such as aldosterone it stimulates renal tubular sodium reabsorption thereby modifying the pressure natriuresis response. Furthermore, angiotensin II activates the sympathetic response by norepinephrine-reuptake inhibition. The renin-angiotensin-aldosterone system (RAAS) therefore influ-

ences vascular resistance, sodium balance, extracellular fluid volume and sympathetic activity. The sympathetic nervous system is a major contributor to hypertension initiation and sustenance via its influence on renal blood flow, glomerular filtration rate, renin release, and urinary sodium and water balance regulation.

The kidney is innervated by a network of postganglionic sympathetic neurons arising from the thoracic and lumbar spine. Likewise, it communicates with autonomic centers in the central nervous system by afferent sympathetic neurons. Both efferent and afferent fibers enter and exit the kidneys within the adventitia alongside the renal arteries.

Efferent renal sympathetic nerves release norepinephrine as the primary transmitter and innervate the preglomerular and postglomerular vasculature, all elements of the juxtaglomerular apparatus and virtually all segments of the nephron in both cortical and medullo-papillary regions.

An increase in efferent renal sympathetic nerve activity causes renal vasoconstriction with subsequent reduction in renal blood flow, renal tubular sodium reabsorption, renin release and thereby activation of the renin-angiotensin-aldosterone cascade, and release of catecholamines and other vasoactive substances all of which lead to a blood pressure increase.

The activation of the above mechanisms appears to be dependent on the intensity of the renal sympathetic nerve signal.
It is important to recognize that the kidneys are richly innervated not only by sympathetic efferent fibers but also by sensory afferent fibers that communicate pressure and electrolyte changes to the central nervous system.

These afferent fibers originate in the kidney. The cell bodies are located in the dorsal root ganglia and are connected via the spinal cord to the autonomic centers in the central nervous system (mainly within the paraventral nucleus of the hypothalamus). They contain substance P, calcitonin generelated peptide and adenosine as the primary neurotransmitte. Furthermore, afferent fibers are coupled to the efferent sympathetic fibers of the contralateral kidney and thereby coordinate the excretory function between the two kidneys through reno-renal reflexes. Signals are transmitted to the spinal cord and central nervous system via afferent fibers located (together with the efferent fibers) in the renal arterial wall.

Adverse conditions such as ischemia or hypoxemia result in an increase in renal afferent nerve activity. Renal afferent nerve activity, on the other hand, by modulating posterior hypothalamic activity, directly influences overall sympathetic adrenergic drive (to the kidneys and other highly innervated organs such as the heart and peripheral vasculature).

The denervation of the renal sympathetic nerves was performed with a specifically designed catheter (Ardian Symplicity® Catheter), providing an insulated arch wire to position the electrode at the vessel wall and an electrode on its tip connected to a radiofrequency generator. The radiofrequency catheter was positioned into the renal artery via a 5 French guide catheter, both of which are generally delivered through an 8 French renal guide catheter. Once the tip of the catheter was positioned appropriately at the renal artery wall radiofrequency was applied. The sympathetic nerves are particularly sensitive to radiofrequency energy and at the energy levels applied are disrupted without affecting the surrounding tissue.

Prior to the procedure, anticoagulation was initiated and maintained aiming for an ACT between 250-200 seconds. Analgesics and narcotics were routinely administered as the intended injury of renal afferent sympathetic nerves is invariably associated with diffuse abdominal discomfort. After access via the femoral artery and confirmation of anatomic eligibility with renal angiography, the radiofrequency ablation catheter was inserted

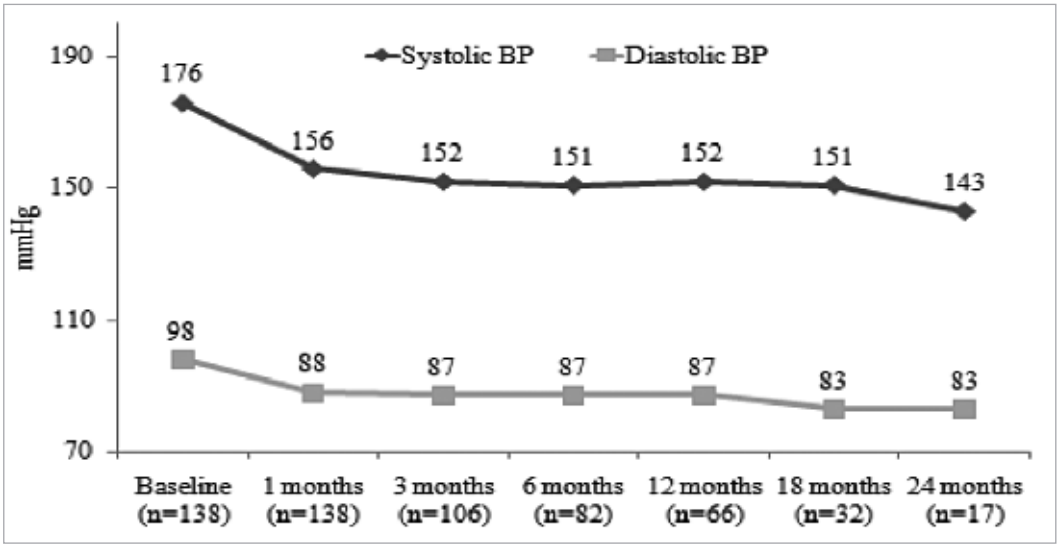

Fig. 1. *Results of office blood presure change after treatment with perairterial renal radiofrequency (Simplicity HTN-1 trial).*

into each renal artery, and the radiofrequency ablations of 8 watt or less lasting 2 minutes each were applied to achieve at least 5 ablations for an optimal result. Catheter tip temperature and impedance were constantly monitored during the ablation procedure and delivery of the radiofrequency was regulated according to a predetermined algorithm. In case of reduced renal blood flow, catheter tip temperature may rise to greater than 75°C due to a decreased cooling effect of the blood causing automatic deactivation of the radiofrequency generator and thereby preventing damage to surrounding tissue. The energy delivered was several magnitudes lower than that used for radiofrequency ablation of the pulmonary veins in patients with atrial fibrillation. Upon completion and removal of the radiofrequency catheter, either manual compression or closure devices were used to achieve hemostasis at the puncture site. After the procedure no specific medications were required and the previous antihypertensive regimen was continued. Treated patients were usually discharged from hospital the following day. Periodic follow-up to one year with blood pressure reassessment and determination of the number of antihypertensive medications was mandatory. To explore the feasibility, safety and efficacy of selective renal sympathectomy via a radiofrequency catheter positioned into the renal arteries percutaneously, in 2007, the non-randomized prospective Simplicity HTN-1 trial was initiated. Patients with resistant hypertension and suitable renal artery anatomy (bilateral single renal arteries with a minimal diameter and length of 4mm and 20 mm respectively) were enrolled. 138 patients were included and treated as described above. At baseline, the average arterial office blood pressure was 176/98 mmHg despite a mean of 5.0 antihypertensive drugs. The data of 138 patients who underwent selective catheter-based sympathectomy with follow-up to 24 months confirm the favorable blood pressure response and durability of the results (figure 1).

The Symplicity HTN-2 trial was an international, multi-center, prospective, randomized, controlled study in patients with uncontrolled hypertension. 106 patients were enrolled from 24 investigational sites. At baseline, the randomized treatment and control patients had similar high blood pressures: 178/97 mmHg and 178/98 mmHg, respectively, despite both receiving an average daily regimen of 5 antihypertensive medications. After six months, the aver-

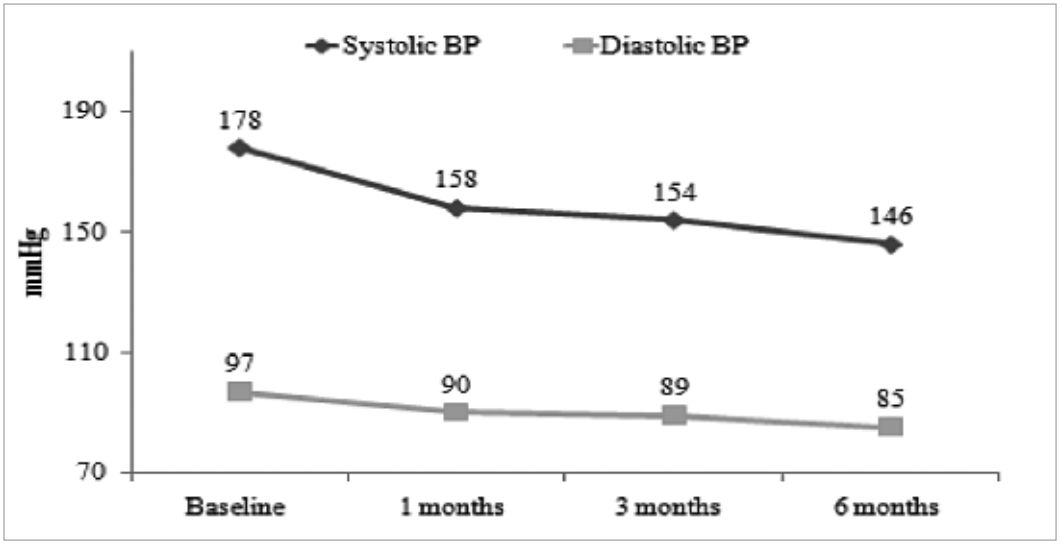

Fig. 2. Results of office blood presure change after treatment with perairterial renal radiofrequency (n=49, Simplicity HTN-2 trial).

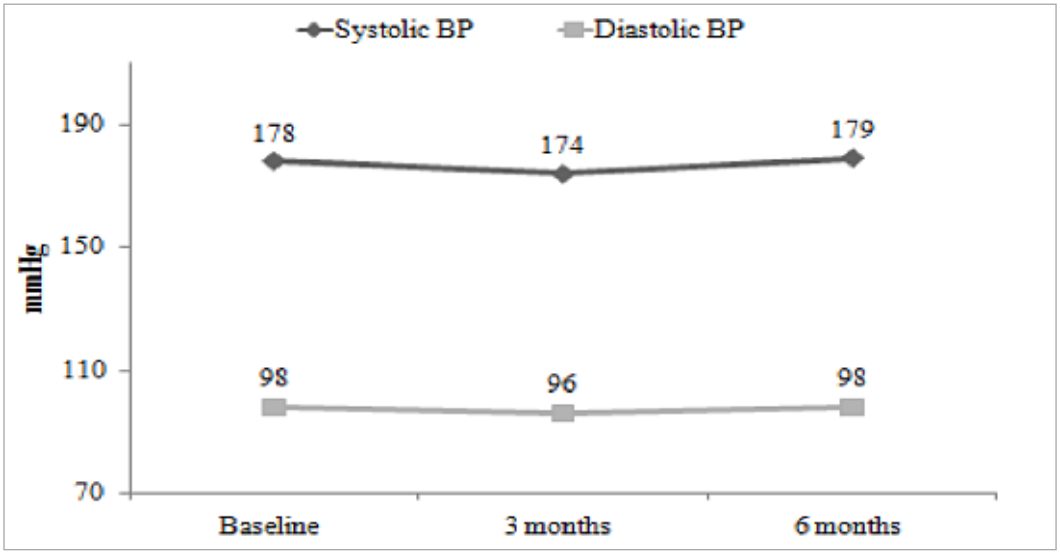

Fig. 3. Results of office blood presure changes in the control group (n=51,Simplicity HTN-2 trial).

age blood pressure of the renal denervation group was reduced to 146/85 mmHg, compared to an average blood pressure of 179/98 mmHg for the control group (figure 2 and 3).

The results of the multi-center prospective, randomized, controlled Symplicity HTN-2 trial demonstrate that catheter-based renal denervation is safe and results in substantial reductions of blood pressure in patients with uncontrolled hypertension. These results confirm the findings of the previously published and presented results of the multi-center, single-arm Symplicity HTN-1 study, which demonstrated the longer term safety and the durable benefit of catheter-based renal denervation. The trials found that the therapy has no serious device or procedure-related events, no cardiovascular complications and no kidney-related complications.

Ptient and device selection for endovascular repair of visceral aneurysms and dissections

Van den Berg, J.

Visceral artery aneurysms represent a rare clinical entity. Once considered uncommon, they are now being diagnosed with increasing frequency. This increasing incidence is caused by the more frequent use of computed tomography (CT), magnetic resonance imaging, and ultrasound. These aneurysms are important to recognize because up to 25% may be complicated by rupture, and the mortality rate after rupture is between 25% and 70%, depending on the location of the aneurysm.

However, little is known about the natural history and clinical presentation of visceral artery aneurysms and therefore controversy still exists regarding their treatment. The decision for intervention has to take into account the size and the natural history of the lesion, the risk of rupture, which is high during pregnancy, and the relative risk of surgical or endovascular intervention. For most asymptomatic aneurysms, conservative treatment is acceptable. For larger (>2 cm in diameter) aneurysms, aneurysms that demonstrate growth, and symptomatic aneurysms treatment is advisable. Diagnostic radiology plays a major role in the detection and characterization of visceral artery aneurysms. Cross-sectional imaging can help exclude aneurysm rupture, which requires emergent treatment. CT angiography or catheter angiography can clearly depict the aneurysm and help identify other aortic, visceral, or peripheral aneurysms. Most important, radiologic examination can help determine the adequacy of the collateral blood supply to the vascular bed distal to the aneurysm, information that is essential prior to the initiation of endovascular treatment. Advances in endovascular therapy have allowed interventionalists to contribute to the management of visceral artery aneurysms.

Coil embolization or covered stent placement as well as flow-diverting devices can now be used to treat patients with aneurysms whose size or location would make a surgical approach problematic, as well as patients in whom surgery is considered to pose considerable risk. Surgical treatment can consist of aneurysm exclusion (ligation), excision, or revascularization. This paper will discuss patient diagnostic work-up, and will give tips to properly select treatment modality and help in device selection.

Carbon dioxide angiography for endovascular abdominal procedures

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Renal dysfunction following EVAR and other interventional, abdominal procedures is multi-factorial in origin. Iodinated contrast agents used during transluminal intervention are likely a major factor in causing renal dysfunction following EVAR. The deterioration in renal function after EVAR requires the use of methods that may reduce perioperative renal toxicity. Avoiding iodinated contrast agents in patients with pre-existing renal insufficiency or allergy to iodinated media, could reduce the risk of deterioration in renal function and allergic reactions to contrast during EVAR.

Carbon dioxide (CO2) is an extremely safe negative contrast agent, vastly under-utilized by vascular surgeons and other interventionalists. Carbon dioxide is not nephro-toxic, is not allergenic, and when used with adequate digital subtraction angiographic technique provides excellent angiographic images of the abdominal aorta and its branches. Carbon dioxide has extremely low viscosity (less than 400 times that of iodinated contrast material), a unique property that allows effective injection of high volume rates of carbon dioxide through extremely small catheters, and virtual spaces such as those existing between the components of coaxial transluminal devices. Our experience with CO2 for EVAR guidance in more than 100 consecutive procedures, included 96 patients with mild to severe reduction in glomerular filtration rate (GFR). Postoperatively, this group of patients did no experience any significant decrease in the GFR, and had no increase in delayed endoleak detection or in requirement for additional intervention. Our experience suggests that CO2 guided EVAR is technically feasible and safe, and does not produce significant renal toxicity even in patients with pre-existing renal dysfunction.

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Endovascular recanalization should be first opinion for proximal lesions

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Proximal lesions of the supraortic vessels are rare compared to i.e. lesions of the carotid bulb/proximal internal carotid artery. However, access for open surgical revascularization of proximal arterial obstruction sometimes requires a major exposure.

Indications are important: asymptomatic occlusion should probably not be treated no matter at which position. Non-hemispheric symptoms in a patient with proximal obstruction of one or more of the carotids/vertebrals should probably only be treated if cerebral blood flow is compromised as evaluated by stimulation tests.

There are no good scientific data to support whether open surgical or endovascular approach is first option for treatment of proximal lesions of the supra-aortic vessels. However, given the morbidity associated with major exposure i.e. by sternum split, endovascular approach will often be attractive. However, in some cases, i.e. occlusion of the left subclavian, open surgical repair remains a good first choice.

Endovascular therapy in thoracic outlet syndrome: Benefits and limitations

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Transluminal intervention has an important role in the management of patients with vascular compression at the thoracic outlet as an adjunct to surgical decompression. During the last five years we have treated 72 patients presenting with predominantly arterial (34) or venous (38) compression at the thoracic outlet. Among the arterial cases, 7 (21%) underwent catheter directed arterial thrombolysis and/or surgical thrombectomy prior to thoracic outlet decompression. All patients underwent arterial

decompression with rib resection, with simultaneous arterial reconstruction in 9 (26%) cases. At three months to five years of follow-up, all decompressed arteries remained patent, and none required additional transluminal intervention or surgical revision.

Among the 38 patients with venous compression at the thoracic outlet, 37 presented with acute axillo-subclavian vein thrombosis and one with subclavian vein stenosis.

Twenty-eight patients (74%) underwent emergency catheter directed venous thrombolysis one day to one year prior to surgical decompression of the thoracic outlet, while 10 patients (26%) were initially treated with anticoagulation only.

The final, comprehensive treatment in all patients was first rib resection with simultaneous intraoperative, transluminal dilatation of the subclavian vein. Additional intraoperative mechanical/chemical, catheter directed thrombolysis was required in 8 (21%) patients. Immediate postoperative subclavian vein re-thrombosis occurred in 7 (18%) patients. Additional catheter directed mechanical/chemical thrombolysis was successful in treating 6 of the 7 recurrent thromboses, with only one patient undergoing stenting of the subclavian vein. Following intervention, all patients were placed on Coumadin therapy for 6 months. Overall, the axillo-subclavian vein segment remained patent in 37 (97%) patients, and no recurrent thromboses were identified during the follow-up period.

Current evidence review on CAS for symptomatic patient

Fraedrich, G.

Innsbruck

Carotid Stenting Trialists' Collaboration (CSTC)

Recent randomized controlled trials comparing carotid artery stenting (CAS) with endarterectomy (CEA) for the treatment of symptomatic carotid stenosis were not powered to investigate differences in risks in specific patient subgroups.

A pooled analysis of individual patient data from the Symptomatic Severe Carotid Stenosis trial (EVA-3S), the Stent-Protected Angioplasty versus Carotid Endarterectomy trial (SPACE), and the International Carotid Stenting Study (ICSS) was therefore performed.

Individual data from all 3433 patients randomized and analyzed in these trials were pooled and analyzed with fixed-effect binomial regression models adjusted for source trial. The primary outcome event was any stroke or death.

In the first 120 days after randomization (ITT analysis), the primary outcome event occurred in 153/1725 patients in the CAS group (8 9%) compared with 99/1708 patients in the CEA group (5 8%, risk ratio

[RR] 1 53, 95% confidence interval [CI] 1 20-1 95, p=0 0006; absolute risk difference 3 2, 95% CI 1 4-4 9). Age was the only subgroup variable which significantly modified the treatment effect: in patients <70 years old (the median age), the 120-day stroke or death risk was 5 8% in CAS and 5 7% in CEA (RR 1 01, CI 0 68-1 47); in patients 70 years or older, there was an estimated twofold increase in risk with CAS over CEA (12 0% versus 5 9%, RR 2 04, 1 48-2 82, interaction p=0 0053) (Figure). Patients who underwent CAS within two weeks of their most recent clinical event were at an almost three times higher risk of stroke and death (RR 2.7, CI 1.4-5.5) compared to CEA. (Carotid Stenting Trialists' Collaboration: Lancet 2010;376:1062)

Endarterectomy was safer in the short-term than stenting, because of an increased risk of stroke associated with stenting in patients over the age of 70 years. Stenting should be avoided in older patients, but may be as safe as endarterectomy in younger patients. Determination of the efficacy and ultimate balance between the two procedures requires further data on long-term stroke recurrence.

CSTC data compared to the CREST findings

The CSTC results should be put into the context of the latest published randomised evidence from the Carotid Revascularisation Endarterectomy Versus Stenting Trial. CREST's conclusion of a similar benefit between both procedures was driven by the inclusion of even silent myocardial infarction in the composite endpoints. When 30-day outcomes in symptomatic patients (n=1321) were analysed with regard to the endpoints of the European trials (perioperative stroke and death) CAS was associated with a doubling of the risk for these endpoints (6.0% vs 3.2%, HR 1.9, CI 1.1-3.2). Corroborating the CSTC findings the procedural risks following CAS were nearly equivalent to CEA in patients < 70 years, while CAS was significantly inferior to CEA in patients older than 70 years in CREST. (Brott T.G. et al: New Engl J Med 2010;363:11)

Conclusion

In summarizing these actual meta-analyses including nearly 5000 symptomatic patients it should be concluded that CEA is safer than CAS, particularly in patients older than 70 years. In younger patients CAS could be as safe as CEA, but this has to be shown in studies evaluating long-term restenosis rates. At present knowledge CEA should be considered the gold standard, including patients younger than 70 years.

Should CREST results enourage CAS defenders?

Criado, F.

The CREST Trial reflects the best of evidence-based Medicine. Both CAS and CEA performed in an exemplary fashion, speaking –among other things – of the extremely high quality operators involved on both the stenting and surgical arms of the study.

There is little doubt CEA emerged (again) as the superior form of therapy for the majority of patients. However, the truth be told, CAS also performed quite well, and really better than most of us would have anticipated.

We are left now with a situation that is clearly better than it was in the past as we have at our disposal 2 valid and satisfactory treatment options.

But care must be exercised at the time choosing one versus the other modality, and we must resist the attempts at unfair induction in one direction or the other from various specialists who are clearly trying to spin the CREST results in a way that appears most favorable from their biased perspective and unique background.

Current evidence does not affect my practice in symptomatic patients

Cao, P.

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Objectives
This study sought to evaluate long-term outcomes of carotid stenting (CAS) versus carotid endarterectomy (CEA) based on physician-guided indications.

Background
The issue regarding long-term outcome of CAS versus CEA in patients with carotid stenosis is clinically relevant but remains unsettled.

Methods
Consecutive patients (71% men, mean age 71.3 years) treated by CEA (n=1,118) or CAS (n=1,084) after a training phase were reviewed. Selection of treatment was based on better-suitability characteristics (morphology and clinical).

Data were adjusted with propensity score analysis and stratified by symptoms, age, and sex.

Results
Thirty-day stroke/death rates were similar: 2.8% in CAS and 2.0% in CEA (p=0.27). The risk was higher in symptomatic (3.5%) versus asymptomatic (2.0%) patients (p=0.04) but without significant difference between CAS and CEA groups. Five-year survival rates were 82.0% in CAS and 87.7% in CEA (p=0.05). Kaplan-Meier estimates of the composite of any periprocedural stroke/death and ipsilateral stroke at 5 years after the procedure were similar, in all patients (4.7% vs. 3.7%; p=0.4) and the subgroups of symptomatic (8.7% vs. 4.9%; p=0.7) and asymptomatic (2.5% vs. 3.3%; p=0.2) patients in CEA versus CAS, respectively. Cox analysis, adjusted by propensity score, identified statin treatment (p=0.016) and symptomatic disease (p=0.003) associated with the composite end point. There were no sex- or age-related significant outcome differences.

Conclusions
When physicians use their clinical judgment to select the appropriate technique for carotid revascularization CAS can offer efficacy and durability comparable to CEA with benefits persisting at 5 years.

Review of the recent CAS trials and an interventionists appraisal of them

Gaines, P.

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Introduction
There are a some simple concepts associated with carotid artery disease. Stroke can be devastating for the patient and burdens society with huge cost. The intention of treating carotid artery disease is to prevent future stroke and stroke associated death using a technique that minimises risk. Unfortunately different specialities have their own view of carotid artery intervention. Open surgery is considered to be an enjoyable, technically challenging procedure. Carotid stenting is seen as the cutting edge of endovascular therapy. Both in the correct environment bring financial reward. Both are presented with learned interpretation to suite the speaker. To help clarify how carotid endarterectomy (CEA) and carotid artery stenting (CAS) compare with regard to those outcomes that matter to the patient, 2 large trials have recently been completed and published. I will present the bare results and then give my perspective on how the data may be viewed.

ICSS
This international multicentre trial randomised 1713 recently symptomatic patients, with a culprit ipsilateral internal carotid artery stenosis, to either CAS or CEA. The preliminary results have been published and consider early outcomes to 120 days. The headline outcome is that the the risk of stroke, death or procedural MI

	NON-DISABLING STROKE	DISABLING STROKE	RATIO
EVA 3S	4	2	2
SPACE	19	17	1.1
CREST	21	8	2.6
NASCET 50-69%	65	20	3.25
NASCET 70-99%	24	10	2.4
ECST	17	13	1.3
AVERAGE	**150**	**70**	**2.14**

was significantly higher in the CAS group - 8.5% vs 5.2% (HR 1.69, 1.16-2.45, p=0.006). As ever, the results require rather more dissection.

What matters to the patient and society i.e. major stroke and death, were not different. The dominant feature that changed the outcome was the incidence of non-disabling stroke and death. In all major studies other than ICSS the number of non-disabling strokes was at least twice the number of disabling strokes (Figure 1). But not on the per-protocol analysis in ICSS. Whilst following CEA there were 14 disabling strokes , there were only 11 non-disabling strokes. Surely ascertainment bias is the only reasonable cause.

Neither is everyone happy with the way that the results are presented. If the bottom line is to be major stroke and death, then fine. However, to include non-disabling neurological events is also sound, but lets include them all including cranial nerve palsy. The argument that palsies are not important because most are not disabling is fine, but that also applies to non-disabling stroke (hence the name). So, count them all, or count neither, but do not count only one of a collection of non-disabling neurological event. If the trial were to set the bottom line at counting all bad events in the per-protocol analysis to include; important outcomes (death and disabling stroke), all the rest of the adverse neurological events (non- disabling stroke and cranial nerve palsy) and procedural MI, and major haemorrhagic major complications then we have 71 outcomes in the CAS group and 102 in the CEA group. An outcome that favours CAS.

Hidden too within the trial are some gems. The trial is biased because the process to CAS is more efficient than to CEA. This meant that the time to treatment is quicker for CAS, which is to be applauded. We know that this means that the initial outcomes will be worse but over all more strokes will be prevented. Which probably explains the catch up for stroke prevention even in the flawed EVA 3S trial. For women, those presenting with amaurosis fugax, and for the younger patient the outcomes as defined by ICSS are equivalent. And for high volume centres the outcomes were the same for all patients. It remains a mystery to me why CAS needs to demonstrate superiority over CEA when the benefits of a minimally invasive approach are clear to all well informed patients.

CREST

This multi-centre study randomised 2502 patients with carotid disease to CAS or CEA. The chosen primary end-point was a composite one that combined stroke, MI and death from any cause during the peri-procedural period, or any ipsilateral stroke

out to 4 years follow-up. There was no difference. In addition, the equivalence of treatment was true when only the symptomatic patients were reviewed. I have heard commentators suggest that what matters is death and stroke and therefore the difference favours CEA. Yet those commentators chose the end-point and subsequently wish to ignore it. MI does matter. A subsequent paper from the CREST team shows that if a patient suffers an MI during treatment then their life expectancy is significantly reduced.

On a personal note it was nice to see that the Interventional Radiologists had the best outcomes in those treated by CAS.

Conclusions

CAS has outcomes at least as good as CEA. The option for both treatments should be given to patients.

We should spend time identifying groups of patients who may benefit more from one particular intervention.

To my mind today: if I had a symptomatic carotid stenosis I would prefer a carotid endarterectomy

Veith, F.

Background: Carotid artery stenting (CAS) is considered by many as an alternative to carotid endarterectomy (CEA) for the management of carotid artery stenosis. However, recent trials demonstrated inferior results for CAS in symptomatic patients compared with CEA. We reviewed the literature to evaluate the appropriateness of CAS for symptomatic carotid artery stenosis and to determine the pathogenetic mechanism(s) associated with stroke following the treatment of such lesions. Based on this, we propose steps to improve the results of CAS for the treatment of symptomatic carotid stenosis.

Methods: PubMed/Medline was searched up to March 25, 2010 for studies investigating the efficacy of CAS for the management of symptomatic carotid stenosis. Search terms used were "carotid artery stenting," "symptomatic carotid artery stenosis," "carotid endarterectomy," "stroke," "recurrent carotid stenosis," and "long-term results" in various combinations.

Results: Current data suggest that CAS is not equivalent to CEA for the treatment of symptomatic carotid stenosis. Differences in carotid plaque morphology and a higher incidence of microemboli and cerebrovascular events during and after CAS compared with CEA may account for these inferior results.

Conclusions: Currently, most symptomatic patients are inappropriate candidates for CAS. Improved CAS technology referable to stent design and embolic protection strategies may alter this conclusion in the future.

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The brain injury implications: Endarterectomy vs CAS

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Introduction

Carotid endarterectomy (CEA) and stenting (CAS) are widely accepted revascularization procedures in carotid atherosclerotic disease. Authors concern on neurological morbidity following CEA or CAS is mainly focused on TIAs or strokes detection whereas subclinical brain injuries are merely reported. The clinical impact of silent ischemic lesions within brain areas without primary motor, sensory, or linguistic function is debated[1]. However cumulative burden of ischemic brain injuries can cause neuropsychological deficits or aggravate vascular dementia[2]. Microemboli are known to initiate an inflammatory response and cause brain dysfunction demonstrated by cognitive impairment[3]. Cognitive function is being increasingly recognized as an important outcome measure that affects patient well-being and functional status4. While subtle brain injuries occurring during or after carotid revascularization procedures can be detected by the use of Diffusion-Weighted Magnetic Resonance Imaging (DW-MRI), neuropsychometric tests (NPMTs) can be useful in evaluating neurocognitive decline, thus allowing comparison between the two findings[5-12].

Furthermore subclinical neurological ischemic events can be detected by measuring serum markers of brain injury. A variety of biochemical markers of brain injury have been described. Among them neuron-specific enolase (NSE) and the calcium-binding protein S100 have been demonstrated to be markers of stroke in animal models13-14 and human patients[15-17].

We performed a study to assess the relationship between serum levels of S100 and NSE and post-operative DW-MRI and Mini-Mental State Examination (MMSE) score in two groups of patients submitted to carotid revascularization by CEA or CAS and to compare MMSE scores and DW-MRI findings at follow-up evaluations.

Patients and methods:

Patient Population

Between April 2008 and April 2009 60 consecutive asymptomatic patients undergoing elective carotid revascularization were recruited to participate in this prospective study. Inclusion criteria were the presence of a carotid stenosis ≥70% (ECST stenosis evaluation criteria) with no previous neurological symptoms referred in past history and the absence of a previous brain ischemic lesion detected at DW-MRI.

Exclusion criteria for entering the study were the presence of previous neurological symptoms related to carotid disease referred in past history, previous ischemic lesions detected at DW-MRI, inability to give consent.

Patients were allocated in the two treatment groups according to clinical and anatomic criteria.

CEA was performed under loco-regional cervical anaesthesia by standard surgical protocol in 32 cases. Shunt was used in 12.5 % of cases. Patch angioplasty was performed in 78% of cases.

CAS was performed with local anesthesia in 28 cases. FilterWire (Boston Scientific, Natick, MA, USA) embolic protection device and Wallstent (Boston Scientific, Natick, MA, USA) were used in all patients. Technical success was achieved in all cases.
All patients underwent DW-MRI pre-operatively and at 24 hours in the post-operative period. In the present series no patient showed ischemic lesions at pre-operative DW-MRI.

Patients were assessed with Mini-Mental State Examination (MMSE) test before surgery, within 24 hours from intervention and at the 6 and 12-month follow-up visits. Venous blood samples were obtained for each patient preoperatively (basal sample) and at 5 minute after declamping ICA or EPD retrieval, and 2, 6, 12 and 24 hours after the end of the procedure. S100 and NSE proteins were analyzed by the use of automated immunoluminometric assays (S100 Elecsys test, Roche Diagnostics GmbH, Mannheim, Germany; ELSA-NSE, CIS bio international, Gif-sur-Yvette Cedex, France).

We considered the variation in markers of brain injury (S100 e NSE) primarily in subjects (within variation) and then between different groups (between variation). Besides analysis on continuous markers values we divided patients in each treatment group according to the variation of markers encountered by comparing each value with basal sample and 24-hour value with 12-hour value. We considered significant an increase of ±25% from the reference value. Results were subsequently stratified in stable, increased or decreased in each patient and then analyzed as belonging to these three groups for between variation analysis.

Statistical Analysis
Chi-square test, unpaired t-student test for multiple comparisons and Fisher exact test (95% Confidence Interval) were used to assess differences in demographic and clinical data, MMSE score, presence of new lesions on DW-MRI and serum biomarkers levels between the two treatment groups. Continuous values were expressed as mean±SD. The threshold for significance was set at $p<0.05$.

Results
Thirty-two patients were submitted to CEA and 28 to CAS. No significant demographic and preoperative characteristics differences between the two treatment groups were detected except for coronary artery disease and COPD. No mortality was observed in the peri-operative period in both groups. One patient in the CAS group presented an ischemic stroke 2 hours after the end of the procedure, while being completely asymptomatic throughout the intervention (1.6%). In this patient postoperative DW-MRI showed two acute brain injury, accompanied by a significant increase in neuro-markers starting from the 2-hours value.

All patients in the present series were submitted to pre-operative DW-MRI with no ischemic lesion detected. In 6 CAS patients and 1 CEA patient new ischemic lesions were detected at 24 hours post-operative DW-MRI (21.4% vs 3%, $p=0.03$). All patients were submitted to MMSE with a mean pre-operative score of 26.1±3.46 and 25.6±4.46 and post-operative score of 25.6±3.27 and 22.9±4.54 in CEA and CAS groups respectively. Analysis within group revealed a significant decrease in MMSE score in CAS group not observed in CEA group ($p=0.045$ and $p=0.67$ respectively). Analysis between group showed a significant decrease in post-operative score in CAS patients respect to CEA patients ($p=0.03$) with a >5 points decrease in 7 CAS (25%) and 1 CEA (3%) patients. In CAS patients new lesions at DW-MRI were significantly associated with MMSE score decline greater than 5 points ($p=0.001$); in those patients MMSE score was significantly decreased compared to patients with negative post-operative DW-MRI ($p<0.001$). At six-months follow-up MMSE score showed an improvement in CAS patients with stable values in CEA group (mean score 23.7±4.58 in CAS and 25.9±3.43 in CEA group; within and between group analysis p=ns). Twelve-month follow-up

evaluation was performed in 58 patients out of 60 (96.6%) by DW-MRI and MMSE. No clinical or subclinical brain lesion was observed in both groups. Patients presenting new ischemic lesions at postoperative DW-MRI showed lower MMSE scores compared to CEA and CAS patients with no ischemic lesions (p=0.08).

Basal NSE and S100 levels were the same for each group (p=ns). Analysis on continuous values after intervention in CAS group showed an increasing trend for all S100 and NSE levels compared to basal value and for 24-hours value compared to 12-hours level. This trend was not confirmed in CEA patients.

In CAS group S100 showed a ≥25% increase at 12-hours value respect to basal and 24-hours respect to 12-hours values in 78 and 82% of patients and NSE in 57 and 71% of cases. In CEA group increases were recorded in 44 and 50% of cases in S100 and 53 and 34% in NSE.

Analysis between groups showed a significant number of CAS patients with increasing 24-hours values respect to 12-hours level of S100 and NSE compared to CEA patients (p=0.02).

All CAS patients with new lesions on postoperative DW-MRI and significant decline in post-operative MMSE score had a not-significant increase of 24 hours S100 value compared to basal value.

Discussion

In the present series patients submitted to CAS presented more frequently postoperative subclinical brain lesions compared to those submitted to CEA. Those lesions were detected with both DW-MRI and NPMTs combined with S100 and NSE levels evaluation. At 12-month MMSE evaluation patients presenting postoperative silent ischemic lesions showed a persistently lower score compared to patients with no ischemic lesion detected.

At present DW-MRI is considered the gold standard for very early brain ischemic changes detection. It has been shown to be positive within a few minutes after brain injury since the DWI enhancement appears within 5–10 minutes of the onset of neurological symptoms and remains for up to two weeks18. The increased signal detected on a DWI scan is given by cytotoxic edema that favors restriction to water diffusion. The combined images of perfusion and diffusion techniques highlight the "mismatch" representative of the so-called "ischemic penumbra", the area capable of reperfusion by expedite revascularization.

Subclinical brain injuries can also be detected by the use of highly sensitive markers of neuronal cell damage. Maximum levels of S100 can be detected as early as 20 minutes after brain injury and its estimated biologic half-life is about 2 hours[19-20]. Neuron-specific enolase (NSE) is a glycolytic enzyme that is found mainly in the cytoplasm of neurons and cells of neuroendocrine origin[21]. It has a molecular weight of 78 KDa and a biological half-life in serum of 20 hours[22-23].

Since subclinical brain injuries usually involve small brain areas, those areas could be responsible for higher cortical functions. Cognitive functions can be evaluated by the use of NeuroPsychoMetric Tests (NPMTs). They can also be useful in monitoring subclinical long-term effects of microembolization. The MMSE or Folstein test is a brief 30-point questionnaire test that is used to screen for cognitive impairment. It is commonly used in medicine to screen for dementia[12,24-25]. It is also used to estimate the severity of cognitive impairment at a given point in time and to follow the course of cognitive changes in an individual over time, thus making it an effective way to document an individual's response to treatment.

Recently some authors have considered cerebrovascular disease beyond the traditional clinical endpoints of major motor and speech strokes. The role of carotid emboli in silent stroke and their cognitive sequelae has been addressed in a lot of studies and

reviews[2-4, 26-33]. In their study Rapp et al.[5] reported a series of 48 patients undergoing 54 CAS procedures with excellent clinical outcomes but a concerning number of new lesions on DW-MRI. These subclinical brain injuries showed up in the ensuing 48 hours, when transcranial Doppler studies had confirmed an ongoing number of embolic events. In their review on carotid atherosclerosis and vascular cognitive decline, Dempsey et al.[29] concluded that a linear relationship between the process of mechanically unstable areas of carotid plaques and cognitive decline suggests a contributory role for such a process in silent strokes. Rate of microembolization in different carotid revascularization procedures has been compared in many studies and reviews. Zhou et al.[29] found that the incidence of microemboli detected by DW-MRI was significantly higher in a group of 68 patients submitted to CAS compared to a group of 100 patients submitted to CEA (46.3% and 12% respectively). In their review Ghogawala et al.[30] showed that CAS was associated with a higher burden of microemboli compared to CEA. A substudy of the International Carotid Stenting Study (ICSS)[31] found that about three times more patients in the CAS group than in the CEA group had new ischemic lesions on DW-MRI on post-treatment scans.

A recent report by Gupta et al.[34] on the incidence of microemboli in carotid revascularization found that flow-reversal filters in CAS were able to decrease that rate when compared to distal embolic protection devices but the incidence was still higher than in CEA patients.

In this small group of patients presenting with subclinical brain lesions we were able to demonstrate postoperative DW-MRI enhancement together with increased levels of neurobiomarkers (S100 and NSE) and MMSE score decline. The ability of combined neurocognitive and biohumoral tests compared to DW-MRI to detect subclinical brain injuries should be proved in larger series, because of its good reproducibility and low costs[35].

In our series all patients with new postoperative enhancements in DWI presented no lesions at 12-month DW-MRI evaluation but a persistently decreased MMSE score. This finding may be related to temporal (too late) and spatial (too small lesions) limits of DW-MRI while the neurocognitive impairment can still be detected by specific tests[36].

If those findings will be confirmed in future studies, we will then derive some considerations:

1.- Carotid revascularization procedures should be evaluated and compared not only on the basis of death/stroke rates but also of microembolization rates.

2.- Microembolization effects may persist over time so adequate evaluation tools should be used.

3.- New easier and cheaper methods to perform cognitive impairment evaluation should be validated.

4.- Following the principle of no-harm, microembolization should be avoided whenever possible since its consequences remain still unknown.

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Transcervical carotid stenting with carotid flow reversal reduces embolic events

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The embolic risk during carotid stenting (CAS) is influenced by the access technique and cerebral protection methods utilized in the procedure. Embolic phenomena during transfemoral carotid stenting occur universally due to instrumentation of the arch and proximal supra-aortic trunks, and crossing of the carotid lesion without protection, as well as during stent deployment. In addition, the use of distal filter protection devices has never been shown to reduce the embolic risk during CAS. The transcervical approach with carotid flow reversal for protection for CAS can eliminate the embolic risk of the transfemoral approach with distal filter protection.

The advantage of transcervical CAS is demonstrated by the lower incidence of middle cerebral artery TCD-detected embolic signals during the procedure, and a major reduction in the post-procedural incidence of ischemic brain infarcts detected by diffusion weighted MRI, when compared to transfemoral stenting with distal filter protection. The aadvantages of trancervical CAS with carotid flow reversal are clinically demonstrated by a remarkably low rate of neurological adverse events, even in the octogenarian population.

The endoluminal treatment of carotid disease has gained popularity during the last few years, thanks to technological advances and increasing experience with this technique. In 1996, Theron et al[1] described a rather sophisticated technique for transluminal CAS and reported a rather large experience with excellent initial results. During the last 2 decades it has become apparent that embolic events are very common during transfemoral carotid artery stenting not only at the experimental level,[2,3] but also *in vivo*[4,5]. The critical steps during carotid artery stenting that are particularly likely to produce embolization are during access of the guidewires and catheters into the aortic arch and supra-artic trunks, the advancement of the guiding catheter or sheath into the common carotid artery, crossing of the stenotic lesion with the guide wire, and balloon inflation and stent deployment[2,6].

These well known embologenic phenomena prompted the development of several protection methods to avoid embolization during carotid CAS. Distal cerebral protection devices involve either and occlusion balloon distal to the lesion that prevent forward flow in the carotid or a filter placed distal to lesion that would theoretically capture embolic debris. Proximal protection devices rely on flow cessation through the carotid artery during the intervention or flow reversal in the internal carotid artery. Both systems aim to avoid migration of embolic material into the carotid territory during the intervention.

Distal filter protection has become the most popular protection method, and in general consists of polymeric membranes with pores ranging in diameter from 80 to 200 mi-

crons attached to an expandable metallic frame that allows filter deployment and withdrawal distal to the lesion. Distal filters have the advantage to preserve antegrade flow in the carotid artery and allow angiographic injections throughout the intervention. However, they present serious disadvantages, such as the lack of protection during crossing of the stenotic lesion, rather large profiles that make lesion crossing not only difficult but hazardous, allowing small particles to migrate through the pores of the filter, or passage of even larger particles around the filter and into the distal cerebral circulation. In addition, filters may become thrombosed or clogged by large amounts of debris that may occasionally be produced during the intervention. In addition, filters do not allow the physician to choose whichever guide wire seems more appropriate for the procedure.

Distal filters although may allow angiography during the procedure certainly restrict the amount of carotid blood flow because of the small size of the pores. Most distal filter protection devices require significant number of technical steps that may prolong the duration of the procedure[7,8].

Distal balloon occlusion devices have the advantage of offering a rather low crossing profile that indeed prevent the passage of any particles into the distal circulation while the balloon is inflated.

However, they may allow embolization of trapped particulate matter as soon as the balloon is deflated. They also require crossing of the lesion without protection, a rather a hazardous maneuver. In addition, flow remains interrupted into the internal carotid artery and the distal internal carotid artery may be traumatized or become spastic during inflation. Another limitation of distal occlusion devices is the inability to conduct angiography during the procedure. They may provide incomplete occlusion in tortuous or large carotid arteries, or produce intolerance to the carotid occlusion, or occasional production of arrhythmias during balloon inflation[7,10].

Proximal protection methods include two systems that occlude the common carotid and external carotid arteries. The MoMa (Invatec, Rocandalle, Italy) applies occlusion to the common carotid artery and with an additional balloon the external carotid artery thereby arrest inflow into the internal carotid artery. This method has been associated with cerebral intolerance rates of 6 to 8%[11]. The other proximal protection method designed by Parodi[12], known As the Parodi Anti Embolism System (PAES), (Arterial Medical Science, San Francisco, California, USA) is currently under development and allows flow reversal from the internal carotid artery into the femoral vein with an interposed filter to avoid paradoxical embolization of potential embolic material.

Both proximal protection systems have the major advantage that they do not require crossing of the stenotic lesion without protection. They do not preclude the use of additional distal protection should there be a need for them, such as in the "seat belt and airbag technique",[13] where all the embolic particles, regardless of the size may be recovered. The disadvantage of distal flow interruption during protection is a certain degree of intolerance, and that they require rather large sheath diameters that need to be negotiated through the femoral-iliac arteries and into the supra aortic trunks. This maneuver in the presence of diseased arches or torturous trunks may be associated with significant embolization during access and catheter placement.

In 2004, we described[14] a transcervical approach with cerebral flow reversal established between the common carotid artery and the jugular vein. This technique is done through a minimal incision at the base of the neck that allows control of the common carotid artery. This transcervical approach avoids all the technical difficulties and risks inherent to the use of protection devices deployed through a transfemoral route.

The transcervical approach for carotid artery stenting with carotid flow reversals has a

number of important advantages over other previously described protection methods. It avoids crossing of stenotic lesions without cerebral protection. Although this problem is also avoided with transfemoral proximal protection methods. Transcervical CAS does not require negotiation of the aortic arch or aortic trunks that may be risky in many cases and certainly always emboligenic. In addition, in the octogenarian population were the prevalence of the calcific atherosclerotic arch lesions and tortuous anatomy in the arch and trunks is well known provides an additional advantage by avoiding the embolic risk. This risk is illustrated by the initial experience of the CREST[15] trial that reported a 12% perioperative stroke rate in octogenarian compared to 3% in younger patients. In a similar way Lamb[16] reported an 11% stroke rate in octogenarian patients compared to 1% stroke rates for patients under 80 years of age, and Kastrup[17] encountered a significantly higher neurological complication rate in patients older than 75 years compared to the younger population. Roubin[18] et al in a prospective study of 5 years observed that age greater than 80 years was a strong predictor of perioperative complications and late stroke. Strikingly, Alvarez et al[19] using our technique with transcervical carotid artery stenting with carotid flow reversal observed a lack of increased complications in octogenarians compared to younger patients, and actually documented a stroke rate comparable to that obtained with carotid endarterectomy in octogenarians.

The flow reversal time required during transcervical carotid artery stenting averages from 15 to 21 minutes,[20,21] and the mean total procedure time ranges from 50 to 70 minutes. Procedural times associated with a very low rate of intolerance of less than 3%. Transcervical carotid artery stenting avoids any potential complications associated with the transfemoral puncture and negotiation of the iliac vessels. Complications related to this particular approach may be as high as 14%.[22] During transfemoral CAS microembolic signals have been routinely encountered in the middle cerebral artery as documented by transcranial Doppler ultrasound. Interestingly, the systematic use of distal filter protection for CAS was supported in a 2004 consensus document, published in the *Journal of Vascular Surgery*, without offering any clear evidence to support there use[23]. Prior to it, several uncontrolled studies suggested a reduction in neurologic events with the use of distal filters. However, the only randomized prospective trial comparing transfemoral CAS with distal filter protection against carotid stenting without protection failed to show any reduction in the number of micro embolic events or in the number of new embolic lesions in the ipsilateral hemisphere using diffusion weighted magnetic resonance imaging (DW-MRI)[24]. In addition, the comparison of distal filter protection with other systems of cerebral protection has shown in several occasions that the use of distal filters increases the number of micro embolic signals detected in the middle cerebral artery detected by transcranial Doppler ultrasound[25,26].

Animal studies have established that particles greater than 50 microns are capable producing ischemic cerebral lesions[27]. Since most size pores in the currently available filters range between 100 and 120 microns, it is not surprising to find a significant number of ischemic lesions following CAS with distal filter protection. The clinical relevance of new ischemic lesions detected by DW-MRI is not known, but there is an increasing concern with their likely relationship with long term psychometric deterioration and later development of dementia and decline in cognitive functions, as it occurs in patients with multiple laccunar infarcts or with multiple white matter ischemic lesions[28].

The most likely cause of all these new hyper intense ischemic lesions detected following carotid stenting is embolization of thrombotic material or atherosclerotic plaque during the procedure, since the micro air bubbles that may be injected during the procedure are normally absorbed. Although when air bubbles occlude capillaries, the

distal perfusion impairment may cause endothelial damage with an inflammatory response that may lead to cerebral tissue injury and perhaps the development of minor cerebral symptomotology[29].

The majority of the new ischemic lesions following CAS are found on the side ipsilateral to the carotid intervention, which suggests that the manipulation of the ipsilateral carotid access and stent delivery may be related with a high incidence of symptomatic neurologic events[30].Interestingly, between 19 and 32% of patients undergoing transfemoral CAS may show evidence of embolization into the hemisphere contralateral to the treated side, most likely secondary to the manipulation of the aortic arch and supra aortic trunks[24,31].

The occurrence of neurological symptomatology following embolization is related to the location of the new ischemic lesions and on the total number and volume of the lesions[30], as well as the size of the embolic particles. In this regard Rapp[32] demonstrated experimentally that embolic particles greater than 200 microns produce neuronal ischemia compared to smaller particles.

The use of carotid flow reversal diminishes the number microbolic signals as detected by transcranial doppler[24], which may actually drop to zero as Parodi[12] and Ribo[21,33] suggested. In addition, carotid flow reversal during CAS significantly reduces the number of new ischemic lesions as detected by DW-MRI[34]. This is supported by our unpublished experience with 31 patients in whom a prospective, blinded evaluation of DW-MRI detected embolic signals following transcervical CAS was remarkably lower than that reported in the literature for transfemoral CAS.

The experience with transcervical CAS is limited, however all published studies have shown a remarkably low rate of major adverse events despite of the technique being in its infancy. In conclusion, carotid flow reversal using a transcervical approach for carotid artery stenting produces a significant reduction in the embolic signals and the development of new ischemic lesions in the brain. It is likely that a reduction in ischemic infarction following CAS is beneficial to the patient, most likely by reducing the long-term incidence of dementia and other long term neurological deterioration. Transcervical carotid artery stenting avoids arch and supra aortic trunk manipulation, thereby reducing potential embolic phenomena from these arteries and more importantly avoids the need to cross the lesion before the protection is in place.

All these advantages make the transcervical approach to carotid stenting an excellent alternative for all high risk patients such as octogenarians, those with unfavorable anatomy or with contraindications for a transfemoral approach. Transcervical carotid stenting with carotid flow reversal is extremely safe and may be the procedure of choice in many cases.

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Carotid stenting vs Surgery in asymptomatic patients: update of the ACST-2 Trial

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on behalf of the ACST-2 collaborators

Introduction

ACST-1 (1993-2008) randomised 3120 asymptomatic patients requiring treatments for carotid artery stenosis into two arms: 1) best medical treatment only and 2) best medical treatment with "immediate" carotid endarterectomy (CEA). The five year results provided evidence that CEA involved a small (~3%) but definite peri-procedural risk of stroke or death, a substantial (~3% vs ~12%) reduction in the subsequent stroke rate over the next 5 years and hence a net reduction (~6% vs ~12%) in the overall 5-year risk of stroke or peri-procedural death. In 2010 the 10 year results were published which indicated the benefit was retained and that allocation to immediate CEA almost halved the non-perioperative stroke rate over the next 10 years. Therefore ACST-1 provided evidence that immediate intervention by CEA with best medical therapy was superior to best medical therapy alone and has resulted in changes in clinical practice.

Carotid artery stenting (CAS) is now being used to treat carotid artery stenosis and previous comparative trials of symptomatic patients have shown CEA to be the preferential treatment. However, worldwide 70% of CAS are performed on asymptomatic patients therefore further investigation into this cohort is required. The CREST trial recruited 1181 asymptomatic patients and results suggest that both procedures are comparable (N Engl J Med 2010;363:11-23.: Stenting versus Endarterectomy for Treatment of Carotid-Artery Stenosis, T.G. Brott et al, CREST Investigators). However, a much larger scale clinical trial is needed to fully assess CAS versus CEA in asymptomatic patients and ACST-2 has been designed to meet this need.

ACST-2 is a large, simple, randomised trial of CEA versus CAS for stroke prevention. The trial has been designed to minimise collaborators' workload, making it easy to integrate into normal medical routine. The primary objective is to compare the peri-procedural risks (myocardial infarction [MI], stroke and death within the first month after the intervention in attempted), and the long-term prevention of stroke (up to 5 or more years), particularly disabling or fatal strokes. Secondary objectives: Data may enable some types of patients to be identified in which one or other procedure is clearly preferable. As part of a health economic evaluation, procedural costs, stroke-related healthcare costs and quality of life will be assessed for a subset of patients.

Methods

Before joining the trial, each operator submits a track record documenting their experience (a minimum of 25 CEA or CAS, mostly performed in the last two years) giving stroke and non-stroke deaths within 1 month of the procedure. In general, the operators should have <8% stroke and death

PROCEDURAL EXPERIENCE					
PROCEDURE	APPROVED CLINICIANS	COMBINED EXPERIENCE		MEDIAN EXPERIENCE	
		CAS	CEA	CAS	CEA
CAS only	69	11,384		60	
CEA only	118		28,283		100
CAS and CEA	67	7,666	29,882	59	124
Total combined	254	19,050	58,165		
Total combined Experience for all Procedures		77,215			

rate for symptomatic patients and <4% risk for asymptomatic patients. Each centre must have a collaborating neurologist (or stroke physician), vascular surgeon and stenting interventionalist (radiologist, cardiologist, surgeon or physician with specialist training in carotid stenting). They will be jointly responsible for patient recruitment, treatment and follow-up. A centre may be organised between colleagues in neighbouring hospitals.

All patients in the trial should be on optimum medical treatment, however still require intervention. To be eligibility for the trial, the patient must not have not suffered any ipsilateral symptoms for six months and have had no previous procedure performed on the side. If the patient has undergone any previous coronary procedures (eg CABG) they must wait 30 days before participating in the trial (be outside the periprocedural period for any previous treatment). All eligible patients should be offered the trial, and if interested they are then assessed by MRA or CTA to ensure they are anatomically suitable for both procedures. Written consent is required and after a short call to the randomisation unit an allocation of treatment group(either CEA or CAS) is obtained. The procedure should be carried out following normal routine practice. The patient should be seen for a 30 day post procedure followed up. Thereafter the patient is followed up annually by postal questionnaire.

Results

To date 288 operators have submitted track records for blinded review by an independent management committee. 254 from 26 countries have currently been approved. Some remaining operators have been advised to obtain further experience. The procedural experience of our operators is shown below.

Currently 79 centres from 23 countries can randomise into the trial and another 28 centres are in the process of obtaining ethics.

Conclusion

CEA is a well established procedure in the treatment of carotid stenosis. Experience in CAS is increasing as evident in the publications of country registries, national guidelines, and the CREST results. There is insufficient evidence to determine the best treatment for asymptomatic patients. A large randomised trial is required to answer the question, therefore ACST-2 has been

designed to provide evidence needed for the treatment of asymptomatic carotid artery stenosis.

The ACST-2 aims to recruit 5000 patients as this will provide generalisable results and providing reliable level 1 evidence on which cohort of patients may benefit from CEA and CAS procedures.

If you are UNCERTAIN, randomise and be CERTAIN that the trial will provide the answer.

The ACST-2 is still recruiting centres. For further information on the trial, please contact acst@nds.ox.ac.uk or visit our website at www.acst.org.uk .

Asymptomatic carotid stenosis should be treated pharmacologically alone

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Risk of recurrent ischemic events in patients with symptomatic carotid artery stenosis is well established to be high. Based on the classic trials NASCET and ECST the estimated 3 year risk of stroke or death was 20-30%. Carotid endarterectomy became an evidence based treatment modality in the early 1990'ies in case of stenosis exceeding 50% diameter reduction and ipsilateral symptoms. Later, re-analyses of the data from these trials (NASCET and ECST) showed that age, sex and time since index event were important predictors of a second event – much like in patients with coronary artery disease.

Specific trials to show the benefit of pharmacologic agents in patients with carotid stenosis with respect to hard clinical endpoints has not been conducted so for. Antiplatelet agents and lipid-lowering drugs are recommended today based on secondary analyses of trials with designed to show effects primarily in other or patient groups or in trials with surrogate end-points.

Similar in patients with asymptomatic stenosis, trials showing the benefit of medical treatment have never been conducted. Two trials have shown statistically significant benefit from carotid endarterectomy in patients randomized before introduction of today's medical therapy and risk factor reduction! Latest, the ECST published 10 year results showing a persistent benefit of endarterectomy, however, the benefit was obtained on the early years of the trial when neither of the treatment groups were treated according to today's recommendations. In fact, the survival curves are parallel in the later years indicating that all benefit was from before all patients were treated as recommended today!

The risk of ipsilateral stroke and death has declined in patients with asymptomatic

carotid stenosis, in fact, just as stroke risk in general has declined in the western world. In the latest studies, the annual risk is below 1% per year – much less than in the 2 trials comparing endarterectomy to medical treatment; in both trials the annual risk of stroke or death exceeded 2% in the non-surgically treated groups.

Therefore, it is pertinent to argue that trials of the past, conducted in symptomatic as well as in asymptomatic patients are outdated! With an annual risk of less than 1% per year and a perioperative risk of intervention of 2-5% it will not be possible to show benefit in a trial undertaken comparing best medical treatment and carotid endarterectomy.

Carotid stenting has never been proven to reduce the risk of ipsilateral stroke. In trials comparing carotid endarterectomy to stenting in symptomatic patients meta-analyses clearly show inferiority of carotid stenting. No specific trials have been conducted in case of asymptomatic carotid disease although asymptomatic cases have been included in some trials. However, only when end-points such as coronary infarction (also asymptomatic) have been included some data show equality. However, the same trials did not consider asymptomatic brain infarction which has been shown to be much more common after carotid stenting.

In conclusion, with today's effective medical preventive therapy, invasive treatment for asymptomatic carotid stenosis is not warranted.

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Asymptomatic carotid stenosis >70% should be treated: Pharmacologycally plus CAS

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In Western countries, stroke is the third leading cause of death and is the most common cause of permanent disability. A stenosis of the internal carotid artery may be responsible for 10% to 20% of all strokes or transient ischemic attacks (TIA).

Carotid artery stenting (CAS) has emerged as a useful, potentially less-invasive alternative to carotid endarterectomy (CEA) and is one of the most controversial procedures in the era of modern medicine.

The two most referenced trials in the current clinical decision-making process for carotid stenosis are the North American Symptomatic Carotid Endarterectomy Trial (NASCET) and the Asymptomatic Carotid Atherosclerosis Study (ACAS), that concluded there was a clear benefit to CEA in patients with symptomatic and asymptomatic carotid occlusive disease, defining which patient population, which patients and what degree of stenosis would benefit from CEA.

In current clinical practice, CAS has emerged as a viable alternative for patients who are deemed at high risk for surgery or poor candidates for CEA, which is still considered the standard of care.

This is demonstrated by some trials, but some Authors suggest that the 30-day and 1-year risk of death, stroke, or MI with CAS is equivalent to that with CEA in symptomatic and asymptomatic patients with the same degree of carotid stenosis without considering surgical risk.

The critical safety objective of carotid bifurcation prophylactic intervention is the avoidance of stroke, in particular, disabling stroke.

On the basis of several studies, CEA is generally considered the standard therapy for severe carotid artery disease.

In the last years the scientific world have been concentrated on CAS investigation. There is no general agreement whether it should be accepted as an alternative method to CEA. This controversy is caused by the lack of large randomized trials comparing endarterectomy to stenting particularly in non-high risk patients. If we look at the Literature we can find a wider interest for patient at high-risk treated with CAS but only in the recent years attention moved to patient with a low-standard risk.

There is certainty: on the basis of the current evidence, CAS with cerebral protection, in the hands of experienced Operators should be considered equal (if not superior) to CEA in high-risk patient. Despite the fact that the immediate peri-procedural and in-hospital results are encouraging, we are aware that embolic protection devices (in all their forms) allowed Operators to protect the procedure but unfortunately did not affect late embolic events.

Our experience with CAS started 11 years ago. Initially we made a precise patient selection and we focused endovascular treatment to patient with anatomical complex situations (hostile necks, deleterious neck surgery with tracheostomy, secondary interventions after endarterectomy, cervical radiotherapy, carotid stenosis after radiotherapy, frozen neck, large and short neck with high bifurcation, carotid bypass stenosis) or with poor clinical conditions where surgery offers worse results (controlateral occlusions, deficient Willis,Äô circle, severe coronary diseases, neurological deficit, heart failure or pending coronary revascularization, low life expectancy due to tumours, or old age) [so called: High-risk patient].

Year after year of experience with CAS, our learning curve was optimized and the results obtained supported our conviction to offer CAS as the first-choice to a patient with severe carotid stenosis.

At the moment we relatively contraindicated to CAS these kind of patient:

- Patient with floating thrombus in internal carotid artery or common carotid artery.

- Patient very young (40-60 years) if they are at standard risk for CEA (ASA ,≤2).

Long-term stroke prevention in our treated patients is the hallmark of successful carotid intervention. The 1-year and 3-years rate of ipsilateral stroke for CAS in this review are respectively 2.92 %, 7.23%, similar with those of the CEA arm 2.93%, 6.20% (p value not significant).

Several Studies, comparing both techniques revealed equality of stenting and surgery, taking MI into account as an endpoint, high-risk patients benefit more from CAS. In our experience we lack to demonstrate differences statistically significant for MIs at 30 day between the two groups (p=0,16).

On the basis of our results we can demonstrated with facts and not with fictions, that if we used specific devices applied to specific lesions and/or anatomies (‚Äútailored‚Äù CAS strategy) the endovascular procedure can be successful with a very low percentage, but not without complications. The ‚Äútailored‚Äù CAS strategy bases its rationale mostly on deep knowledge of patient clinical status, vascular anatomy, carotid plaque characteristics and complexity. We believe that the pathological conditions have to matched to the technical features of the materials at disposition of the Operator. An another important factor is that the Best Medical Treatment during the last years is bettering and nowadays is not equal at all to that of 20-25 years ago (the NASCET ‚Äúera‚Äù). We have now more different families of drugs to fight hypertension, dislipidemia, ischemic cardiopathy and diabetes. For example, there is a convincing evidence that clopidogrel, a new generation of anti-platelet anti-aggregation drug, used widely for CAS, in addition to aspirin reduces the risk of myocardial infarction.

The medical therapy and in the future molecular and gene therapy will be extremely important to the cardiovascular patient.

We strongly believe that the treatment of severe carotid stenosis must be successfully managed by skilled Operators in high-volume centers. These can be only centers of Vascular Surgery, because the Vascular Surgeon knows very well the pathology, the anatomy, the haemodynamic of the blood and the correlation with Echo-duplex findings and the lesion characteristics. This joined with a correct patient and lesion analysis could indicate and not force, the right intervention to the single, selected patient (‚Äútailored‚Äù procedure). A ‚Äútailored‚Äù procedure can be possible if the operator knows completely both the procedures with a precedent exhaustive learning-curve. The vascular surgeon can completely come up to all patient‚Äôs requests.

Our real world study demonstrated an equivalence between CAS and CEA and in particular a superiority of CAS to CEA for

high-risk patients. We can strongly affirm that an accurate learning-curve for CAS is mandatory to obtain optimal results.

Our standard of care, has become to treat as first option with CAS and we indicate CEA only with younger people, particular hypoechoic lesion at Duplex. Nowadays we can offer both CEA and CAS to the patient with the same peacefulness and consciousness.

However the literature lack of evidence to support our consideration, others trials and registers will be necessary, but we don,Äôt forget that the medical science is continuously evolving and maybe the randomized large trials with their strict protocols can not follow on time the advancement of technique, materials and devices. We need for more dynamic studies but now we can not do without randomized trials.

Asymptomatic carotid stenosis >70%: endarterectomy and pharmacology

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Background:

In Europe, at least one million people have severe carotid stenosis. Patients with severe carotid artery stenosis are 3 times more likely to suffer fatal or disabling ischaemic stroke compared with the general population. What is the best treatment for asymptomatic severe carotid artery stenosis (ASCAS)? We conducted a literature review in order to get consensus guidelines for treatment of ASCAS.

Methods:

We have undertaken a comprehensive review of the published literature dealing with the ASCAS, found out evidence-based answers to this questions and made a summary.

Results:

Guidelines from American heart association, American academy of neurology and European society of vascular surgery recommended that CEA can reduce future stroke rate for ASCAS patients if the perioperative complication rate is kept low (< 3%). Guidelines from Society for vascular surgery and other clinical trials recommended CEA plus best medical therapy (BMT), if the perioperative risk is low. In the first asymptomatic carotid surgery trial (ACST-1), 3120 patients were randomised between immediate CEA plus medical therapy and delayed CEA plus medical therapy. The 10-year results showed stroke risks were 4.1% versus 10.0% at 5 years and 10.8% versus 16.9% at 10 years, excluding perioperative events and non-stroke mortality. 62 versus 104 had a disabling or fatal stroke, and 37

versus 84 had a non-disabling stroke. Combining perioperative events and strokes, net risks were 6.9% versus 10.9% at 5 years and 13.4% versus 17.9% at 10 years. Many studies have all indicated that antiplatelet agents and statins have made repair as much as 50% safer. One meta-analysis of randomised trials of statins in combination with other preventive strategies, including 165792 individuals, showed that each 1 mmol/L (39 mg/dL) decrease in LDL cholesterol equates to a reduction in relative risk for stroke of 21·1% (p=0·009). Although four published trials of CEA versus CAS and the lead-in phase of the Carotid Revascularisation Endarterectomy versus Stent Trial (CREST) have included some asymptomatic patients, no large trial has specifically set out to compare CAS and CEA in asymptomatic patients. ACST-2 aims to compare CEA with CAS in asymptomatic patients and provide clinicians with robust evidence as to which (if either) intervention is least hazardous and which can provide best long-term stroke reduction benefit.

Conclusion:

CEA plus BMT is currently the best way to treat most ASCAS, if the patients are carefully selected and the surgery is performed by surgeons with procedural morbidity and mortality rates of less than 3%.

Asymptomatic carotid stenosis >70%: Treatment should be considered according to the plaque characteristics

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The treatment of asymptomatic carotid stenosis is still controversial after more than 15 years of randomized trials and diverging opinions about the best solution between the surgical option, carotid endarterectomy (CEA), or the endovascular procedure, carotid stenting (CAS).

Today, more than 50% of the interventions on carotid stenosis worldwide are performed on asymptomatic patients. The benefit in stroke reduction coming from the Asymptomatic Carotid Surgery Trial (ACST) study for the treatment of asymptomatic patients is considerable: CEA halved the net 5-year stroke risk from about 12% to about 6%[1]. But, outside trials, inappropriate selection of patients or poor quality procedures could neutralize such benefits.

The endovascular approach to carotid stenosis with CAS has been proposed for years but never really had the power to replace CEA: in 2009, the Cochrane Collaborative review stated that CEA still has to be considered the treatment of choice for carotid stenosis[2].

The latest data from the CREST study showed that CAS or CEA, if randomly performed on asymptomatic patients, have similar rates for periprocedural stroke, death and subsequent ipsilateral stroke and myocardial infarction, although the incidence of periprocedural stroke was lower in the CEA group rather than the CAS group whereas myocardial infarction rates were higher for the CEA group[3]. On January 2011, the Circulatory System Panel of the Food and Drug Administration in the US voted in favor of an expanded indication for the RX Acculink Carotid Stent System (Abbott, Abbott Park, IL), stating the benefits of carotid stenting in patients at standard risk for adverse events from endarterectomy outweigh the risks[4].

In 2006, we stated that CAS and CEA are not equivalent and should not be alternatively proposed in the same way to every patient. Moreover, the selection of asymptomatic candidates for any carotid procedure based on the degree of stenosis alone does not identify correctly the real risk presented by the patient. We therefore described that the treatment of carotid stenosis should be tailored upon peculiar characteristics of each patient, such as comorbidities, vascular anatomy features and plaque morphology[5].

Plaque morphology plays an important role in order to identify asymptomatic patients at high risk of cerebral infarction, and therefore select the best treatment option.

For the first time, in 2009 the ESVS Guidelines for the treatment of carotid stenosis underlined that plaque morphology should be assessed before any invasive treatment[6].

Carotid plaques are not always the same. Differences in macroscopic and microscopic appearance are clear to those who perform surgery of the carotid bifurcation; different plaques are associated with different behaviours allowing us to divide plaques with low and high embolic power (vulnerable plaques).

Several morphological features can be assessed by modern imaging techniques such as ultrasound, CEUS, Angio-CT and PET in order to characterize the vulnerable plaque. One of the most common predictors of recurrent events is plaque echolucency, obtained by duplex scanning.

Echography, assessed according to the Gray-Weale/Geroulakos classification[7-8] can reliably identify areas rich of echoes (hyperechoic or echogenic) and areas with few echoes (hypoechoic or echolucent).

Several independent authors discovered that echolucent plaques are associated with a much greater embolization rate rather than echogenic plaques, a higher grade of future neurological events and an increased presence of plaque macrophages[9-15].

In conclusion, plaque echolucency reflects a histological "unstable" composition made by lipids, a thinner fibrous cap, hemorrhagic core, neovascularization and inflammatory markers.

The carotid echographic evaluation has been improved with the introduction of a computer-assisted objective grading of the echogenicity of the plaques, the GSM[16-18].

The GSM measures plaque echogenicity, a quantitative index of the echoes registered from the plaque. Low GSM plaques generate a higher number of embolic particles following CAS[19].

There is evidence of a direct correlation between the number of particles generated during CAS and the incidence of new clini-

cal and subclinical lesions on magnetic resonance imaging and the risk of stroke during the endovascular procedure[20,21].

With the Imaging in Carotid Angioplasty and Risk of Stroke (ICAROS) study, an international multicenter registry that collected 418 CAS cases from 11 centers, we evaluate the relationship between the echogenicity of carotid plaque, as measured by GSM, and the risk of stroke during CAS in order to obtain a better selection of candidates for CAS[22,23].

An echographic evaluation of carotid plaque with GSM measurement was made preprocedurally. The onset of neurological deficits during the procedure and the postprocedural period (30 days) was recorded. The GSM value in complicated patients was significantly lower than in uncomplicated cases, both in the stroke ($p<0.005$) and the stroke plus TIA ($p<0.005$) subsets. A receiver operating characteristic curve was used to choose the best GSM cutoff value: the most successful threshold was 25. The prevalence of a GSM value <25 (echolucent plaques) was high: 37% (155 of 418 patients). Eleven (7.1%) of the 155 patients with GSM ≤25 had a stroke compared to 4 (1.5%) of 263 patients with GSM >25 ($p=0.005$)[22].

Further evidence derives from many works that showed that echolucent carotid plaques (with low GSM values) have a higher incidence of a positive brain computed tomography for ischemic lesions, a condition related to neurological impairment and dementia, elevated serum levels of triglyceride-rich lipoproteins and lower levels of high-density lipoprotein cholesterol (HDL), higher inflammatory markers (serum interleukin-6 and C-reactive protein), and a faster plaque progression[24-33].

The combination of contrast agents to traditional ultrasonography (Contrast-Enhanced Ultrasonography, CEUS) is currently emerging as a new diagnostic tool in vascular medicine. CEUS has the potential to identify carotid plaque neovascularization, an index of plaque vulnerability. Carotid neovascularization assessed by CEUS is significantly associated with onset of neurological symptoms, the presence of ipsilateral embolic lesion on pre-operative brain CT, a thinner fibrous cap, greater inflammatory infiltrate in carotid plaque specimens[34].

Within the new emerging imaging modalities of plaque morphology, positron emission tomography (PET) of atherosclerosis with the use of [18F]- fluorodeoxyglucose (FDG), in which glucose metabolism within plaques can be assessed with high sensitivity, has been identified as a diagnostic method and for risk stratification[35-37]. High FDG uptake in carotid artery plaques is associated with presence of macrophages and molecular gene up-regulation of enzymes known to degrade the cellular matrix of vulnerable plaques[38-40]. Because of that, FDG PET depicts inflammation in atherosclerotic carotid lesions and this finding is correlated with echolucent plaques.

Conclusion Indications for treatment with CAS or CEA are essential in order to perform safe and tailored procedures.

Selection of candidates for CAS or CEA should be based on vascular anatomical features, comorbidities, and plaque morphology; in the near future, the use of new imaging techniques (GSM; CEUS; PET) and vascular biomarkers will select asymptomatic patients with the higher benefit from surgery or carotid stenting.

The GSM index allows the detection and stratification of vulnerable plaques in asymptomatic patients; A low GSM value is not an absolute contraindication to CAS, but an index related to a higher risk for the procedure. Echographic evaluation of carotid plaque through the GSM should therefore always be included in the planning of any clinical trial on the endovascular treatment of carotid lesions.

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The spinning of crest

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Level I evidence founded on well conducted randomized controlled trials is supposed to be the holy grail of scientific data on which to base good medical practice. The recent CREST trial (Carotid Revascularization Endarterectomy versus Stent Trial) comparing the outcomes of carotid stenting (CAS) and carotid endarterectomy (CEA), is one such study that was designed and conducted in exemplary fashion. It has attracted a great deal of attention and should be part of a solid and definitive basis for determining medical practice.

Yet when its findings have been presented, the conclusions differ greatly depending on the underlying bias of the presenter. If a vascular specialist with a bias toward CEA interprets the CREST findings, the lower stroke and death rate for CEA justifies the conclusion that CEA is superior and should be used preferentially to treat patients requiring an invasive procedure for a carotid stenosis. On the other hand, if a vascular specialist with a bias toward CAS is interpreting CREST findings, he or she will regard them as definitive and will conclude that the equivalent and low overall composite (death, stroke and myocardial infarction) adverse event rates for the two procedures justifies the widespread and increased use of CAS to treat patients with symptomatic and asymptomatic carotid stenosis.

All should recognize the extent to which the results of CREST are being spun and that the truth lies somewhere in between these two diametrically opposed views. Moreover, all should realize that the true significance of CREST awaits a careful analysis and sub-analysis of the trial's detailed results, some of which have yet to be fully revealed in peer reviewed publications.

Before determining how CREST should influence practice patterns and utilization of CEA and CAS, we need to see the data relating to the costs for the two procedures. More importantly we need to appreciate that minor strokes and mild myocardial infarctions (MIs) are not equivalent (as CREST might imply). This non-equivalence is borne out by the greater late disability suffered by those who had adverse events after CAS than after CEA in CREST. This difference is the result of a minor stroke's residual brain damage, which can cause subtle problems not reflected in even a careful neurological exam. We also should appreciate that, although there were more cranial nerve injuries (CNIs) after CEA, most of these were minor and transient. Although some have equated CNIs to strokes, the latter may leave patients with lasting brain dysfunction and mood changes even though there is no apparent residual motor or sensory loss. We also still need to know what were the exact effect of age, sex and other factors on the incidence of stroke, myocardial infarction and death rates after the two procedures?

In addition, we must consider that CREST, even though it was well designed and conducted, has its flaws. The techniques used for CAS are already outdated. For example, flow reversal and cessation methods for cerebral embolic protection, already clearly shown to be useful in some circumstances, were never employed. So the case could be made that current CAS results would be better than they were in CREST. Moreover, even better CAS technology like

membrane-covered stents are on the horizon and may well further improve CAS results. Off- setting these possibilities, the CAS operators in CREST were unusually vetted and skilled. This raise the question: will the CAS results in CREST be generalizable if the procedure is widely adopted by vascular specialists at large? Population based studies suggest that CAS will have substantially higher adverse event rates than those in CREST.

Another issue with CREST is that it included both symptomatic and asymptomatic patients. This clearly reduces the power of the trial, and prevented the substantially larger number of major strokes and deaths after CAS in symptomatic patients from achieving statistical significance. There is also the issue that the periprocedural antiplatelet regimen for CAS patients was more intensive than for CEA patients. This could account in part at least for the lower MI rate after CAS than CEA.

Finally in the asymptomatic patient cohort, the nagging possibility remains that current best medical therapy, particularly with high dose statins which were not used in CREST, could produce equal or better outcomes than both CEA and CAS, since the stroke rate in such medically treated patients only ranges between 0.4% and 0.8% per year. This possibility will remain until appropriate prospective trials such as SPACE II, ECST-2 and TACIT, which compare both CEA and CAS to best medical treatment, are completed. The completion of these trials will take many years, and TACIT has yet to be funded.

So how should we cut through the spin surrounding CREST and use the trial to help us as soon as possible? We should await its complete publication and the analyses and sub-analyses of the data contained in these articles. We should recognize the intrinsic flaws even in this well conducted trial and view it in the perspective of other randomized prospective trials which also have their flaws. ICSS is particularly relevant in this regard since it was conducted entirely in symptomatic patients. Although the experience of the CAS operators in this trial can be criticized, the incidence of strokes and silent brain defects on diffusion weighted MRI was clearly and significantly greater after CAS than CEA.

Most importantly we should demand other trials in this interesting and extremely controversial area where bias leads to "spinning" of results. These other trials are sorely needed to evaluate evolving improvements in patient selection and technology for CAS and to compare both CAS and CEA with best medical therapy in asymptomatic patients. Other work is needed to develop methods to detect vulnerable but asymptomatic plaques at high risk of causing a stroke so they can be treated invasively without subjecting large numbers of patients with low risk plaques to unneeded procedures at a great monetary cost to society.

Although CREST is an important trial, we must remember that no trial is perfect, definitive or of timeless value. Beware the spinning that purports to make it so – in any direction.

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Are ESVS guidelines on carotid intervention still valid?

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In April 2009, the European Society for Vascular Surgery published clinical practice guidelines for the invasive treatment of carotid disease[1]. Today, after 2 years of endovascular progress and accumulation of knowledge, the question that is raised is whether these guidelines are still valid.

Invasive treatment recommendation 2. Carotid artery stenting (CAS) in symptomatic patients

The available level I evidence suggests that for symptomatic patients, surgery is currently the best option [A].

The recommendation was based on a meta-analysis by The Cochrane Collaboration of eight randomised trials comparing carotid endarterectomy (CEA) with CAS (CAVATAS, Kentucky, Leicester, Wallstent, SAPPHIRE, EVA-3S, SPACE and BACASS) showing that surgery is associated with lower stroke and death rate within 30 days of treatment (OR: 1.39, 95% CI: 1.05-1.84, p=0.02)[2]. The results of two more trials were published thereafter, both of which lending further support to the ESVS recommendation. The ICSS trial showed that the risk of any stroke or death within 120 days of randomization was higher in the stenting group than in the endarterectomy group (8.5% vs 4.7%, OR 1.86, 1.26-2.74)[3]. Similarly, in the subgroup analysis of the symptomatic patients in the CREST trial, the peri-procedural stroke or death rate was 6.0% in the stenting group vs 3.2% in the endarterectomy group (OR 1.89, 1.11-3.21, P=0.02)[4]. A trend towards a higher rate of myocardial infarction in the group of symptomatic patients undergoing CEA did not reach statistical significance (1% in the CAS group vs 2.3% in the CEA group, OR 0.4, 0.18-1.11, P=0.08).

Mid-term stroke prevention after successful CAS is similar to CEA [A].

The recommendation was based on the mid-term outcomes of EVA-3S and SPACE[5,6].

In accordance with these data, the results of the CREST trial showed that, after the periprocedural period, the incidence of ipsilateral stroke was similarly low with carotid artery stenting and with carotid endarterectomy (2.0% and 2.4%, respectively; P = 0.85)[4]. Because the life expectancy of the patients included in CREST was 15 years after the procedure, outcomes are being assessed out to 10 years and are awaited.

CAS should be offered to symptomatic patients, if they are at high risk for CEA, in high volume centres with documented low peri-procedural stroke and death rates or inside an RCT [C].

The recommendation was based on experts opinion with the term “high risk for CEA” referring mainly to adverse vascular and local anatomic features. Today, there is still insufficient evidence to support a widespread change in clinical practice away from these strict indications for CAS.

Invasive treatment recommendation 3. CAS in asymptomatic patients

Meanwhile, it is advisable to offer CAS in asymptomatic patients only in high-volume centres with documented lo peri-procedural stroke and death rates or within well-conducted clinical trials [C].

The recommendation was based on the fact that data on asymptomatic patients were very weak, coming only from one small randomised trial, comprising only 85 patients[7], and a subgroup analysis of the SAPPHIRE trial, which was not prespecified[8]. Both studies showed that CAS and CEA are equally effective in preventing stroke and death in asymptomatic patients.

Today, there is increasing evidence that the rate of stroke and death does not differ significantly in asymptomatic patients undergoing carotid artery stenting and those undergoing carotid endarterectomy, since a subgroup analysis from the CREST trial showed that the rate of peri-procedural stroke or death was 2.5% in CAS vs 1.4% in CEA (OR 1.88, 0.79-4.42, P=0.15)[4]. No statistically significant difference was also found in the rate of myocardial infarction (1.2% vs 2.2%, OR 0.55, 0.22-1.38, P=0.2), in the rate of any periprocedural stroke (2.5% vs 1.4%, OR 1.88, 0.79-4.42, P=0.15) or in the rate of the composite primary end point (any periprocedural stroke, myocardial infarction or death: 3.5% vs 3.6%, OR 1.02, 0.55-1.86, P=0.96)[4].

On the other hand, there is growing evidence that rates of ipsilateral and any-territory stroke with medical intervention alone have fallen significantly since the mid-1980s, with recent estimates overlapping those of patients who underwent CEA in randomized trials[9, 10]. The average annual risk of ipsilateral stroke in asymptomatic patients with >50% stenosis was >3% in 1985, but has fallen to approximately 0,5% in 2008[9]. Given this new evidence, current vascular disease medical intervention alone may now be best for stroke prevention associated with asymptomatic severe carotid stenosis. Until the results of the SPACE-2, TACIT and ACT I studies are available, it would be prudent to stick with the ESVS guideline and offer CAS in asymptomatic patients only in centers of excellence or within well-conducted randomized controlled trials.

Invasive treatment recommendation 4. Treatment options influenced by medical co-morbidities

For asymptomatic patients at 'extremely' high risk (several medical comorbidities at the same time), best medical treatment might be the best option instead of invasive intervention [C].

CAS should not be offered to asymptomatic 'high-risk' patients if the peri-interventional complication rate is >3% [C].

There is still no indication from the literature that a 'high risk' for surgery patient is also at 'high risk' for stroke if medically treated. Therefore, a peri-interventional stroke or death risk of >3% in 'high-risk for surgery' patients with asymptomatic carotid stenosis cannot be accepted.

CAS is associated to higher risk of embolisation in octogenarians [B]. CEA is performed in octogenarians without increased risk of embolisation and with an acceptable rate of neurological and cardiac complications [C].

The recommendation was based on several papers demonstrating that octogenarians undergoing CAS are at higher risk than nonoctogenarians for peri-procedural complications, including neurological events and death[11,12]. The recommendation was strengthened by the findings of the CREST trial detecting an interaction between age and treatment efficacy, with a crossover at an age of approximately 70 years; carotid-artery stenting tended to show greater efficacy at younger ages, and carotid endarterectomy at older ages[4]. Mechanisms underlying the increased risk with CAS in

very elderly patients probably include vascular tortuosity and severe vascular calcification, leading to an increased risk of cerebral embolization in this group of patients[4].

Invasive treatment recommendation 13. Improving the CAS outcome Cerebral protection devices are probably beneficial [C].

The recommendation was based on a systematic review of all studies reporting on the incidence of CAS complications that were published between 1990 and 2002[13], as well as on a subsequent report by the Global Carotid Artery Stent Registry documenting a 5.3-5.5% rate of stroke and death in cases performed without protection, compared with 1.8-2.2% in cases performed with cerebral protection[14].

A randomised study of CAS with or without a distal cerebral protection filter, published before the ESVS guidelines, had shown that, contrary to the initial expectations, new MRI lesions developed in 72% of the cerebral protection group compared with 44% in the no cerebral protection group (p=0.09)[15]. Most of these lesions were silent, with the stroke rate being equal in the two groups (11%). The major limitation of this study was the small number of cases included (36 stenting procedures in 35 patients), which was due to the reluctance of the patients to participate in a study with no cerebral protection group.

Interestingly, the findings of this study were recently duplicated by another randomized trial, which showed that filter-protected CAS is associated with an increase in new lesions on diffusion-weighted magnetic resonance imaging (29% vs 18%) and significantly higher rates of total and particulate microembolisation on transcranial doppler (426.5 and 251.3 vs 165.2 and 92, respectively) than unprotected CAS[16]. This study was also very small (30 patients) and the differences in MRI lesions did not reach statistical significance. Larger studies are clearly warranted, though recruiting for such studies is expected to be very difficult, due to the already established, widespread belief that, as the ESVS recommendation states, "cerebral protection devices are probably of benefit".

This belief is also reinforced by the findings of the most recent systematic review comparing stroke outcomes in protected and unprotected CAS[17]. The review included 134 articles reporting on 12,263 protected CAS patients and 11,198 unprotected CAS patients. Using pooled analysis, the relative risk (RR) for stroke was 0.62 (95% CI 0.54 to 0.72) in favor of protected CAS. Subgroup analysis revealed a significant benefit for protected CAS in both symptomatic (RR 0.67; 95% CI 0.52 to 0.56) and asymptomatic (RR 0.61; 95% CI 0.41 to 0.90) patients (p<0.05).

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Flow diversion concept: stenting and flow divider stents

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The appearance of flow diverting stents (FD) heralds a new tool in the treatment of fusiform aneurysms (FA) and wide-neck saccular aneurysms (SA). These were now either problematic to treat or considered intractable, which in many cases meant that vessel occlusion was the only treatment option. The objective of a FD is to secure the remodelling of the artery and the redistribution of flow, allowing progressive exclusion and resulting in the thrombosis of the aneurysm, while maintaining permeability in healthy branches covered by the stent keeping permeable[1-6]. They are self-expanding tight-mesh stents, and therefore present high-metal surface area coverage[1]. There are 2 options on the market, the Pipeline (ev3/Chestnut Medical, Menlo Park, California) which comprises 48 braided strands of cobalt chromium and platinum which, when expanded, offers a metal coverage of approximately 30% to 35% of the total surface area 1. The second FD available is the Silk (Balt, Montmorency, France), of similar manufacture but using of nickel-titanium and platinum, and providing a metal coverage of 35% to 55% of the surface area[4]. To date, they have been described in limited series, mainly in the treatment of uncomplicated aneurysms, and show a promising future[1-6]. In the past year, articles of isolated cases have also been published in which the indications have been extended to small aneurysms (< 2mm) treated in 3 patients with FD 35, 24 and 10 days after a subarachnoid haemorrhage (SAH), also in an acute case of a patient with SAH secondary to the rupture of a blood blister-like aneurysm[8], and in the treatment of a mycotic aneurysm of the cavernous carotid artery in a 10-year-old girl[9]. Despite being relatively new technique, we should be conversant with the new characteristics, either for optimal treatment planning or being aware of potential FD-specific complications.

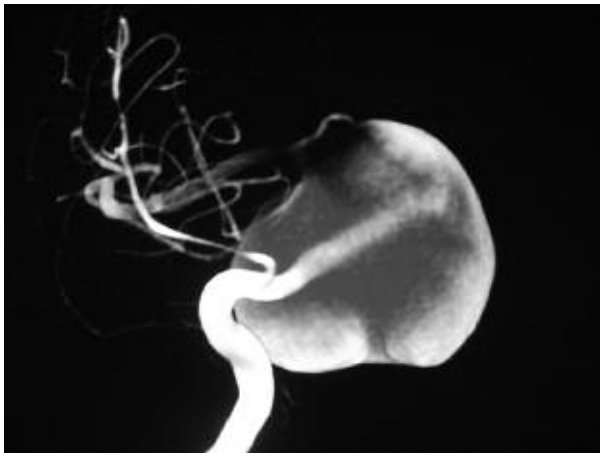

Fig. 1. 3D MIP reconstruction showing a fusiform aneurysm at the supraclinoid rigth internal carotid (RICA).

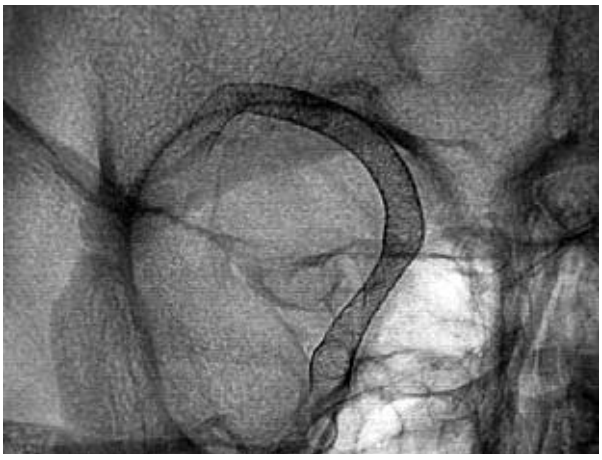

Fig. 2. Stent mesh at the (RICA), just at the end of the procedure.

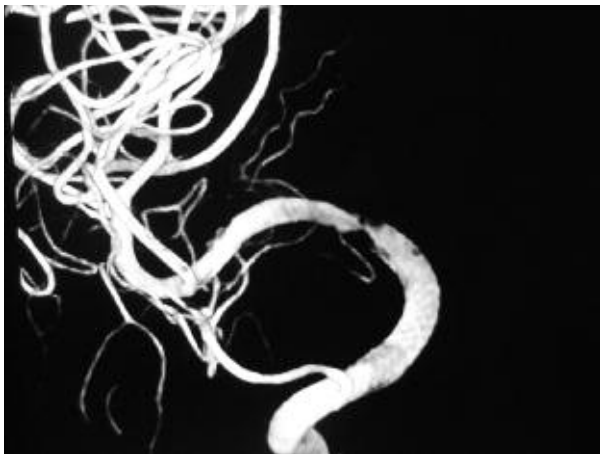

Fig. 3. 3D angiographic reconstruction showing a complete aneurysm occlusion with moderate intrastent stenosis at the 3 month follow up.

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Wine in health

Palmaz, J.

Wine is a pleasant and healthy beverage whose salutary properties have been recognized in ancient times. In recent years there has been an emphasis on the health promoting aspects of wine in a variety of conditions which created a consumption increase in the US. In Europe, time-honored wine drinking has never been challenged although the conviction on its benefit has been recently reinforced by the French Paradox.

Basic chemistry of wine

Wine is a live liquid. If we could perfectly seal wine in a vessel it will invariably turn to vinegar if we wait long enough. The reason is the presence of peroxide generators in wine like phenol turning into quinone by the presence of PPO and other enzymes. Fortunately PPO has a pKa about 9-10, making the forward reaction quite slow under the normally acid wine environment of 3.5-4. Free oxygen radicals oxidize many substrates in wine, like ethyl alcohol to acetaldehyde and further to acetic acid (vinager).

This concept helps understand the increasing chemical complexity of wine with time known as the "wine multiplication effect". As alcohol oxidizes to aldehyde and carboxic acid spontaneous combinations of alcohol, aldehyde and acid produces esters, acetal and hemiacetals. If we consider that there is more than ten alcohols in wine it is easily seen how hundreds of new chemicals are generated with time, increasing the chemical complexity of wine.

A few of the known "wine factoids" have chemical explanations. One of them is *"bottle shock"* or the loss of flavor soon after bottling. Wine that has been protected from air during barrel aging, is suddenly exposed to air-and oxygen- during bottling causing a rapid generation of acetaldehyde which is blamed for the flavor loss. With time, the acetaldehyde is converted to acetic acid and the flavors return. Three alternatives to deal with this are: prevent agitation and air exposure during bottling, age the bottled wine for a year before release or add sulfur dioxide to the wine to turn the aldehyde into hyposulfite, a flavorless substance.

Corkiness is caused by TCA or trichloroanisole, an incredibly flavorful substance (detectable at 1 ppb) produced by a mold naturally occurring in cork and wood. The mold cannot be avoided but since it needs chlorine to make the nasty substance, Cl is totally avoided in the wine industry, therefore minimizing this problem. Although many of us have returned bottles to a sad sommelier because of corkiness, fewer truly recognize the flavor: Burnt charcoal, moldy, medicinal, wet cement. Another factoid is related to *red wine headache*. This has been blamed to intolerance to sulfites or allergies to red wine phenols. More recently it has been associated to biogenic amines like histamine and tyramine, known to produce headache, flushing, nausea and general discomfort. These substances are produced by slow growing bacteria in wine, introduced by poor sanitation in its processing. Modern wine facilities produce far cleaner (bacteria free) wines than 50 years ago.

Of importance to doctors, particularly when dealing with patients on low sodium diets, is the fact that wine is actually sodium poor

(≤100 mg/lt) and potassium rich (≥1000 mg/lt). Among the anions of interest, phosphate is in relatively large concentration at 300mg/lt and sulfates (the reason for the label warning in wines) at around 800 mg/lt. Phosphates are naturally occurring in the grape while sulfates are largely introduced by processing in the field and later in the winery. Many randomization studies have proven that sulfite intolerance actually does not have a rational basis. Many people who claim sulfite intolerance with wine do not have the same effect when exposed to dried fruits, having many times the concentration of sulfites of wine.

Tannins are important chemicals because they are responsible for the astringency and color, two important characteristics of wine, particularly red wine. Also, some of them (flavonoids) are known as the health molecules, quite relevant these days. Tannins account for about 800 mg/lt in reds and are responsible for astringency and mouth feel, giving wine taste persistence and body. Tannins are polymers of gallic and ellagic acid and catechins. As the name implies they tan (bind irreversibly to proteins causing denaturation). They bind irreversibly to proteins of the mucosal lining of the mouth and tongue producing the astringency feeling and the persistence effect. The longer the tanning polymer, the more effective it is in binding mucosal proteins. Since polymerization of tannins is a time-dependent effect, it is possible that older red wines produce longer, more intense mouth feel because of the more effective binding to the mucosa and taste buds. This fact is the basis for the careful handling of old wines and red wine in general, avoiding the disruption of the delicate long tannin polymer chains. This is also the basis for gravity flow in wine making, replacing mechanical pumps to move wine around.

Biological effects of wine

Resveratrol is among several flavonoids in wine. It has been recognized to prolong the life span of Saccharomyces Cereviseae, the yeast used for grape fermentation. This is achieved by inhibition of cell apoptotic mechanisms. It is interesting that this molecule in the grape promotes fermentation by supporting life in a saprophyte organism present in the grape skin. Further, it has been found to increase SIR-2 activity, a protein deacetylase with anti-apoptotic properties. For this reason molecules like *resveratrol* are called *sirtuins*. Interestingly, *Resveratrol* as a molecule is quite similar to the synthetic estrogen diethylethilbestrol (DES). In live animals, *resveratrol* increases the life span of mice on a high calorie diet by improving many altered metabolic pathways resulting from high calorie consumption, like insulin resistance.

In recent years there has been an emphasis on the *neuroprotective* effects of *sirtuins*. In a mouse model of Alzheimers's disease, consumption of wine instead of water by these animals slowed down the progression of the disease, improved neuromuscular function and significantly decreased the focal deposits of amyloid beta protein in their brains. This and other studies are the basis for the prudent use of red wine in the prevention of progression of a variety of neurodegenerative disorders such as senile dementia, Parkinson's disease and Alzheimer's disease.

A population study published in the New England J of Medicine in 2005, older women drinking moderate amounts of alcohol had better cognitive functions and memory that those not drinking.

The most resounding effect of red wine has been its *cardiovascular benefit*. My favorite publication is a French study in Circulation 2002, describing the effect of wine consumption in victims of myocardial infarction. Of 437 survivors of AMI followed for 4 years for mayor acute cardiovascular endpoints (MACE), there was a 59% reduction in those who drunk 2 wine glasses/day and 52% reduction in those drinking 4 glasses/day compared to abstainers.

More recently wine has been proven to have an effect against *weight increase* in women. In another population study published in Arch of Intern Med 2010, the weight of 20,000 women averaging 39 yrs of age were follow up for 13 yrs. There was an inverse correlation between alcohol consumption and weight gain with those consuming ≥30gr/day (2-3 glasses wine/day) having the least weight increase.

Flavors in wine:

Several defined chemicals are known to give wine specific flavors. Terpenoids are responsible for floral aromas, damascenone for fruity aromas while pyrazines give vegetative aromas. Some of these substances are used in the food industry as additives but wine being a natural product should not receive any flavor enhancing chemicals. Of note is the buttery flavor in white wine, particularly chardonnay given by diacetyl. This chemical is a byproduct of malo-lactic fermentation, a common procedure aimed at decreasing tart flavors in wine produced by malic acid. Its conversion into lactic acid softens the wine acid and gives a round mouth feel. Further, diacetyl adds a buttery taste that is pronounced in certain California chardonnays. Diacetyl used as artificial butter flavor for pop-corn has been recognized as potentially harmful for workers inhaling it in large amounts for a long time to produce a form of obliterative bronchiolitis known as pop-corn lung.

The chemical nature of wine remains largely unknown and is should be regarded as a complex natural substance not to be manipulated beyond the traditional ways. Although wine tasting should be defined by a combination of the four basic tastes of sweet, sour, salty and bitter (umami, the meety flavor can be included as a fifth basic taste) it involves smell. The wine aroma feel couples with flavor and mouth feel to give a complex perception of flavor, scent and texture that goes beyond description by simple words. A useful way to identify flavors is to compare them with known flavors in our memory and use them as descriptors. One way to help identify those flavors is the aroma wheel from UC Davis, Ann Noble. The wheel has general descriptors in the center, multiplying by more defined descriptors in the periphery, such that a fruity flavor can be identified as tropical and further into pineapple.

Wood, an important determinant of quality

Wine aging in contact with wood is an important because it adds complexity and finesse to the basic fruity components of wine. It is also the largest value added to wine manufacture and something that defines its quality and price. Wine exposure to wood (particularly certain types of oak) adds tannins and complex carbohydrates like ramnose and arabinose. The most expensive way to do this is by barrel aging. Barrels are expensive and yield wood flavors in only a fraction of the wood thickness.

They also allow for certain amount of evaporation and perhaps oxygen and gas exchange with the surrounding air. Barrel aging is quite old and yet the effects on wine are not completely understood, beyond the fact that it is the best way to age and finish wine before bottling. Alternative, less expensive ways to impart wood flavors to wine are wood staves, cubes, chips and saw dust. Unfortunately, the immersion of these forms of wood products in the wine have the potential for contamination with machine oils and dust. An even less desirable form of adding wood flavors is concentrated fluids resulting from boiling wood. These are added to the wine. As easily understood, the wood finish of wine is a matter of price and quality that should make us think twice before drinking cheap wine!

The wine lingo

One puzzling consequence of the complexities of assessing wine by using language is

that there are not enough specific words to describe wine taste. This has brought a sort of wine jargon where qualities are described by words not easily understood by the uninitiated.

For example, a mouth feel can be round, sharp or thick or angular and the flavors forward, assertive, layered, balanced, bright, etc.

Importantly,

"Wine is one of the most civilized things in the world and one of the natural things of the world that has been brought to the greatest perfection, and it offers a greater range for enjoyment and appreciation than, possibly, any other thing which may be purchased"

Death in the afternoon. Ernest Heminway 1899-1961

Should EVAR, DREAM and OVER be re-edited with the new technology and experience?

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Clinical Trial Data

The early results of the EVAR-1[1], DREAM[2] and OVER[3] trials were consistent and convincing. (Table 1) 30-day mortality is at least a factor of 3 times greater following open surgery (OR) than endovascular repair (EVR). Despite this, sceptics cite concerns about the long term durability. They also challenge EVR based on cost effectiveness. EVAR-1 did report a higher post-operative complication rate within 4 years in the EVR group [41% EVR vs. 9% OR p<0.0001].

The DREAM trial reported operative mortality of 4.6% [95% CI 2-8.9] for OR and 1.2% for EVR [95% CI 0.1-4.2] with mean follow up to 22 months. Similar early post-operative benefits were reported in the OVER study, but the survival advantage was not sustained beyond 2 years (mortality 7.0% EVR vs. 9.8% OR p=0.13).

More recently the results up to 10-years following the start of the EVAR-1 trial have been published[4].These show no difference in all-cause or aneurysm-related mortality. The study describes the high rate of graft related complications and additive costs of re-interventions.

EVR should be re-evaluated, but not just because of the long term results of the randomised trials. EVR outcomes have improved significantly since the original trials were performed. The reasons for this are multifactorial. EVR is the driver for improved peri-operative outcomes in AAA

STUDY	N=	EVR MORTALITY	OR MORTALITY	P-VALUE
EVAR-1	1082	1.7%	4.7%	0.009
DREAM	351	1.2%	4.6%	0.10
OVER	881	0.5%	3%	0.004

TABLE 1. 30-day mortality from the randomised trials.

surgery, and has allowed a greater number of patients with large AAA to be treated who would previously have had no therapeutic option.

Principal Limitations of the Clinical Trials

Current devices have superseded many of the older generation of endovascular grafts. Although the long-term in-vivo durability of the newer endografts is yet to be established it is likely that they will prove more durable and lead to less complications both in the short and long term.

Secondly, EVAR-1 was initiated when EVR was in its infancy; there was limited understanding of EVR, and many centres had limited experience. The trial began 3 years before reporting standards for graft related complications. No core-lab was established for consistent unbiased reporting. The units recruiting patients qualified having performed a minimum of 20 cases; it have since suggested that centres should have performed 55-60 cases. There is also now a clear documented relationship between the outcomes from aneurysm repair and hospital volume.

A further limitation regarding the trial data is the interpretation of readmission, reintervention and complication rates. EVAR-1 demonstrated significantly greater reintervention rates in the EVR group. These complications, being vascular specific were relatively simple to identify and record. The principal complications following open repair are not vascular specific and are more likely to lead to readmission under non-vascular specialists, and may be under-reported.

EVAR-1 concluded that EVR was more costly. The cost calculation was based on a requirement for 3 computed tomography [CT] scans in the first post-operative year, followed by annual surveillance CT imaging. This intensive surveillance is not required and many units now recommend primary follow-up with Duplex ultrasound[5]. Some are now suggesting that duplex is unnecessary in the majority of cases and that targeted higher risk cohorts might be identifiable from risk modelling. This would bring the overall cost down significantly. There is an accruing body of evidence that re-intervention rates are less than described in EVAR-1. A contemporary large series demonstrated a 7.4% re-intervention rate at median 2.5 years follow-up[6]. In 553 EVR patients at St George's, 12.5% required re-interventions at 3 years[7].

Intraoperative problems are now better recognised and corrected, reducing reintervention rates. There may also have been a degree of over-intervention in the early days; with time we have developed a greater understanding of those problems that can managed conservatively, such as type-2 endoleaks. The majority of re-interventions are now performed using endovascular means, with no impact on aneurysm-related or actuarial 5-year survival[8]. This was not the case in EVAR-1 where 3.2% of patients received secondary interventions for a type

REGISTRY	PERIOD OF DATA COLLECTION	N=	30-DAY MORTALITY	REINTERVENTIONS
EVR				
EUROSTAR	1996-2006	8345	2.3%	19.2%
LIFELINE	1998-2004	2664	1.7%	22%
RETA	1996-2000	1000	5.8%	62%
SWEDVASC	2000-2005	1064	2.5%	-
OR				
NVD	1999-2004	4545	6.8%	-

TABLE 2. *Registry data regarding outcomes following AAA.*

II endoleak and significant proportion of secondary interventions required open surgery with inherent increased risk.

Lastly, it should be noted that the original EVAR-1 study was only powered for analysis to 3.3 years. The continued follow-up provides a unique data-set, but should be interpreted in the same manner as any post-hoc analysis. Therefore, while the long-term findings of EVAR-1 are both interesting and valuable, they should be interpreted in light of the wealth of other evidence supporting the wider adoption of EVR.

Registry data for elective EVR (Table 2)

The prompt identification of a need for long-term data on the safety and efficacy of EVR led to the establishment of a series of prospective registries. The largest of these is EUROSTAR. Similar registries were established world-wide; the RETA registry was created in the U.K., and the LIFELINE registry in the U.S.A.

EUROSTAR has presented outcomes for 30-day and long-term [8 year] mortality (2.3% and 9.5% respectively)[9]. Adverse events were experienced in 11.1% but aneurysm rupture [0.5%] and device migration [1.8%] were rare. 9% required late re-intervention. The first generations of endograft were characterized by excellent early results but poor durability. The latest data show significant improvements in all outcome measures, most importantly, those relating to durability[10].

The RETA registry published long-term 'first generation' outcome data prior to the EVAR-1 trial [1996-2000]. Despite 25% considered unfit for OR, the 30-day mortality was 5.8%[11]. Conversion rates and mortality fell with time, reflecting better patient selection, advances in stent-graft design, and improved mentoring. The Lifeline registry, showed similar improvements in outcome measures with time[12].

Registry evidence for OR outcomes is available from the UK National Vascular Database (NVD). The 30-day mortality rate of 6.8% improved to 5.2% in 2009, with contemporaneous 1.9% mortality for EVR. The NVD also showed an increased uptake of EVR from 29% of cases in 2006 to 44% in 2009[13]. 'Swedvasc' has reported increased uptake of EVR with an associated increase in overall improvement in peri-operative outcomes[14].

Conclusion

EVR should be re-evaluated, but not just as a consequence of the randomised trials, which suggest no difference between OR and EVR in long term all-cause mortality. Clinicians' expertise, understanding and the technology have progressed significantly since the establishment of the trials, such that the results, though valuable, may not translate to modern practice. The evidence-base now demonstrates that best practice in AAA management is in specialist vascular centres, performing high volume surgery offering EVR to all patients who are morphologically suitable.

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EVAR for small aneurysm is not yet justified

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Background

Randomised trials have failed to demonstrate benefit from early surgical repair of small abdominal aortic aneurysm (AAA) compared with surveillance. This study aimed to compare results after endovascular aortic aneurysm repair (EVAR) or surveillance in AAA<5.5 cm.

Methods

Patients (50-79 years) with AAA of 4.1-5.4 cm were randomly assigned, in a 1:1 ratio, to receive immediate EVAR or surveillance by ultrasound and computed tomography (CT) and repair only after a defined threshold (diameter≥ 5.5 cm, enlargement >1 cm /year, symptoms) was achieved. The main

endpoint was all-cause mortality. Recruitment is closed; results at a median follow-up of 32.4 months are here reported.

Results

Between 2004 and 2008, 360 patients (early EVAR = 182; surveillance = 178) were enrolled. One perioperative death after EVAR and two late ruptures (both in the surveillance group) occurred. At 54 months, there was no significant difference in the main end-point rate [hazard ratio (HR) 0.76; 95% confidence interval (CI) 0.30-1.93; p=0.6] with Kaplan-Meier estimates of all-cause mortality of 14.5% in the EVAR and 10.1% in the surveillance group. Aneurysm- related mortality, aneurysm rupture and major morbidity rates were similar. Kaplan-Meier estimates of aneurysms growth≥5mm at 36 months were 8.4% in the EVAR group and 67.5% in the surveillance group (HR 10.49; 95% CI 6.88-15.96; p < 0.01). For aneurysms under surveillance, the probability of delayed repair was 59.7% at 36 months (84.5% at 54 months). The probability of receiving open repair at 36 months for EVAR feasibility loss was 16.4%.

Conclusions

Mortality and rupture rates in AAA <5.5 cm are low and no clear advantage was shown between early or delayed EVAR strategy. However, within 36 months, three out of every five small aneurysms under surveillance might grow to require repair and one out of every six might lose feasibility for EVAR.

Endovascular repair for ruptured abdominal aortic aneurysm: update from the IMPROVE trial

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Background

Systematic reviews have suggested a survival advantage for patients with ruptured abdominal aortic aneurysm (AAA), who are managed by endovascular repair. These reviews are based mainly on single centre experiences of selected patients although more recently they have been complemented by an exploratory analysis of the US Medicare data base. The problem with all these data is that they are confounded by patient and centre selection. For any widespread strategy to improve the outcome of patients with ruptured AAA (whether national as in the UK National Health Service or insurance company based), we need to know whether endovascular treatment should be available to ALL patients with ruptured AAA. If so, there will need to be changes in the way in which care for ruptured aneurysm is delivered through policy and management changes. Increasingly we need to be able to show that any new clinical strategy not only improves patient-spe-

IDEAL PHASE	DESCRIPTION	CITATION
Innovation	First case described	Yusuf et al. 1994
Development	Protocols developed&associated problems described in a few centres	Mayer et al 2009 Verhoeven et al 2008
Exploration	Pilot randomised trials Exploratory analysis of registries	Hinchliffe et al 2006 Egorova et al 2008
Assessment	Randomised controlled trials (AJAX, ECAR, IMPROVE)	AJAX, IMPROVE Trialists 2006, 2009
Long-term follow up	To 10 years using registries & other sources	

TABLE 1. Application of IDEAL statement to the use of endovascular repair for ruptured AAA.

cific outcomes but also is cost-effective. Initial estimations, based on highly selected patients, suggests that endovascular repair of ruptured AAA might be cost-effective.

How should new technologies and new care pathways be evaluated for translation into clinical practice? The IDEAL statement (Lancet 2009;374:1089-1112) states that there should be no surgical innovation without evaluation and recommends the 5 steps, Innovation, Development, Exploration, Assessment and Long-term follow up: Randomised Controlled Trials are the gold standard for the assessment phase.

The cornerstone of Assessment is the randomized controlled trial. The application for the IDEAL standards to the repair of ruptured AAA are shown in Table 1. There are 3 trials in progress for ruptured AAA. The Amsterdam AJAX trial which has nearly completed its recruitment of 120 patients started first. This trial, like its sister Paris-based French trial, ECAR, is taking a conservative approach. They ask the question as to whether in haemodynamically stable patients who are anatomically suitable for EVAR whether 30-day operative mortality is lower after EVAR than open repair. Patients are randomized after assessment by CT scan and haemodynamic monitoring. The IMPROVE trial in the UK has at its heart a different question: does a strategy of endovascular repair whenever possible improve 30-day survival of all patients with ruptured AAA? This trial poses questions directly relevant to the delivery of clinical services and requires more patients, 600, to show an advantage for endovascular repair (Figure 1). The IMPROVE trial needs a wide contributory base (many hospital across the UK) to have generalisable findings.

Objective of the IMPROVE trial

To determine whether a policy of endovascular repair improves the survival of all patients with ruptured AAA.

Methods

A randomized controlled trial, IMPROVE (ISRCTN 48334791) will randomize patients with a clinical diagnosis of ruptured AAA, made in hospital, either to immediate CT scan and endovascular repair whenever anatomically suitable (endovascular first), or to open repair, with CT scan being optional (normal care), The trial is set on a background of guidelines for emergency care, CT scanning and anaesthesia, which incorporate the protocol of permissive hypotension. Recruitment started in late 2009 and 600 patients are required to show a 14% survival benefit at 30 days (primary outcome) for the endovascular first policy.

Secondary outcomes include 24h, in-hospital and 1 year survival, complications, costs, quality of life and cost-effectiveness.

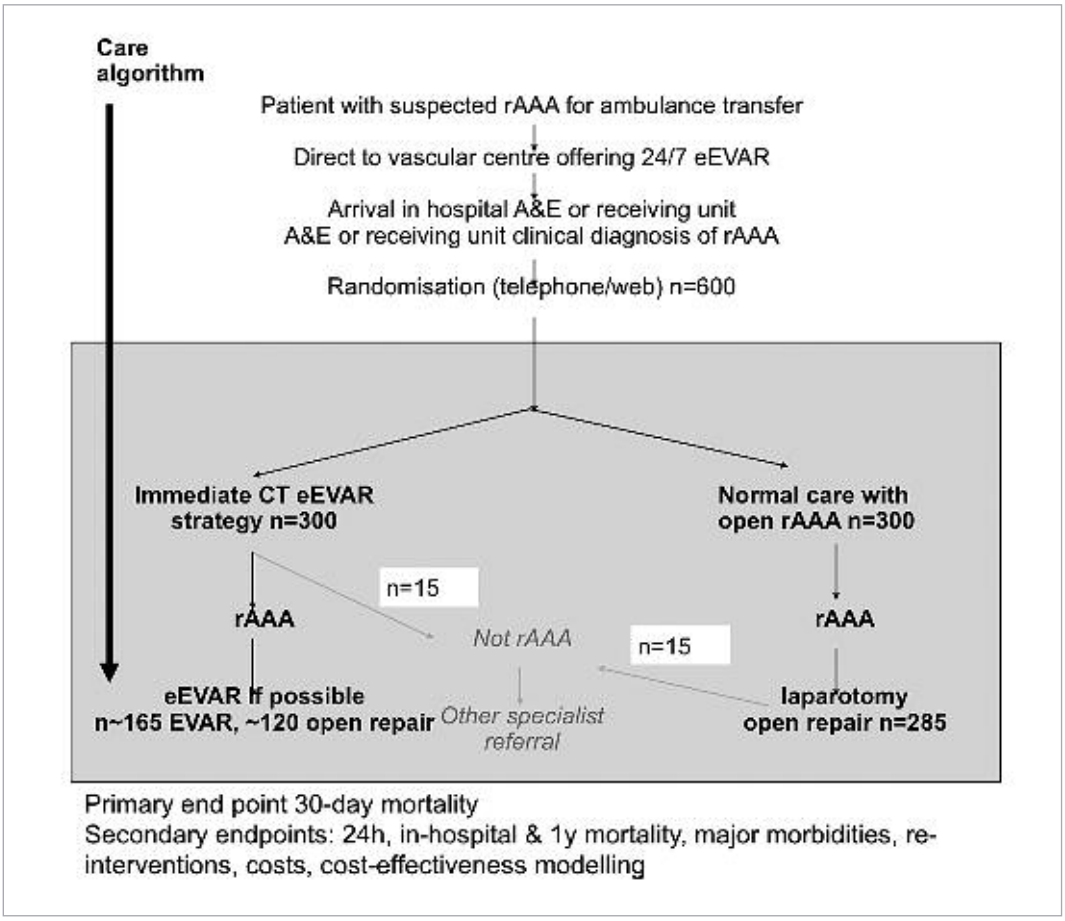

Fig. 1. *Design of the IMPROVE trial.*

Progress

We are one third of our way to target recruitment and the Data Monitoring and Ethical Committee have no safety concerns. The trial has stimulated the uptake of endovascular repair for ruptures throughout the UK and we now have 21 centres actively recruiting patients. The patients being randomized have very large aneurysms, median 7.8cm and no small aneurysms (<5.5cm) have presented. Our recruitment target remains very challenging in a time when the incidence of ruptured AAA appears to be decreasing rapidly.

Discussion

This is a "real life" trial that will answer the fundamental relevant clinical dilemma, namely, do patients who present with ruptured aneurysm derive benefit from treatment in a system, which offers a preferential strategy of endovascular repair? The trial addresses whether the anticipated reduced mortality and morbidity associated with endovascular repair offsets the relatively greater ease of access, speed and lower initial costs of conventional surgery. This issue is pivotal to future patient care and provision of services.

Acknowledgements

The IMPROVE trial is funded by the National Institute for Health Research Health Technology Assessment Programme in the UK. The views expressed here are those of the applicants.

A randomized trial of EVAR vs OR for rAAA is not necessary: accumulated world experience is enough

Veith, F.

This presentation reviews the history of and experience with endovascular repair (EVAR) of ruptured abdominal aortic aneurysms (RAAAs). It also addresses the question whether or not a randomized controlled trial (RCT) comparing EVAR with open repair (OR) for RAAA is needed.

Many single center reports, meta-analyses and population-based studies have shown a substantially lower 30-day mortality for EVAR than OR in the RAAA setting. However, it is possible that this difference is due to patient selection with OR being sometimes used in higher risk patients than EVAR. In addition, some comparative trials have failed to find better mortality outcomes after EVAR than after OR. For this reason RCTs have been proposed.

A recently completed review (2009) of the collected world experience with EVAR for RAAAs included data from 13 centers in which EVAR was used to treat almost all RAAAs in patients with suitable anatomy irrespective of hemodynamic status or risk status. In these centers the 30-day mortality for EVAR treatment was 19.7% while 30-day mortality for OR was 36.3% ($p < .0001$). Several treatment strategies, adjuncts and technical factors were felt to be important in achieving this lower mortality for EVAR. These included use of a standardized RAAA protocol and adequate EVAR experience, fluid restriction and hypotensive hemostasis, appropriate techniques for achieving supra-celiac aortic balloon control and use of such control only when necessary, early detection and appropriate treatment of abdominal compartment syndrome, and use of EVAR in the treatment of the worst risk patients.

Because of these results in the 13 centers, none of which would participate in a RCT of EVAR versus OR for RAAAs and because of logistical and ethical considerations, it is concluded that a RCT is not needed to validate the preferential use of EVAR to treat RAAAs in patients with suitable anatomy for the procedure.

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EVAR vs open surgery for rAAA: an update systematic review

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Mortality in patients with a ruptured abdominal aortic aneurysm (AAA) treated with open surgery remains high. Among patients who arrive in the hospital alive and undergo open surgery, the reported mortality rates varied between 32% and 70% (average 50%) and the morbidity rates between 30% and 50%.

Advantages and disadvantages of endovascular repair over open surgery exist. Important advantages of endovascular repair are potential avoidance of general anesthesia and minimization of invasiveness. During endovascular repair the aorta is not clamped and blood loss is considerably less than with open surgery.

Several studies have demonstrated a reduction in mortality and morbidity rates of endovascular repair compared with conventional open surgery in patients with ruptured AAAs. Most of these studies, however, included hemodynamically unstable patients in the open surgery group, whereas in the endovascular group mostly hemodynamically stable patients were included.

In a systematic review of the literature we identified all studies comparing open surgical treatment and EVAR for ruptured AAA. The pooled 30-day mortality was 22% (95%-confidence interval (CI) 16–29%) for endovascular repair and 38% (95%-CI 32–45%) for open surgery. The crude odds ratio for the 30-day mortality for endovascular repair compared to open surgery was 0.45 (95%-CI 0.28–0.72). After adjustment for patients' hemodynamic condition, the odds ratio was 0.67 (95%-CI 0.31–1.44).

In a 4-year period we evaluated the results of 94 consecutive patients with a ruptured AAA that were referred a teriairy referral center in the Netherlands. Thirty-nine patients were excluded from the analysis because of supra-renal clamping (N=26), AAA of unknown origin (N=2) or patient unconscious and therefore too unstable to undergo CTA.

Fifty-five patients were available for analysis, 26 patient received endovascular treatment and 29 patients received conventional open surgery.

Mortality and systemic complications were similar in both groups.

Patients treated with an endovascular intervention required less blood transfusion, shorter ICU stay and a shorter hospital stay. Despite the body of evidence currently existing about outcome of EVAR versus open surgical repair of patients with a ruptured AAA EVAR, still controversy exist about the superiority of EVAR.

In a recent Cochrane review the authors came to the following conclusion: "There is no high quality evidence to support the use of EVAR in the treatment of RAAA. However, evidence from prospective controlled studies without randomisation, prospective studies, and retrospective case series suggest that EVAR is feasible in selected patients, with outcomes comparable to best conventional open surgical repair for the treatment of RAAA ."

This controversy can only be overcome with

level 1 evidence from properly powered randomized controlled trials. Debatable can be if these randomized controlled trials should evaluate the results of EVAR versus open surgical repair only in patients suitable for EVAR or that a trial design randomizing all patients with a ruptured AAA between open surgery versus a strategy that includes EVAR if suitable.

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Influence of wallstress on AAA growth and biomarkers

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Growth rate of an AAA is generally defined as the change in maximum aortic diameter over a certain time period. Previous studies indicate that AAA growth rate increases with the diameter of the AAA.

However, this growth rate is not identical for all AAA's, as some AAA's remain stable for a considerable period of time, while others show a strong increase in diameter over a short period. Also, some AAA's tend to grow discontinuously, with alternating periods of growth and non-growth.

Recently, multiple studies have focused on patient- specific AAA wall stress analyses. Peak wall stress was found to be significantly higher for patients with symptomatic or ruptured AAA's than for asymptomatic aneurysms. However, in these studies, the relation between wall stress and AAA growth rate was not investigated. With increasing wall stress, more damage may occur in the AAA wall, leading to degeneration of the wall and expansion of the aneurysm. Wall stress may thus have a prominent role in aneurysm growth and computing AAA wall stress may lead to a predictive model for AAA growth rate.

Circulating biomarkers are believed to reflect inflammation and degeneration in

the AAA wall. Matrix metal- loproteinase-9 (MMP-9) is involved in the breakdown of the extracellular matrix and a higher plasma MMP-9 concentration was associated with AAA presence. Additionally, MMP-9 significantly correlated with AAA growth rate.

We hypothesized that in AAA's with high wall stress, relative to the diameter, the wall is more extensively damaged and degenerated than average. This could be reflected by increased AAA growth rate and up- or down regulation of specific biomarkers. The results of our study showed that a relative medium or high wall stress could be associated with a higher growth rate, which was significant between the medium and low wall stress group, and close to significant between the high and low wall stress groups. Although the average levels of MMP-9 and hs-CRP showed an increasing trend for increasing relative wall stress, none of the MMP-9, TIMP-1, a1-AT and hs-CRP concentrations were significantly different between the stress groups. The average concentration of hs-CRP in the medium and high stress groups exceeded 3 mg/L, which was previously identified as threshold level between average and higher relative risk for future vascular events. The growth rate in these groups was also higher than for the low stress group. A positive relation between MMP-9 concentration and AAA growth rate was found, but no correlation between absolute AAA wall stress and biomarkers could be identified.

Between the biomarkers mutually, a positive correlation was found between hs-CRP and MMP-9 possibly reflecting the fact that both biomarkers respond to AAA related events; namely inflammation and matrix degradation. Furthermore, TIMP-1 was negatively corre- lated with MMP-9. Normally, TIMP-1 regulates the activity of MMP-9. This regulation may be disturbed in patients with AAA, resulting in a lower TIMP-1 concentration for higher MMP-9 levels. TIMP-1 and a1-AT were also negatively correlated. The pathophysiological meaning is not clear, but it was previously postulated that both MMP-9 and a1-AT positively correlated with AAA growth. However, in the current study, only MMP-9 showed a positive correlation with AAA growth.

Conclusion

To our knowledge, this is the first study that combines both circulating biomarker information and wall stress information with the prospective growth rate of AAA's. A relative medium or high wall stress was associated with a higher growth rate compared to a relative low wall stress. The MMP-9 plasma concentration positively correlated to AAA growth rate. No correlation was found between absolute or relative wall stress and biomarker concentrations analyzed in this study, although the average concentrations of MMP-9 and hs-CRP showed an increase for higher relative wall stress. Further analysis is warranted to verify the relation between AAA wall stress, growth rate and biomarker concentrations.

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A computational framework for investigating the positional stability of abdominal endografts

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Endovascular repair has greatly reduced the perioperative morbidity and mortality of abdominal aortic aneurysm repair compared to open surgeries[1].

However, endovascular stent-grafts are exposed to a number of clinical complications, such as endograft migration (i.e., loss of positional stability), stent fractures and endoleaks (i.e., persistence of blood flow into the aneurysm sac after device placement).

These complications may result in life-threatening and costly events such as aneurysm growth, rupture, need for secondary procedures, and constant follow-up with imaging studies.

Understanding the biomechanical environment experienced by endografts in-vivo is a critical factor in improving their performance[2]. In this work, we combine computational solid mechanics and computational fluid dynamics tools with patient-specific clinical and imaging data to characterize the performance of abdominal endografts in-vivo.
We propose a Finite Element framework to evaluate the positional stability of stent-grafts deployed in realistic models of the abdominal and thoracic aorta.

This framework consists of several blocks (see Fig. 1): Analysis of the vessel wall pre-stress; deployment of the stent-graft; derivation of the CFD loads, and analysis of the fixation between the device and the aortic wall.

We will discuss the computational challenges of each of the steps highlighted above and provide examples of how different geometric factors affect the positional stability of the device.

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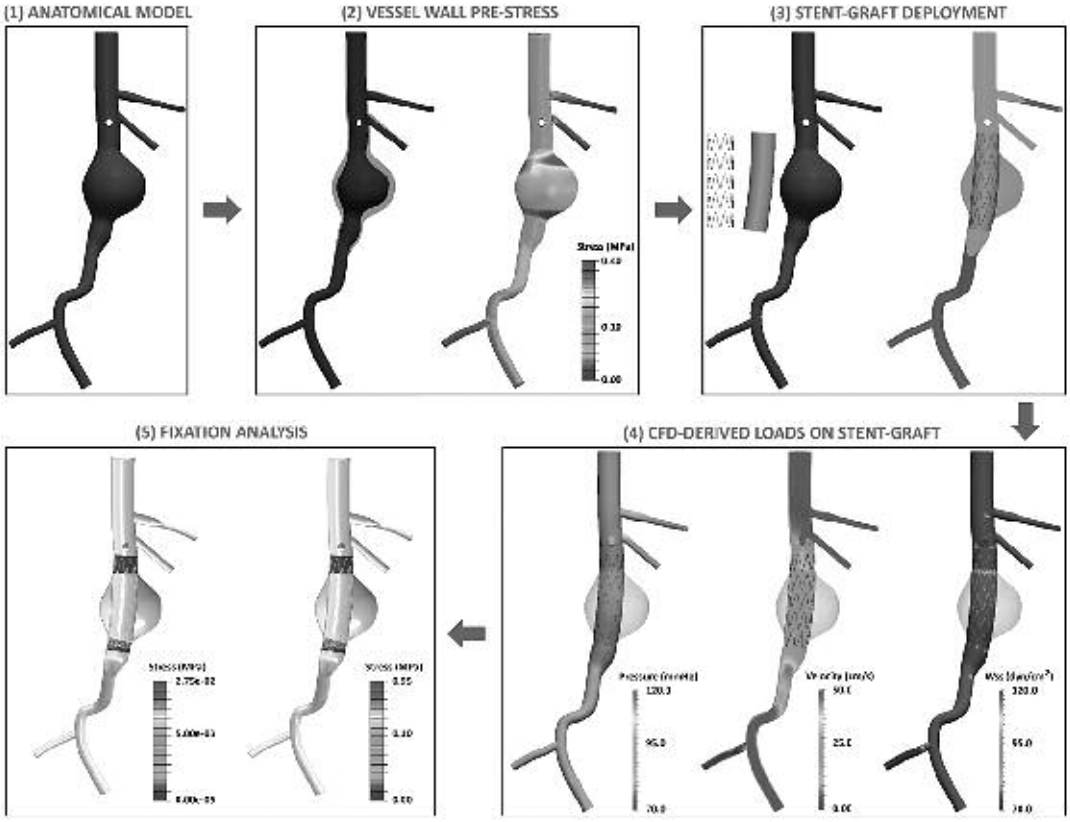

Fig. 1. *Main building blocks of the framework proposed to evaluate the stability of abdominal aortic stent-grafts: Starting with a computer model of the abdominal aorta of the patient (1), a pre-stress analysis of arterial wall is performed to define the internal stresses of the vessel wall corresponding to the pressure recorded at the time of the imaging study (2). Then, a multi-body (i.e., stent and graft) device is fitted into the abdominal aorta considering the proximal and distal fixation lengths and device oversizing (3). Once the device is deployed, a Computational Fluid Dynamics (CFD) analysis is performed to obtain the loads exerted by blood flow on the device (4). Lastly, a fixation analysis (5) examines the frictional stability between the device and the aortic wall at the proximal and distal fixation zones.*

EVAR in women: gender makes the difference

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For both elective and ruptured AAA repair, an increasing number of studies looked at influence of gender on operative mortality. In logistic regression analysis, a majority of these studies showed that gender was an independent predictor of higher treatment mortality in both elective and ruptured AAA repair. The results of these studies

reported odds ratios for treatment mortality ranging from 1.34-1.60 for electively repaired AAAs and 1.21-3.00 for ruptured AAAs, indicating that women may have an up to three times higher treatment mortality than men after AAA repair. Other studies performing logistic regression analysis, however, did not find a significant odds ratio for gender. In addition, many studies on treatment results of AAA repair did not specifically focus on gender. Therefore, currently it is unclear whether treatment mortality is different for women versus men.

Before we reconsider treatment guidelines it is essential to get insight into whether treatment outcomes differ between men and women. The impact of gender on treatment mortality may be different for elective versus ruptured aneurysms. Also, treatment mortality of men and women may be different for open versus endovascularly repaired AAAs. As AAA anatomy is a major selection criteria for EVAR and women have been reported to have a poorer anatomical suitability compared to men it is important to evaluate whether treatment mortality is different for men and women in these groups.

A total of 2264 articles were identified from the literature search . On the basis of title and abstract, 873 articles were retrieved in full and, of these, 62 met our inclusion criteria. The primary reason for exclusion was the lack of gender stratification when reporting mortality. Review of the reference list of each article did not lead to any additional articles being included. Of the 62 included articles, 27 reported on elective open repair, 21 on elective endovascular repair, 26 on ruptured open repair, and one study ruptured on endovascular repair.

The total number of patients of all included articles was 517,064; 404,045 men and 113,019 women respectively. The proportion of women varied from 13% in the elective endovascular repair group to 22% in the elective open repair group. On average, women were older than men in all groups but not significantly. The largest difference in age was seen in the ruptured open repair group where women were on average 5 years older than men. (77.7 years vs. 72.1 years).

For the elective open repair group, 30-day mortality was 6.7% for women and 4.4% for men. The unadjusted odds ratio for mortality for women vs. men was 1.58 (95%CI 1.14-2.2). After adjustment for age the odds ratio for women was 1.51 (95%CI 1.06-2.14).

For the elective endovascular group, treatment mortality was 4.8% for women and 1.8% for men. The unadjusted odds ratio for women was 2.51 (95%CI 1.72-3.69). After adjustment for age and AAA diameter the odds ratio for women was 2.41 (95%CI 1.65-3.53) (After adjustment for age only the odds ratio for women was 2.41 (95%CI 1.49-3.88).

For the ruptured open repair group, treatment mortality was 50.8% for women and 40.9% for men. The unadjusted odds ratio for women was 1.49 (95%CI 1.16-1.91). After adjustment for age the odds ratio for women was 1.24 (95%CI 0.94-1.64).

Only one study was found for ruptured endovascular repair. Treatment mortality was 14.3% for women and 44% for men.

Stratified data on complications was not available for the elective open and ruptured open repair groups. Stratified data was available for the elective endovascular repair group showing higher rates for women compared to men of conversion and/or aborted procedure (11% women vs. 2% men) and endoleaks (17% women vs. 9% men).

Possible mechanisms could lead to worse treatment mortality of women compared to men. The most important factors being the absolute treatment criteria for repair, the endovascular devices not specifically designed for women and the reduced awareness and thus diagnosis of cardiovascular and therefore also abdominal aortic aneurysm disease in women compared to

men. Even though it has been suggested to treat women with an AAA at smaller diameters than men it is still common practice to treat both sexes at an AAA diameter of 5.5cm. Seeing that on average, the normal aortic diameter of a woman is smaller than that of a man; by the time it has reached 5.5cm it has undergone a bigger relative increase in diameter. By using this absolute treatment threshold, women could be in a later stage of atherosclerotic disease when they undergo surgery leading to worse outcome.

Women have poorer anatomical suitability compared to men for endovascular aneurysm repair (EVAR) which we also saw in our study by the higher abortion/conversion rates in women compared to men. Endovascular devices have not been specifically designed for women yet, which possibly also plays a role in their worse outcome in this group. Again the aorta and access arteries are on average smaller in women than men making EVAR in women more difficult than in men.

The most probable explanation for the higher treatment mortality of women compared to men, however, might be that cardiovascular disease as a whole, and thus also abdominal aortic aneurysm is under recognized in women. This leads to an array of problems such as delayed diagnosis and intervention but also to less primary and secondary preventive measures such as cardiovascular medication and life style adjustments. Better awareness of these issues could lead to a better treatment outcome in women with abdominal aortic disease.

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Fenestrated endovascular aneurysm repair with a pre-loaded wire

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Introduction

Initial designs for endovascular aortic aneurysm repair (EVAR) were limited to infra-renal abdominal aortic aneurysms with an adequate sealing zone below the renal arteries for the proximal component of the stent, usually more than 15mm of non-angulated, thrombus-free neck. More recently standard infra-renal EVAR devices have been modified to incorporate fenestrations through which small diameter covered stents may be delivered allowing incorporation of the aortic visceral segment into the

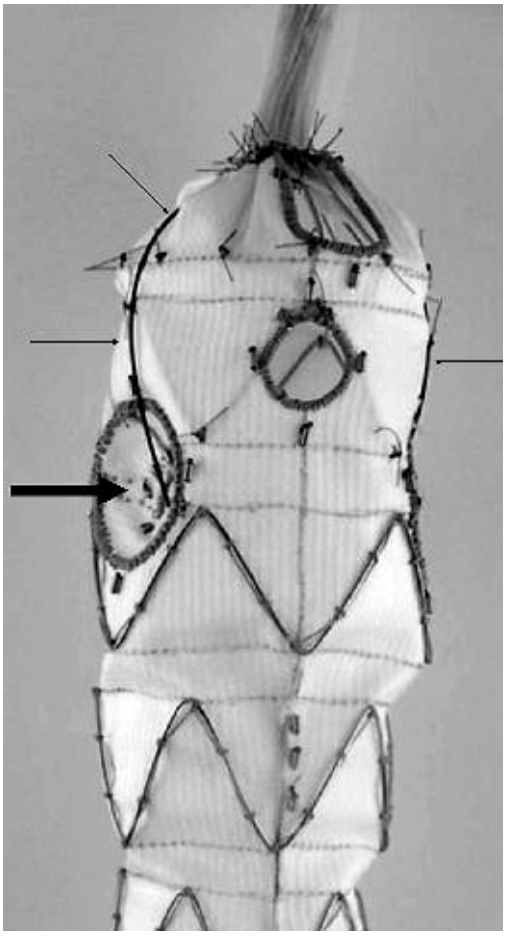

Fig. 1. The wire (thin arrows) passes from within the stent-graft, out through a fenestration (thick arrow), over the top cap, back in through the opposite fenestration and down the stent-graft again.

proximal sealing zone (FEVAR). Prior to the development of FEVAR, patients with juxta-renal aortic aneurysms had only the option of open surgical repair though case reports of infra-renal EVAR with "chimneys" for the renal arteries provided a limited alternative. A contemporary series of open repair of juxta-renal aneurysms carried a peri-procedure mortality of 2.9%[1], however morbidity can be considerable. More than a third of patients may develop acute renal impairment, with over 3% requiring dialysis. It has been shown in previous studies that EVAR carries substantially improved mortality rates[2], as compared with open repair of infra-renal aneurysms. The development of fenestrated endovascular grafts has made this survival benefit available to patients with juxta-renal aneurysms.

Thus far evidence for FEVAR relies only on published case series. Nordon et al[3] compared FEVAR (8 studies with a total of 368 patients) with open repair (12 studies with a total of 1164 patients). They found a 1.4% *versus* 3.6% 30 day mortality in favour of FEVAR. A further analysis by the Ontario Health Technology[4] compared 5 FEVAR studies with 7 open studies giving a 1.8% *versus* 3.1% 30 day mortality in favour of FEVAR and a 12.8% *versus* 23.7% late mortality in favour of FEVAR.

Performing FEVAR can be lengthy and technically challenging. The cannulation of the fenestrations and subsequently the visceral arteries can be difficult and time consuming and renal dysfunction is a common complication[5].

Furthermore, the procedure requires large sheaths to be inserted into both access arteries. This increases the risk for arterial dissection, limb ischaemia and reperfusion injury. The patient is also exposed to significant doses of radiation, with increased fluoroscopy times. The use of pre-loaded wires aiding in the cannulation of fenestrations and subsequently viscera is an innovation designed to tackle these challenges.

Fenestrated grafts with pre-loaded wires: Technique

Fenestrated grafts can be custom made to have a double length 0.014" nitinol wire loaded through a port on the device handle. The wire passes out through the pusher, into the graft lumen at its distal end and out through a fenestration. It then loops over the top-cap to the other side of the graft, through the graft fabric and back in to the contralateral fenestration (Fig 1), where it follows a path back down the lumen and out through a port on the handle (Fig 2).

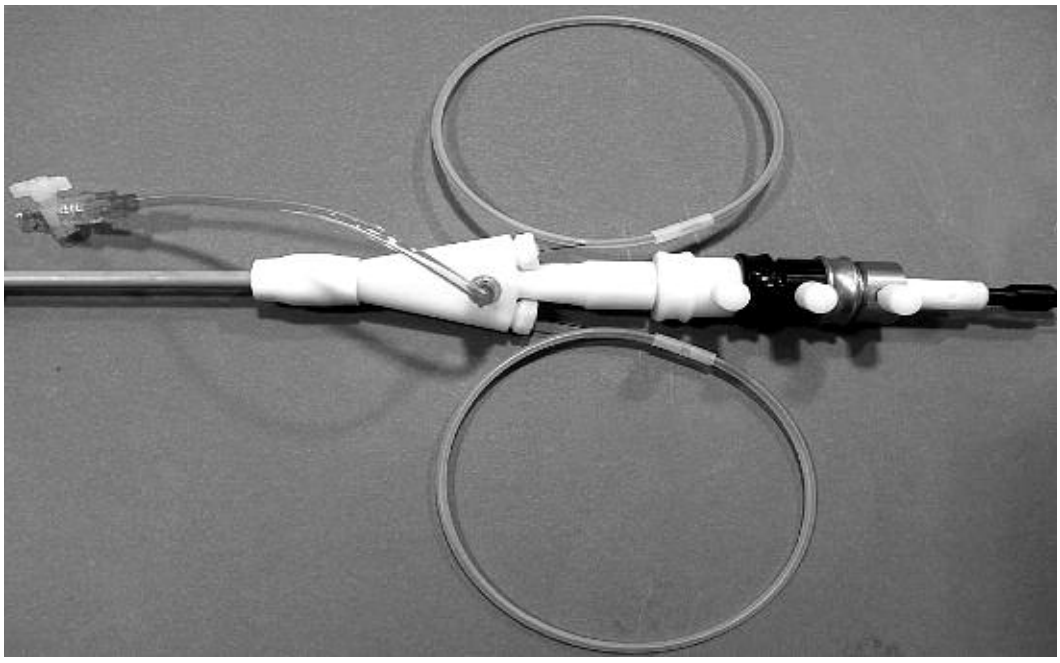

Fig. 2. The Preloaded wires and their entry into the handle of the stent-graft.

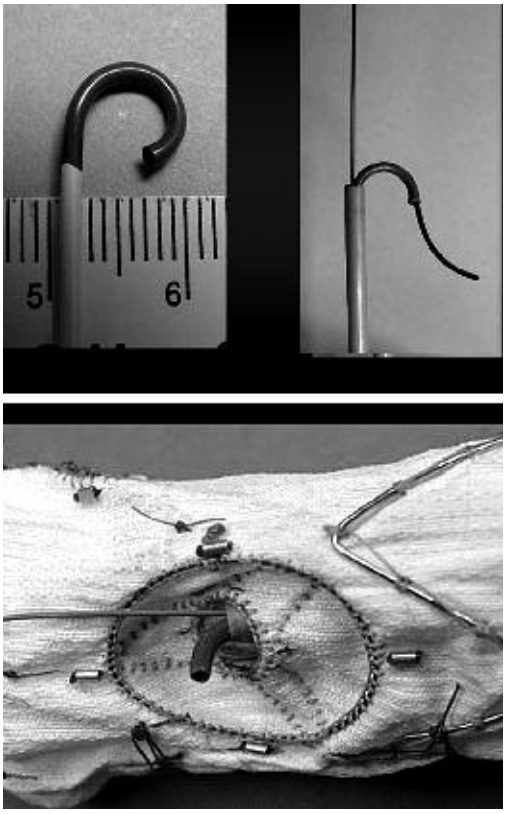

Fig. 3. The Curly Q catheter has a tight curve (upper image) allowing for variable directionality within the fenestration (lower image)

The graft is delivered via the trans-femoral route until it is safely docked in the iliac arterial system. A sheath with a maximum diameter of 6F and ideally 90cm in length is then advanced over one end of the preloaded wire until resistance is felt. Another sheath is inserted over the other end of the wire. Clips may be placed on the ends of the wires and pulled gently to stiffen the wire and allow easier passage. Once both sheaths are in place, the graft is advanced to the visceral segment and orientated and deployed in the usual fashion. The 6F sheaths are then advanced over the pre-loaded wires. Once the sheath dilators have passed through their fenestrations, they should be benched and the sheath should be advanced to the level of the lower margin of the fenestration. The dilators can then be removed.

A separate puncture in the valve of each 6F sheath is made, and an 0.035" hydrophilic wire is advanced through a Curly Q (Cook Medical, Bloomington, IN) 4F catheter. The curve on the catheter allows for variable angulation to be achieved at the level of the fenestration, and each viscera is cannulated in turn (Fig 3).

The pre-loaded wire must then be removed by withdrawing the wire via the side port, as neither sheath may be advanced into the visceral artery proper with the wire in place.

Once the preloaded wire is withdrawn, the sheaths are advanced into over dilators or balloons and the procedure is continued as for a standard FEVAR.

Advantages

The purpose of the pre-loaded wire is to facilitate more rapid cannulation of the fenestrations and subsequent cannulation of the visceral vessels.

This serves to decrease the operating time which has significant benefits; there is reduced physiological stress from lengthy general anaesthesia, reduced blood loss from the exposed arteries and leakage from sheaths, reduced exposure to ionising radiation and reduced ischaemic time for the limbs.

The wires themselves serve as stabilising "reins" and when tension is applied, as with any through-wire, the sheaths on them will track more easily and buckle less.

Another advantage is the obviation of the need for a large contralateral sheath to be inserted for visceral artery cannulation. The sheaths for the target vessels are inserted into ports in the graft main body, which is typically 20F. On the contralateral limb therefore, it may only be necessary to insert a 5F sheath for control angiography, and an additional 6F - 7F sheath for the remaining visceral vessel(s), for example the SMA or the coeliac artery.

By having an uninhibited iliac system on one side, internal iliac and femoral artery patency is maintained and the risk of pelvic and limb ischaemia and reperfusion injury is reduced. In those patients with limited access such as unilateral occluded iliac arteries: this allows the use FEVAR without having to expose or recannalise the occluded side for visceral cannulation.

Limitations

One limitation in the design of the preloaded FEVAR system is the restricted size of the sheaths that can be used for visceral vessel cannulation. At present, this is a maximum of 6F in diameter as this is the largest size that can fit through the device. The largest V12 (Atrium Medical, NH, USA) covered stent that can be accommodated by a 6F sheath is 6mm by 22mm and therefore if a target visceral vessel required a covered stent greater than this, the use of a preloaded system would not be suitable. Any flaring of the Atrium is limited to a 9mm balloon for the same reason. Similarly, only two sheaths can be inserted and if more than two visceral vessels need to be incorporated into the graft there is a requirement for separate sheaths for these vessels, usually delivered via the contralateral iliac system.

Another consideration is the additional steps and technical challenges that the use of the pre-loaded wire incorporates into the procedure. Clearly, this technology is in its infancy and problems can arise in the delivery of the graft. In the tortuous aneurysm, graft twisting may make advancement of stents, balloons and catheters through the 6F sheaths difficult. Similarly, the preloaded wire may become trapped within the top-cap and become difficult or impossible to remove.

Case Report

An eighty year old man was referred for treatment of his 62mm juxta-renal abdominal aortic aneurysm, with no adequate proximal seal for a standard EVAR. The right renal artery arose just 5mm below the origin of the superior mesenteric artery (SMA), and the left renal artery was just below this.

A custom made graft with fenestrations for the right and left renal arteries and the SMA produced, with a preloaded wire for cannulation of the renal arteries. The deployment sequence was as described above (See Fig 4A-4D).

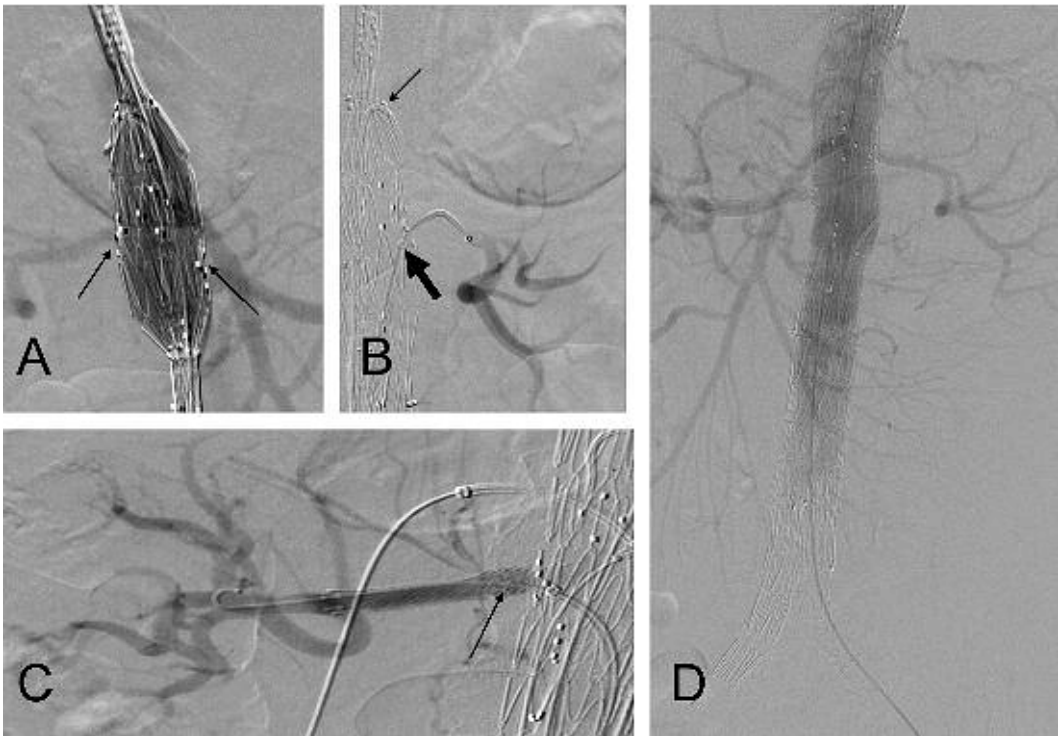

Fig. 4. *A: The stent graft is partially deployed with the renal fenestrations (arrows) orientated to face the arteries*
B: The preloaded wire (thin arrow) facilitates passage of the sheath and catheter (thick arrow) to the right renal artery
C: The preloaded wire has been removed and an Atrium V12 stent has been deployed (arrow)
D: Completion angiogram demonstrating satisfactory filling of the visceral vessels.

Summary

The evolution of endovascular aneurysm repair to include fenestrations and branches for visceral vessels has opened the benefits of this minimally invasive technique to a group of patients for whom open surgery was previously the only treatment option.

These procedures do require refinement and ongoing development in order to maximise their benefit.

The innovation of using preloaded wires to facilitate rapid cannulation of target vessel fenestrations is one such refinement. It serves to decrease the operating time, thus reducing the physiological stress of general anaesthesia, reducing the exposure to ionising radiation and reducing blood loss and limb ischaemic time. The presence of the preloaded wire and consequent passage of the sheaths via the main body means that on the contralateral limb smaller sheaths need only be inserted, thereby further reducing the risk of limb ischaemia.

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The use of Aptus EndoStaples during REVAR, a feasibility study

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Introduction

One of the drawbacks of endovascular abdominal aneurysm repair (EVAR) is the occurrence of proximal migration which can result into type IA endoleaks. The incidence of type I endoleaks increases with difficult proximal landing zones like short and angulated necks. Type I endoleaks have been associated with abdominal aneurysm rupture post-EVAR[1]. Occasionaly, some type I endoleaks might seal during follow-up. However, even if sealing has occurred the previous type I endoleak may have fatal consequences because systemic blood pressure can be transmitted through the clot.

As the need for reinterventions post-EVAR (REVAR) has been associated with substantial morbidity and mortality, proximal migration and type IA endoleaks remain an area of concern and have to be overcome and/ or prevented[2].

Most follow-up schedules post-EVAR include the use of computed tomography (CT) scans at 1 month and 12 months. If no complications are seen at the one-year-CT-scan, yearly follow-up with duplex ultrasound and plane X-ray has been recommended[3]. However, in obese patients proper duplex scanning of the abdominal aorta may not be feasible and CT-scans or magnetic resonance arteriographies are still needed, with their potential contrast related complications. Furthermore, in patients with poor overlap of the endograft components or endotension frequent CT-scans are recommended. The impact of these repeated follow-up visits must not be underestimated regarding a patient's well being.

More reliable and secure fixation of endografts to the aortic wall may decrease the occurrence of proximal migration, type IA endoleaks, and the need for yearly follow-up.

The use of endostaples is a new fixation technique completely independent of the endograft itself. It might enable the vascular surgeon to determine the extent and location of fixation, which simulates the process of suturing during open surgery. We evaluated the feasibility of the use of Aptus EndoStaples during REVAR to solve migrated endografts with or without additionally type IA endoleaks.

Technique

The EndoStapler system (Aptus™ Endosystems, Inc, Sunnyvale, CA, USA) consists of a steerable guiding catheter with obturator (figure 1), which can be used via open or percutaneous femoral access as preferred. When the top of the deflectable endoguide sheath has been positioned at the level of the proximal part of the endograft the obturator is removed. The endoguide has a steerable deflecting tip for precise positioning, perpendicular to the graft material (figure 2). The electronically-controlled EndoStaple applier (with one preloaded EndoStaple) is then advanced into the endoguide, and proper apposition to the graft material is ensured (bulging of the endograft under fluoroscopy). Subsequently the EndoStaple (figure 3) is skrewed into the

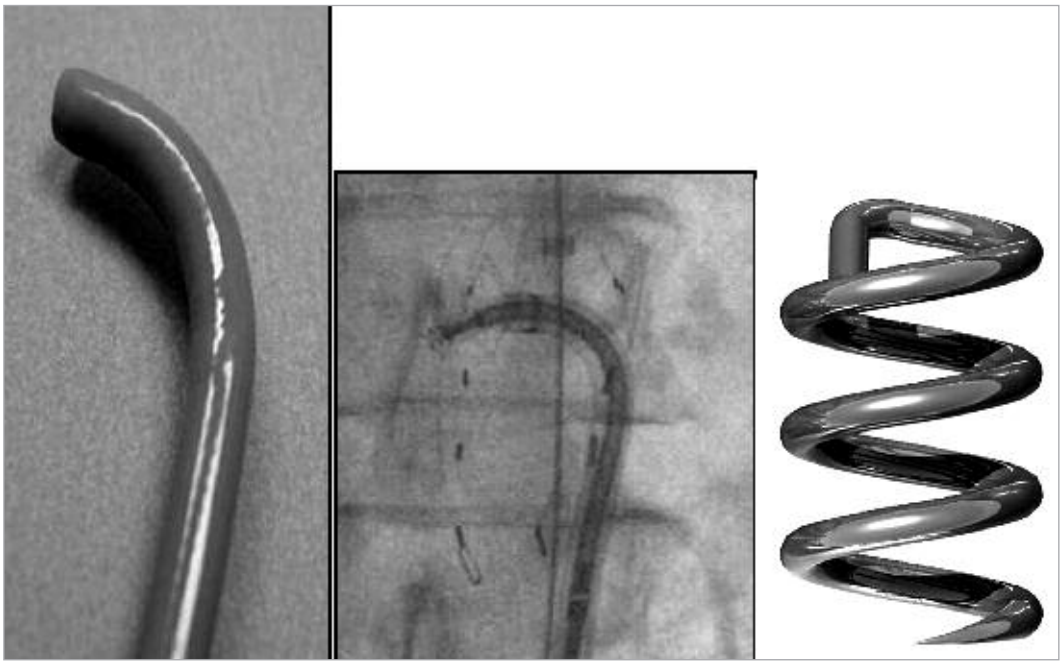

Fig. 1. The deflectable sheath specifically designed for the endostaple delivery.
Fig. 2. Fluoroscopy of implantation of an endostaple in the proximal part of an Aptus endograft.
Fig. 3. The Aptus EndoStaple.

endograft and aortic wall. The leading edge is sharpened to allow passage through the graft and into the vessel wall. The last coil of the helix is folded back on itself, ensuring that it can not pass through the fabric of the graft. It has been advised to implant at least 4 EndoStaples for proper fixation of the endograft[4].

Patients

In a six-months-period 4 patients with proximal migrated endografts or proximal type I endoleaks were treated with proximal extender cuffs and the use of Aptus EndoStaples. Computed tomography (CT) scans were performed 3-months post-procedurally.
The four patients (3 men, age 71 + 6 years) needed revision for proximal migration (n=2) and/or proximal type I endoleaks (n=2) post-EVAR. In all patients, the primary endograft (AneuRx n=2, Endurant n=1, Talent n=1) was first fixated with an average of 4 endostaples to the aortic wall. After endostapling of the primary endograft to the aortic wall, a proximal cuff was inserted with the proximal part of the fabric just below the lowermost renal artery. The proximal cuffs (Endurant n=3, Aptus n=1) were also fixated with endostaples to the primary endograft and/or aortic wall. At completion angiography 1 patient (with a primary huge proximal type I endoleak) still suffered from this leak and a juxtarenal self expandable bare stent had to be implanted.
At 3-months CT-scans no proximal type I or type III endoleaks were seen, nor further proximal migration was noticed. No endostapling related complications were diagnosed.

Discussion

Secondary interventions to treat proximal migration and type IA endoleaks can be challenging. Less invasive options, like the endovascular implantation of an extender cuff as sole treatment is not recommended because of the high risk of persistent migration of the primary endograft, which will

lead to type III endoleaks between cuff and primary endograft during follow-up. More invasive techniques, like unilateral endografts and fem-fem crossover bypass grafts, laparoscopic banding, or even conversion might be necessary.

With the introduction of endostaples a migrated endograft can be secured to the aortic wall and the cuffs can be fixated to the primary endograft, like we did in the aforementioned 4 patients. This patient series showed the feasibility of the use of the Aptus™ EndoStapling system for its use in secondary interventions of proximally migrated endografts. Endostapling of the device in combination with implantation of a proximal extender cuff makes sense and will minimize the risk of future type III endoleaks between cuff and endograft. Besides, it secures the proximal part of the endograft to the aortic wall. The use of EndoStaples enables the surgeon an endovascularly equivalent of a sutured anastomosis.

We will continue with this technique, and start with a European EndoStapling registry to increase the number of patients with long-term follow-up.

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All we need to know about the natural history of asymptomatic acute type B dissection: therapeutic implications

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Acute aortic dissection is a challenging and lethal disease with high in-hospital and follow-up mortality rates. Dissections confined to the descending aorta (Type B) have better in-hospital survival compared with those involving the ascending aorta[1]. However, unlike type A dissection, the majority of patients with TB-AAD are treated with medical therapy alone. Surgery or endovascular treatment is reserved for patients with complications such as rupture, enlarging aneurysm, retrograde dissection, malperfusion syndromes or refractory pain and/or hypertension[2]. In-hospital outcomes

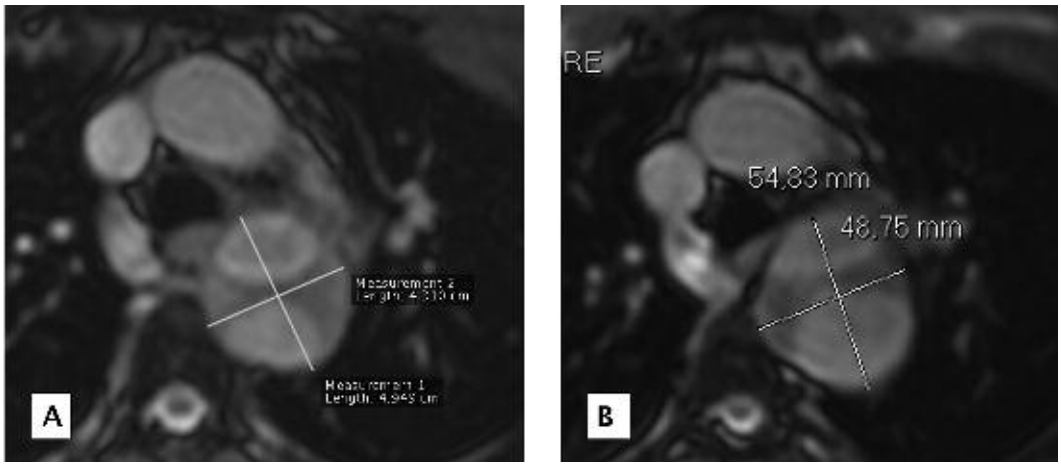

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Fig. 1. *Presence of post- dissected dilation at the level of the upper descending aorta presenting with partial lumen thrombosis. Fig. 1B. MRI shows increasing aortic diameter after one year.*

are generally acceptable in patients with uncomplicated TB-AAD, with up to 90% of patients surviving to hospital discharge after receiving effective antihypertensive therapy[3,4]. Short-term and long-term prognosis after discharge from the hospital remain less clear. In IRAD recent analysis, 1 in 4 patients discharged from the hospital alive were dead at 3 years, which exceeds the cumulative incidence of mortality in other diseases such as coronary artery disease, moderate chronic obstructive pulmonary disease, and stage II colon cancer[5,6]. In other experiences, the long-term prognosis of these patients managed medically, was even far less optimistic, with mortality rates as high as 48-82% after 5 years[3, 7-9].

A large amount of the long-term mortality is caused by aorta-related complications, as aortic rupture or extension of the dissection[10], which can develop despite adequate antihypertensive treatment[11-13]. Nevertheless, preventive open repair in all asymptomatic type B dissections patients is associated with a mortality rate around 30%[12-14]. Recently, endovascular repair is showing better outcomes when compared with open surgery, but preventive treatment with stentgrafts in asymptomatic patients does not seem to improve their mid-term outcome[12-15].

In acute and subacute uncomplicated B dissected patients, early predictors of a successful medical management versus the necessity of an early intervention might help in optimizing their management. However, actually these predictors are scarce and it is largely unknown which asymptomatic patients could benefit more from an early intervention, or require closer follow-up. Imaging studies suggest that thrombosis of the false lumen has beneficial prognostic value while a patent false lumen predicts poor outcomes[16-20]. The impact of a partially thrombosed false lumen (the concurrent presence of partial laminar flow and partial thrombosis) on clinical outcomes has been studied within IRAD. In TB-AAD patients it resulted associated with increased surgical mortality[14], and among those TB-AAD patients discharged alive, a partially thrombosed false lumen on imaging resulted an independent predictor of increased mortality after adjusting for age, gender and type of in-hospital treatment[13]. In this IRAD cohort, the risk of death in patients with a partial false lumen thrombosis was increased by a factor 2.7 in comparison with patients with a completely patent false lumen.13 Due to the observational characteristics of the IRAD registry, the exact cause of the increased mortality in patients with partial false lumen thrombosis remai-

ned unclear. Formation of a partial thrombus may occlude distal reentry tears of the false lumen ("sac formation"), leading to increased pressure in the false lumen. This may subsequently lead to increased wall tension, which may elevate the risk of aortic expansion, re-dissection and rupture and would thus explain the increased mortality seen in these patients[13]. In addition, it has been suggested that patients with a partially thrombosed false lumen might suffer from a higher risk on aortic rupture due to hypoxia of the arterial wall adjacent to the thrombus[13], similarly to what has been described earlier in patients with an abdominal aortic aneurysm[20,21].

However, a study by Sueyoshi and colleagues, focused on the aortic growth rates and thrombosis of the false lumen, did not confirm these findings[23]. In their analysis, the dissected aorta showed the fastest mean growth rate in case of a patent false lumen (4.9mm/year), followed by a partially thrombosed false lumen (4.0mm/year), while dissected aortas with a completely thrombosed false lumen decreased in diameter on average (-0.2mm/year). In the partially thrombosed false lumen group, dissected aortas with a "sac formation type" showed a significantly increased growth rate compared to those with a non-sac formation type[23]. Our group of research, including University of Utrecht, the Nederland, University of Rotterdam, the Nederland, Yale University, USA, and Policlinico San Donato IRCCS, Italy, is actually developing some projects focused on the evaluation of variables that might help to determine the risk of the dissected aorta to expand with consequent morbidity and mortality. Looking into the role of partial lumen thrombosis, our preliminary results showed that aortic segments of patients affected by partial false lumen thrombosis appeared to expand more frequently during follow-up when compared to patients with complete thrombosis or a patent false lumen. The increased frequency of aortic expansion in case of a partially thrombosed false lumen may lead to an elevated risk of rupture and dissection, which could explain the increased mortality, as seen in the IRAD registry. In addition, a trend towards increased aortic expansion was observed as well for patients with hypertension, aortic aneurysm, tobacco history, larger initial aortic diameter and smoking, similarly correlated to increased aortic growth in patients with abdominal aortic aneurysm (AAA)[24-26]. Although careful follow-up may be warranted in all TB-AAD patients and additional data needs in order to validate some observations, those patients presenting with partial false lumen thrombosis might be beneficial from a prophylactic endovascular treatment.

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Ecocardiograma transesofágico: la utilidad real en el diagnóstico y tratamiento de la disección tipo B

Azqueta, M.

La ecocardiografía transesofágica (ETE) es una de las técnicas disponibles junto a la aortografía (angio), la tomografía axial computerizada (TAC) y la resonancia magnética (RM) para el estudio de la aorta. En general todas las técnicas, adecuadamente aplicadas e interpretadas, tienen una buena precisión diagnóstica, si bien demuestran superioridad, unas en relación a otras, en determinados aspectos (tabla I).

Una de las limitaciones de la ETE es la imposibilidad de explorar la aorta en toda su extensión, más allá del nivel gástrico; asimismo las ramas arteriales y las estructuras para-aórticas no son visualizadas adecuadamente. Por el contrario la información endoluminal es excelente, punto de especial relevancia en los casos de disección aórtica, permitiendo visualizar la puerta de entrada, el tamaño, la situación en relación al origen de la arteria subclavia izquierda (ASI) (figura 1) y la presencia de re-entradas a lo largo de la aorta torácica descendente. Además proporciona una exacta identificación de la falsa luz y la situación hemodinámica de la misma con la ayuda del Doppler y la administración de ecocontraste. La presencia de una puerta de entrada de grandes dimensiones junto a una falsa luz sin las reentradas distales suficientes para reconducir el flujo sanguineo a la luz verdadera, provoca una

	ETE	TAC	RM	ANGIO
Extensión	+	+++	+++	+++
Puerta entrada	+++	+	+++	++
Puntos domunicación	+++	+	++	+
Trombosis FL	+++	+++	+++	-
Afectación de los TSA	+	+++	+++	+++
Afectación ramas abdominales	+	+++	+++	+++
Disponibilidad (quiróf.)	+++	-	-	+++
Accesibilidad del eje aorta/femoral	-	+++	+++	+++

TABLE 1.

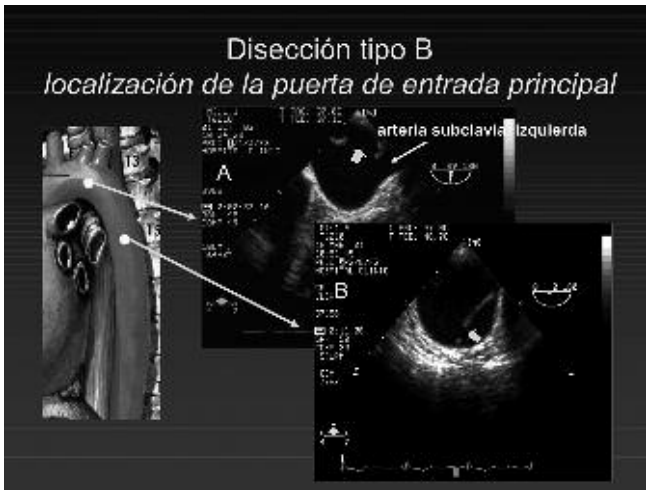

Fig. 1. *A – la forma mas frecuente es una puerta de entrada principal junto al origen de la arteria subclavia izquierda, lo que condiciona una zona de anclaje proximal más corta y en ocasiones la necesidad de proteger previamente parte de los troncos supraaórticos.*
B – puerta de entrada mas distal.

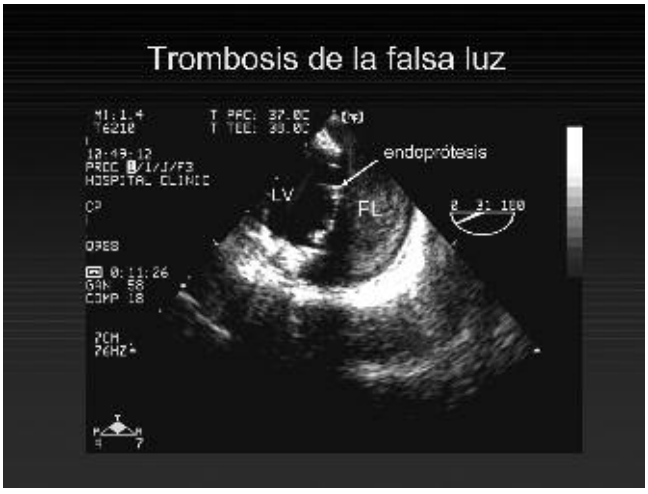

Fig. 2. *Plano transversal de la aorta torácica descendente con una endoprótesis desplegada adecuadamente (flecha) y en la parte derecha la falsa luz (FL) trombosada. LV, luz verdadera.*

alta presurización de la falsa luz y un mayor riesgo de dilatación y rotura en el seguimiento.

Otra de las ventajas del ETE es su disponibilidad en quirófano y por tanto, junto al equipo de radiología, permite contribuir a la monitorización del proceso de implante de las endoprótesis y cuya finalidad es :

conseguir el cierre de la puerta de entrada y redireccionar el flujo a la luz verdadera despresurizar la falsa luz y así mejorar la perfusión de las ramas producir la trombosis de la falsa luz y el remodelado posterior del vaso y prevenir la dilatación aórtica y la rotura posterior.

La identificación de la falsa luz durante el proceso del implante es de vital importancia para la correcta posición de la endoprótesis y su posterior despliegue. Los criterios que permiten diferenciar la verdadera de la falsa luz son :
la falsa luz es mayor que la verdadera, excepto en el inicio de la disección.

el flujo en la falsa luz es en general más lento que el de la verdadera.

la luz verdadera se expande en sístole (con un retraso debido a la distancia de la aorta torácica respecto al corazón). En los casos de una disección crónica, con un colgajo ya muy engrosado y rígido, estos cambios pueden desaparecer.

La ETE permite de forma inmediata valorar el éxito del sellado de la falsa luz al detectar un proceso de trombosis en su interior a lo largo de toda la extensión de la endoprótesis (figura 2). En general la trombosis es sólo parcial a nivel de la aorta abdominal que mantiene un cierto flujo por las re-entradas distales.

En resumen, la monitorización permite evaluar los siguientes pasos :
posición adecuada de la guía posición adecuada de la endoprótesis en relación a la puerta de entrada desplegamiento completo

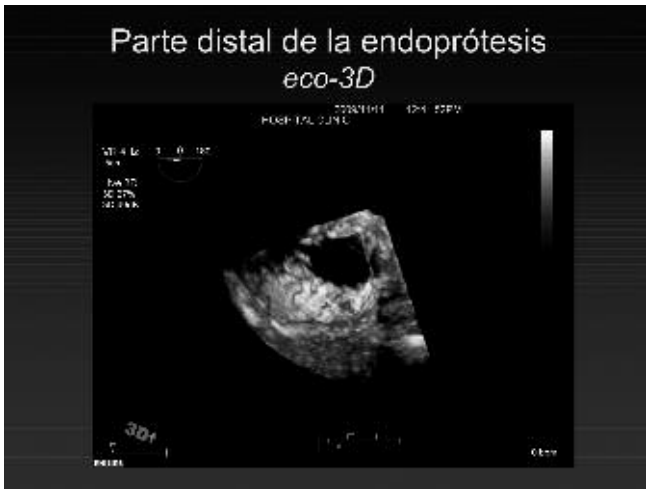

Fig. 3. Imagen tridimensional de la parte distal de una endoprótesis.

de la endoprótesis ausencia de migración de la endoprótesis confirmar la trombosis de la falsa luz y detección de posibles "leaks".

A diferencia de la imagen que proporciona la radiología la ETE no aporta una visión completa, global, de la endoprótesis en el espacio; se trata de planos tomográficos con una precisa información de la estructuras analizadas pero sólo en el plano del corte, no de lo que ocurre fuera del mismo. Esta limitación aplica tanto a la visualización completa de las guías, como de de la propia estructura de la endoprótesis. Para obviar en parte este problema se deben combinar constantemente planos ortogonales, lo que mejora la información al disponer de corte longitudinales de la estructura aórtica. La introducción de la técnica en 3D parece que permitirá en el futuro, una vez superadas la limitaciones actuales en relación a su baja resolución, suplir las limitaciones antes comentadas de la técnica 2D (figura nº 3).

En resumen: la ETE permite un adecuado diagnóstico de la disección tipo B y es un eficaz complemento de la radiología en la monitorización de los implantes de las endoprótesis en la aorta torácica.

Ascending aorta-endografting: the next frontier for type A Stanford dissection and beyond

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Introduction

Endovascular techniques have revolutionized the treatment of pathology affecting the descending thoracic aorta (TEVR), with demonstrable reduction in both mortality and morbidity in conditions with diverse pathologies. It may be argued that endovascular repair of the thoracic aorta is now the first line therapy for complicated acute Type B dissections, descending thoracic aneurysms and thoracic transactions.

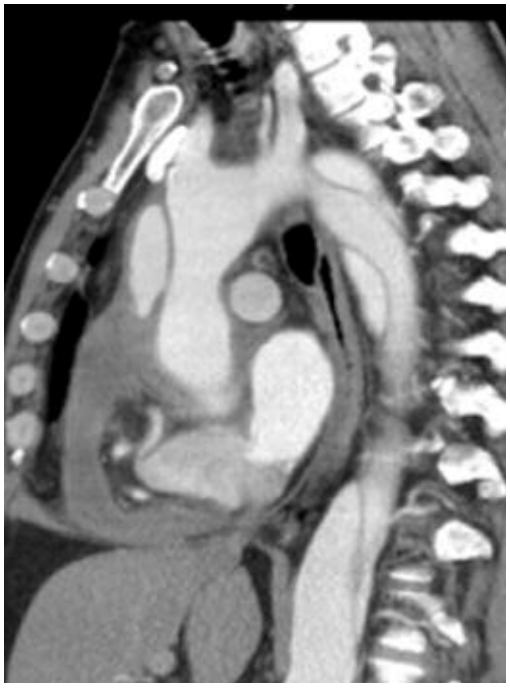

Fig. 1. Acute Type A Stanford Dissection extending into the descending thoracic aorta.

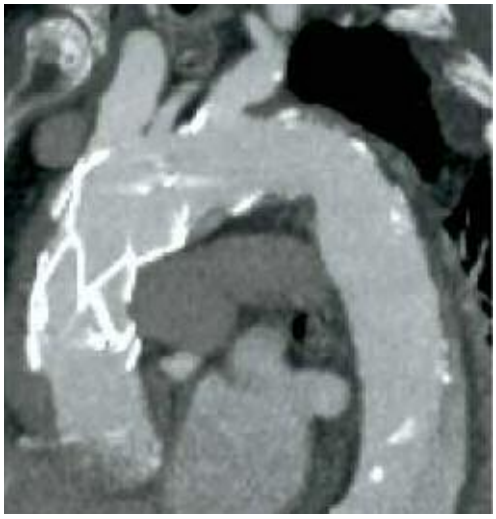

Fig. 2. Successful deployment of an ascending thoracic stent graft.

With the success of TEVR, new applications have been sought for this technology. One area of potential interest is the ascending aorta. Several pathologies may be candidates for endovascular treatment including isolated ascending aortic aneurysms, cannulation site false aneurysms and some Type A dissections. Around two thirds of all dissections affect the ascending aorta (Figure 1).

Challenges of the Ascending Aorta

The anatomical and physiological challenges to endovascular therapy of the ascending aorta remain formidable and include:

- Proximal fixation close to the aortic valve and coronary ostia
- Distal fixation which may impinge on the innominate artery
- Curvature of the distal ascending aorta

Sizing discrepancies in pathological conditions

- Haemodynamic forces in this arterial segment
- Potential for fatal retrograde dissection

Despite these difficulties, endovascular development may offer a therapeutic modality for cases of surgically untreatable Type A dissection (Figure 2). Selective studies have demonstrated that up to 30% of patients with Type A dissection are unable to undergo surgical treatment[1,2]. The mortality in these cases is high at around 1% per hour or 80% in all. Endovascular therapy may be a possible alternative. Furthermore, the mortality from open surgery for type A dissections is high in most centres, with most published series demonstrating a perioperative mortality of over 20%. Approximately 50% of Type A dissections occur 2cm or more distal to the coronary ostia and these patients might derive some benefit from coverage of the primary entry tear.

A number of case reports have demonstrated the feasibility of type A dissection endovascular repair, some of which have incorporated simultaneous stenting of the coronary ostia [3,4,5]. Currently the evidence is limited to small case series with limited long term follow up. The extension of endovascular techniques in to the ascending aorta is now a reality but demands design modifications to existing devices. In the last year a graft has been developed (Cook Medical) for compassionate use in the ascending aorta. The nitinol based stent graft has features

specifically designed for use in this challenging anatomy:

A delivery system capable of delivering the stent to the ascending aorta from a femoral route. This is a hydrophilic coated 100cm flexor system (16-20 French).
A soft flexible tip capable of atraumatic entry to the left ventricle
Stable delivery with accurate placement
Length and diameter compatible with the ascending aorta. The stent graft is available in diameters from 28-46mm diameter and is 85mm long (covered component 65mm with a bare proximal and distal stent).

The design and applicability of this device will be demonstrated. It should be reiterated that this device is not currently approved for commercial use.

Summary

Currently intervention rates for acute type A Stanford dissection are too low, and conservative management confers extremely high mortality rates. Open surgery, while feasible in over two thirds of cases, has a peri-operative mortality of over 20%. We now have proof of concept with regard to endovascular repair and a stent graft specifically designed for purpose. It could be argued that an endovascular approach can only improve current results for type A repair but careful audit and follow up will be required as the technique is developed.

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Endovascular solutions for the residual false lumen (FL) beyond the distal edge of the stent-graft

Criado, F.

The fate of the FL after stent-graft intervention for aortic dissection is a major point of concern, and a highly controversial and debatable issue. It relates of course to the treatment of patients presenting with type IIIb aortic dissection where the dissection process extends well below the diaphragm, and often down into the iliac arteries.

The discussion in this area will be impacted by a number of important issues, such as

Indications for stent-graft intervention in aortic dissection, acute vs, chronic;

Extent of stent-graft coverage/relining of the true lumen (TL);

Significance and morbid potential of continuing flow in the FL beyond the lower edge of the stent-graft repair in the chest;

Possible indications for the PETTICOAT-type repair as an effort to obliterate the FL well beyond the stent-graft repair in the chest;

Adjunctive maneuvers to obliterate the FL such as plugs, coils/glue, and stent-grafts;

Data on long-term outcome when the distal FL remains patent.

Limitations of current endografts for type B dissection treatment. How far are we from the ideal endograft?

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The objectives for stent-grafting of degenerative aneurysms are clear-cut (exclusion of the aneurismal sac from the circulation, depressurization of the sac, prevention of rupture) and the stent-grafts have been specifically designed for these purposes. On the other hand, the goals of stent-grafting for the treatment of dissections are less definite and specific and devices are generally used off-label.

The primary goal in the treatment of type B dissections is to close the proximal entry tear. Any commercially available stent-graft could be used for this purpose, however there are some specific concerns that should be considered for the choice of the device:
1) retrograde dissection: this potentially fatal complication could be more common with the use of proximal bare stents, hooks/barbs, high radial force devices, excessively oversized (> 10%) devices
2) rupture of the intimal lamella at the distal end of the stent graft producing a new entry tear: this may be due to the significant diameter difference between the proximal landing zone in the undiseased aorta and the true lumen where the stent-graft lands distally. This problem may be addressed with tapered stent-grafts or using a smaller stent-graft placed distally to protect the intima-media layers that for the wall of the true lumen of the dissected aorta before placing the proximal stent-graft that will cover the intimal tear.

Other goals may include:
1) closure of additional entry tears: these may be treated with supplementary stent grafts or in selected cases with plugs or cardiac septal closure devices that come from different manufacturers. Diagnosis of these tears is crucial; trans-oesophageal ultrasonography is our preferred diagnostic tool.

The decision to treat additional distal tears in the thoraco-abdominal aorta should be weighted against a possible increase risk of spinal cord ischemia.

2) treatment of collapsed aortic true lumen: if the true lumen is still collapsed after placement of the proximal stent graft in the aorta, specific aortic stents that may be safely positioned also over the origin of the aortic branches may be used.

3) treatment of end-organ malperfusion: single malperfused branches may be treated with stents to address the different potential causes of malperfusion.

4) proximal perfusion of the false-lumen from the left subclavian artery: may be observed from either collaterals or from a carotid-subclavian by-pass if this is performed. It may be addressed percutaneously with plugs.

Aortic remodelling and even healing has been observed especially with early treatment of acute dissections however in many cases, while the stent-grafts eliminates the proximal perfusion of the false lumen that undergoes thrombosis in the thoracic portion, the distal thoraco-abdominal and abdominal portions of the false lumen are often still perfused from secondary smaller tears located at these levels. Expansion of the true lumen and shrinkage of the false lumen are desirable results, however, stability over time of the overall aortic diameter with good organs and limbs perfusion are also considered satisfactory outcomes.

Computational analysis of flow dynamics in type B dissection management and prognosis

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Computational technology provides a powerful tool to probe the biomechanical behavior of arteries and other components of the cardiovascular system. It combines synergistically with medical imaging technologies to provide information that is otherwise difficult (or impossible) to get, and it enables us to study how mechanical forces may induce arterial disease, helps in designing better vascular devices, and may one day be routinely used for therapeutic planning.

In this paper we report a new imaging based tool for the hemodynamic analysis of the vascular system, particularly focused on

aortic dissection and the evaluation of the thoracic endovascular aortic repair (TEVAR). This novel method is based on the CFD technology combined with dynamic and functional MRI.

Methods

- Image acquisition: MRI protocol

Using a 1.5 T MR scanner with ECG-synchronization, a routine contrast enhanced T1-Full Field Echo sequence is performed on sagittal-oblique planes, parallel to the aortic arch. Multi-Slice 2D MR Cine Imaging (b-SSFP), using the same orientation of the angio-MR, is also performed. Usually 30 slices (600 cine images), acquired in 6 apneas, are sufficient to cover the whole aortic geometry. 2D Phase-Contrast (PC) sequences, orthogonal to the vessel's axis, provided the velocity inlet profiles at the ascending, descending aorta and supra-aortic vessels.

- Image data processing

Static geometry extraction is performed with a 3D Level Set algorithm (Matlab 7.6, the MathWorks, Inc). A "native" computational grid is obtained by the discretization of this geometry (Amira 4.1, TGS, Mercury Computer Systems, USA). Wall movements are imposed to the "native" grid according to the cine acquisitions (b-SSFP), by means of a "non linear transformation field" in-house algorithm (Matlab 7.6, the MathWorks, Inc). The flow simulations are performed using the finite volume (FV) method, as implemented in the AVBP 6.0 Navier-Stokes solver (CERFACS, Toulouse, FR).

- CFD features

Blood is assumed to be a homogeneous newtonian fluid with a dynamic viscosity approximated as 4 cPoi and a density of 1050 kg/m3.The FV method used in the code solves the full Navier–Stokes equation, governing the flow, by an efficient explicit Algebraic Lagrangian Eulerian (ALE) formulation, which allows to impose the tetrahedral moving grid within the cardiac cycles (uncoupled). The CFD application provide anatomical images which are plotted as virtual 4D models by a CFD and numerical simulation visualization freeware software (Paraview Kitware Inc., USA). This uses a quantitative color-coded scale to represent the results of the analysis of the blood flow components; velocity (cm/sec), vorticity (s-1) and pressure gradients (mmHg) as well as the parameters relative to the aortic wall; compliance and wall shear stress (Pa).

Results & Discussion

Currently, there is no validated technique available for quantifying the individual risk of rupture for a TAA or a dissection. The decision to electively repair a thoracic aortic disease is widely based on the "maximum diameter criterion"; i.e., when the aneurysm reaches a certain size (typically 6 or 6.5 cm), it is thought that the risk of rupture warrants its repair. However, this criterion is only a general rule-of-thumb and is unreliable. Actually, the 'simplified' Law of Laplace (with only axial diameter) cannot explain why different patients initially presenting with equivalent maximum diameters, have different rates of diameter progression afterwards.

While it is generally accepted that hemodynamics plays a major role in the initiation, acute propagation, and chronic development of dissections, nevertheless, the exact mechanism of formation and development of dissections is yet not well understood. Moreover, there is considerable uncertainty about the critical diameter of rupture of the false lumen and how to treat false lumen aneurysms. For all above-mentioned reasons, there is a certain need for the development of new methods capable of providing reliable quantitative prediction of the risk of rupture of dissections on a patient-specific basis in contrary to the currently adopted "one-criterion-fits-all" approach.

In the literature, the use of CFD for simulating the in-vivo behavior of vascular structures has been reported for the abdominal and thoracic aorta evaluation, derived from

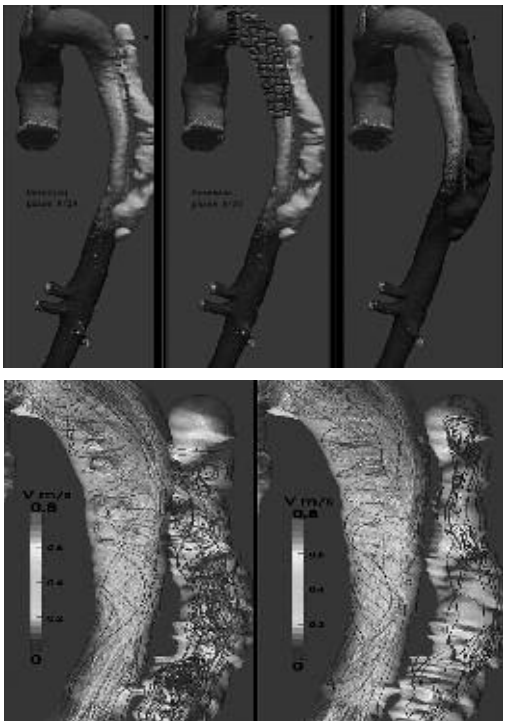

Fig. 1. *Example of an imaging based method for planning the endovascular management of a type dissection: In this case we simulate the use of a stent-graft (panel A/2) to cover the proximal entry tears. Quantitative and dynamic evaluation of wall shear stress, flow rates, and vorticity (panel D/E) is obtained in order to apply objective diagnostic and therapeutic criteria.*

CT scan or MRI. All these investigations, though, apply the numerical computation method in steady state conditions within simplified models, mainly because of the lack of reproducibility of the in-vivo dynamic conditions related to the aortic wall displacement over the cardiac cycle.

Modern equipment and imaging techniques based on the intrinsic sensitivity of MRI to flow and motion offer the possibility of acquiring spatially registered functional information simultaneously with morphological data within a single study. Characterizing the dynamic components of blood flow and cardiovascular function can provide insights into normal and pathological physiology, and considerable progress in this field has been made in recent years.

The objective of this paper is to demonstrate that CFD results provide a reliable technique for the qualitative and quantitative assessment and visualization of blood flow in the aorta. Different applications of this functional information can be useful for the therapeutic decision making for dissections as well as the selection and follow up of stent grafts.

Our multidisciplinary team has developed a dedicated method to build, based on dynamic and functional MR examinations, patient-specific geometric data and boundary conditions for unsteady CFD runs with variable meshes valid over the cardiac cycles, and has finally created color coded 4D-CFD virtual models for each patient. To our knowledge, our project is the first to apply the CFD to in-vivo images derived from a dynamic study of the thoracic aorta. After in vitro validation, the method has been tested for the evaluation of different diseases (aneurysms, dissections, PU and IMH) before and after TEVAR implantation.

As a whole, quantitative evaluation strategies to assess flow rates, wall shear stress and vorticity is obtained in order to develop and apply objective diagnostic criteria for the description of vascular pathologies. Computational technology enables us to simulate and quantify this biomechanical environment in otherwise inaccessible locations. Such techniques, in conjunction with appropriately designed experiments, are helping us better understand the links between biomechanics and arterial diseases. Furthermore, the post processing virtual 4D modeling represent theoretically an important purpose for future investigations on the aortic dissection, in order to develop an imaging based method for planning the interventional strategies (use of stent-grafts to cover the entry tears, creation of fenestrations of the intimal flaps) that are actually being performed on empirical basis. Finally, computing, in conjunction with suitable experimental data, can be important by helping us understand the complex relationship between biomechanics and device failure and by aiding in design of better devices while shortening design cycle time.

Pulsatile displacement forces acting on thoracic aortic endografts

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Endovascular treatment for thoracic aortic disease has developed significantly in the last 15 years. The pioneering work of Dake and colleagues[1] began in the mid-90s; now, tens of thousands of procedures are performed yearly in the US alone. Thoracic aneurysms and aortic dissections constitute the majority of clinical cases. Although the short- and midterm outcomes of endovascular procedures have been favorable compared to open surgical repair, the risks of aneurysm enlargement, endoleaks, endograft collapse, and migration demand costly periodic screenings of the patient. Moreover, a number of investigators have expressed concern regarding the long-term durability and outcomes following thoracic endografting[2-5].

The unique anatomical and biomechanical environment of the thoracic aorta (i.e., large motion, highly pulsatile flow) poses significant challenges to the long-term success of endografts. A deeper understanding of the forces experienced by endografts in vivo is required to improve their perfor-

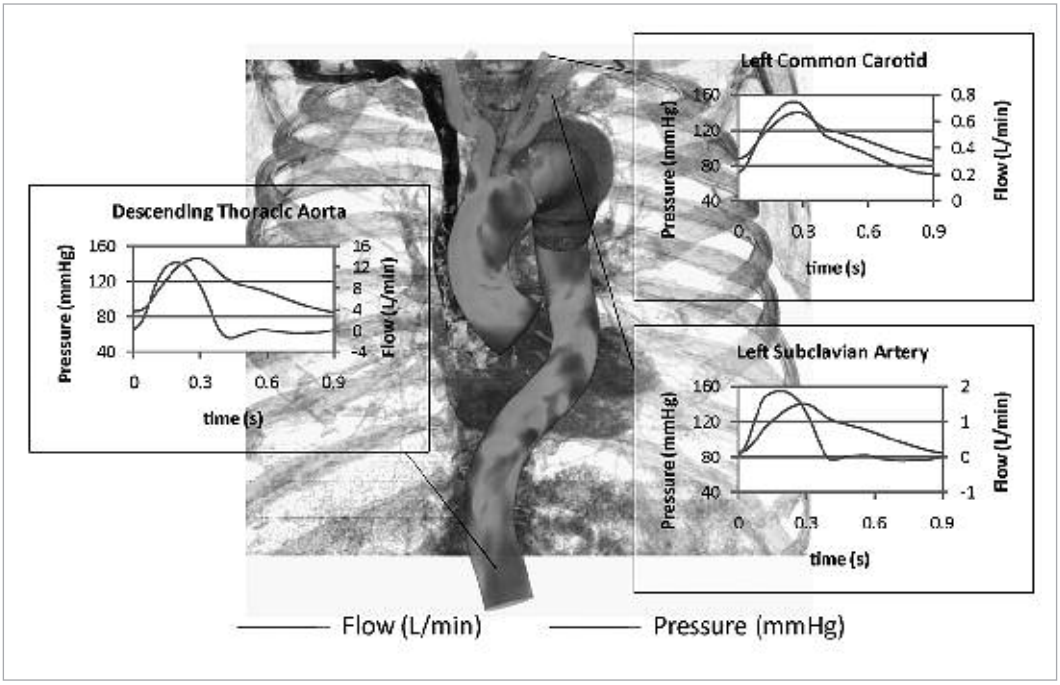

Fig. 2. Flow and pressure waveforms in selected vessels obtained in the CFD analysis of a proximal descending thoracic aortic aneurysm model.

mance and long-term durability. While the displacement force (DF) acting on aortic endografts has been assumed to be in the downward direction of blood flow, recent studies in the abdominal aorta have shown that sideways displacement of endografts in the aneurysm sac is a predictor of late adverse events[6,7]. In-vitro experimental studies[8, 9] as well as theoretical and computational studies[10] have been conducted to investigate the magnitude of loads acting on thoracic endografts, their resistance to dislodgment, as well as their stability and movement. However, in all cases, the studies failed to either reproduce the complex anatomical configuration of the aorta and endograft or the highly pulsatile blood flow, pressure, and wall dynamics of the thoracic aorta. The purpose of this investigation is to study the magnitude and direction of pulsatile displacement forces acting on realistic models of thoracic aortic endografts built from image data using computational fluid dynamics (CFD) techniques (see Figure 1)[11]. We investigate the impact that different factors, such as device location, size, elevated pressure and elevated flow have on the forces experienced by the endograft.

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Supraaortic debranching and endografting for aneurysms involving the arch. Tricks and tips

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Introduction

Stroke is a major source of concern after hybrid aortic arch repair. The aim of this study is to analyse the results of hybrid repair of aortic disease involving the arch and incidence of stroke to possibly identify strategies to avoid this devastating complication.

Methods

In the last decade, 361 patients received TEVAR at our Institution; in 131 cases the

aortic arch was involved (112 degenerative aneurysms, 19 dissections). "Zone 0" patients (29) received supra-aortic arteries de-branching through sternotomy, including the left subclavian artery (LSA) in 3 cases. "Zone 1" patients (30) received extra-anatomic revascularization of the left common carotid artery and the LSA in 7 cases. In "Zone 2" patients (72) the LSA was revascularized selectively in 59 cases. A one-stage procedure was performed in 124 cases and the LSA was ligated or occluded with a plug in 47 cases before stent-graft (SG) deployment.

Results
Initial clinical success, mortality and spinal cord ischemia in TEVAR patients with or without arch involvement were respectively: 87.8% vs. 93.1%, 4.6% vs. 2.7% and 1.5% vs. 3.7%. Patients with arch involvement had a stroke rate of 3.1% vs. 1.1% in patients without (P=NS). The stroke rate was 10.3% (P<0.02) in "Zone 0", 0% in "Zone 1", and 1.4% in "Zone 2". Three strokes were cerebellar and one hemispheric, all fatal and associated with multi-organ embolization. The scans showed severe atheroma and/or thrombus in the arch in all cases. Stroke was observed in patients with (3.4%) or without (2.7%) LSA revascularization, however it was never observed in patients in whom the LSA was occluded before SG deployment and in 4.7% of patients in whom it was patent at the time of SG deployment.

Conclusions
Stroke after TEVAR is not infrequent especially when the arch is involved. Its origin is mostly embolic and possibly related to endovascular manipulation. Better patient selection together with a strategy to reduce embolization such as occlusion of supra-aortic trunks before SG deployment may play a beneficial role.

Chimney techniques in the arch: simplest and safest

Criado, F.

Chimney grafts (stents) have emerged as a very useful and widely applicable adjunctive technique to preserve aortic arch branches during TEVAR.

The appeal of the technique relates to its availability and off-the-shelf nature, the fact that a percutaneous approach is often possible, and its apparent effectiveness and success in achieving the intended goal of preserving normal blood flow into one or more arch branches.

The chimney technique has long been considered as a bail-out or rescue approach – and this is appropriate. However, rapidly growing experience and reported results would appear to suggest that envisioning a larger role may be reasonable.

Total endovascular repair of the arch: branched endografting makes it easy

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UCLH Multi-disciplinary endovascular team University College Hospital, London.

Introduction

Traditionally, arch replacement has involved a median sternotomy or thoracotomy and graft implantation with or without an elephant trunk for descending thoracic aortic disease. Thoracic stent-graft placement after de-branching of the great vessels avoids cardio-pulmonary bypass, but a thoracotomy is often required and this still carries significant morbidity. A new device for total endovascular arch replacement has recently been introduced, a modification of the existing basic structure of the TX2 thoracic stent-graft (Cook Medical, Bloomington, In.).

Current state of open surgery

Since the first series of arch replacements in 1975[1] significant advances have been made in open aortic arch surgery. The introduction of profound hypothermic circulatory arrest (PHCA) and retrograde cerebral perfusion (RCP) improve operative morbidity and mortality with the best outcomes in those undergoing selective antegrade cerebral perfusion (SACP). Not surprisingly, those undergoing elective repair fare better than emergent cases and operative mortality and stroke rates of 2.7% and 5.4% can be achieved[2]. Using SACP, moderate HCA rather than PHCA may be used without increasing stroke rates, with benefit gained from less coagulopathy and blood loss[3]. Patients greater than 80 years, traditionally at highest risk, can be treated with safely with these techniques with a mortality rate reported of 4.5%[4].

More extensive aortic arch disease may require the use of an "elephant trunk" for dealing with the descending thoracic aorta as a staged procedure. Not completing the second stage has been a common problem noted in a number of large series and this raises the spectre of a larger single-stage open approach. This, however is associated with greater morbidity and mortality[5].

One solution to this problem has been the use of a frozen elephant trunk, which incorporates the use of a stent-graft placed retrograde into the descending thoracic aorta as a way of creating a single-stage procedure without further open surgical exposure, with short and long-term results are favourable when compared with standard elephant trunk procedures[6].

Current state of Endovascular Arch Surgery

Chimney grafts

Retrograde positioning of a chimney stent graft to preserve antegrade innominate artery flow is a relatively straightforward technique but a Type 1 endoleak may be created in the gutters around the chimney[7]. The long-term durability of this technique has not been established, and the interaction of different materials in this position creates some uncertainty. Chimney grafts

have therefore a role in emergent situations, but unpredictability limits its application in the elective setting.

In-situ fenestration

The use of in-situ fenestrations has been described for preservation of the left subclavian artery but can be used for establishing antegrade perfusion of the innominate and left subclavian arteries[8]. After temporary bypass to the arch vessels is performed the stent-graft covers the origins of these arch vessels; a retrograde perforation of the stent-graft is then performed. This fenestration is dilated until a further stent graft can be delivered[9]. A complete haemostatic seal can usually be achieved but again its durability in this hostile environment is yet to be determined. Refinements of this approach in the future may include the use of laser, which has been successfully used for left subclavian artery revascularisation[10].

Hybrid Repair

Hybrid aortic arch repair is well described and has good short and long term results[11]. This technique utilises a thoracic stent-graft with extra-anatomic bypass from the ascending aorta to maintain flow in the arch vessels avoiding the need for cardio-pulmonary bypass, though a thoracotomy and a reasonable length of good ascending aorta is still needed.

Branched arch device

Current configurations and technical notes

The current design of the branched arch device is based on a stent-graft delivered via the transfemoral route. This fully custom-made device (Cook Medical, Perth, Australia) incorporates two internalised sleeves for the innominate and left carotid branches with large funnel openings to facilitate retrograde cannulation (Fig 1a).

The graft is mounted on a pre-curved cannula (and pre-curved sheath), which conforms in a reliable fashion to the curvature of the arch. In addition the stent graft is mounted onto the cannula with a spiral trigger wire wound round the cannula, and as such the funnels are reliably delivered to the outer curvature of the arch facilitating orientation (Figs 1b).

Trigger wires secure "pro-form" alignment of the first two sealing stents into the curved portion of the ascending aorta. The portion of the graft containing the openings of the internalised sleeves (the funnels) is reduced in diameter which allows continued antegrade cerebral blood flow through the graft during deployment and prior to completion with the innominate and carotid branches. Diameter reducing ties attached to trigger wires are also a standard feature. Multiple gold markers outline the funnels. (Fig 1c).

A surgical conduit is placed to the right subclavian artery and a left carotid-subclavian bypass is performed. A radio-opaque tipped sheath marks the innominate artery origin. Once the stent-graft has been introduced via the transfemoral route its longitudinal position can be ascertained relative to the innominate artery, with the funnel gold markers fully proximal to the innominate orifice. The graft is then unsheathed under rapid overpacing to minimize aortic movement and reduce wind-socking. All trigger wires are then removed apart from the wire securing the distal stent graft. Both sleeves are retrogradely cannulated and a bridging stent graft is then positioned from the right subclavian conduit preserving the innominate artery bifurcation. The left carotid bridging stent graft is then brought in from the ipsilateral brachial artery. The origin of the left subclavian artery may be embolized from this access to prevent a Type 2 Endoleak.

Case Description

An 81 year old male patient presented with a 73mm saccular aneurysm of the arch associated with a hoarse voice. Severe respiratory disease precluded open arch replacement or debranching via a sternotomy. A bovine origin of the innominate and left carotid

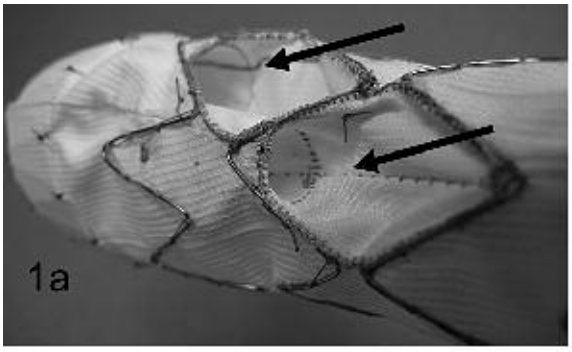
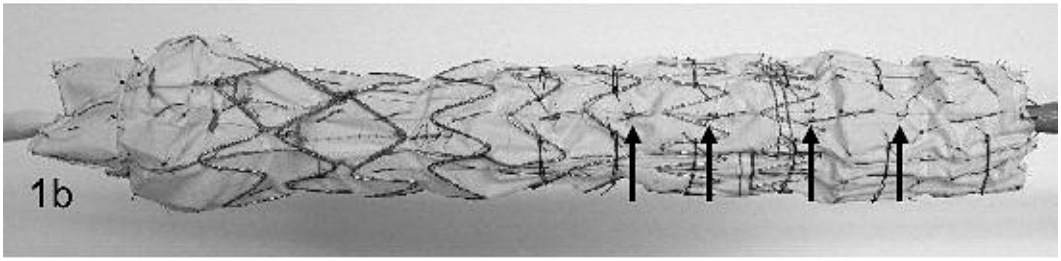
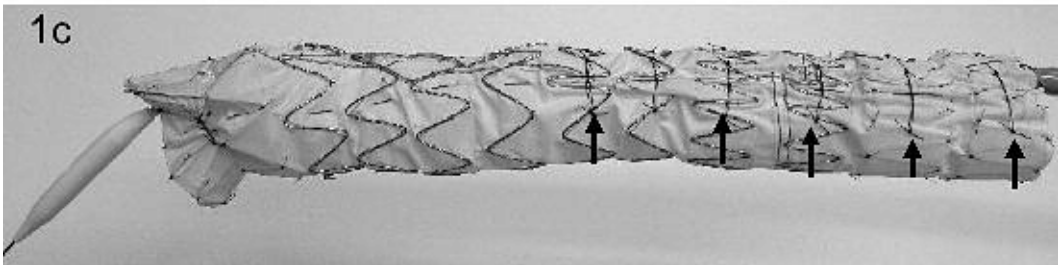
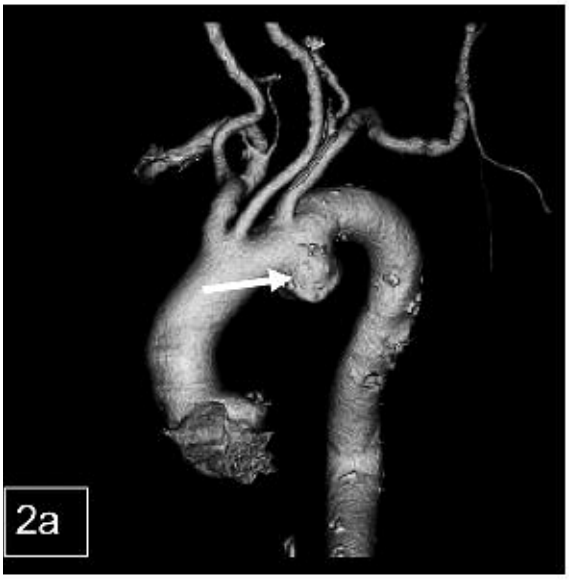


Fig. 1.
1a. External view of stent-graft showing funnel orifices and internalised sleeves (arrows).
1b. Trigger wire wound around the central cannula (arrows).
1c. Diameter reducing ties and the pre-curved cannula (arrows).







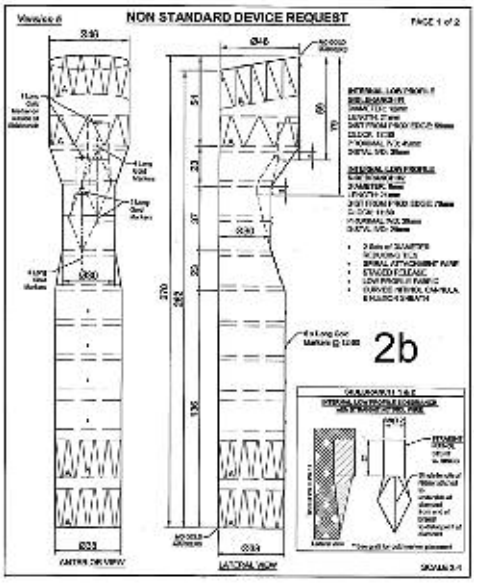


Fig. 2. 2a Pre operative surface shaded image of the aortic arch showing the saccular aneurysm (arrow) and bovine origin of innominate and left common carotid arteries
2b Cook Medical custom-made stent-graft plan.

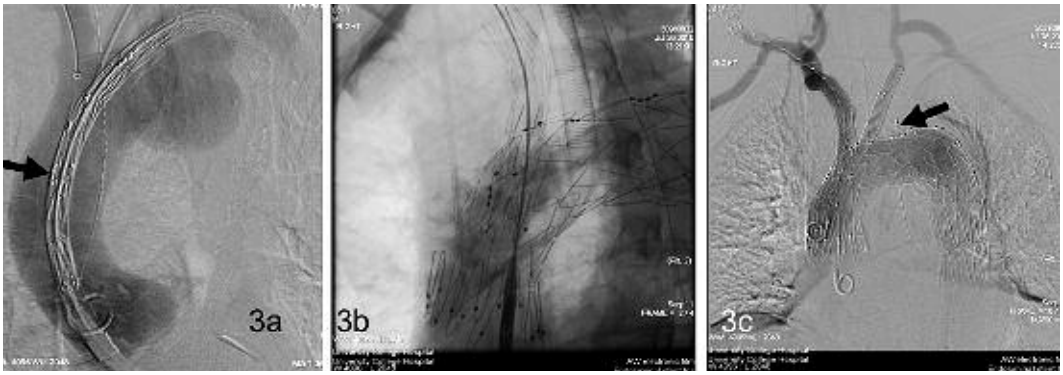


Fig. 2. *3a Angiogram demonstrating stent-graft ready to deploy; the sleeve markers are easily seen on the outer curve of the graft (arrow) 3b Main stent-graft deployed with innominate artery stent-graft in place 3c Completion angiogram demonstrating flow through both arch branches and exclusion of the aneurysm. The origin of the left subclavian artery has been embolised (arrow)*

arteries without an adequate seal distally precluded placement of a standard thoracic stent-graft (Fig 2a) and therefore a custom-made stent graft (Cook Medical, Perth, WA) incorporating the internalised sleeve design was used.

The stent-graft was constructed with two proximal sealing stents 46mm in diameter for an ascending aortic diameter of 41mm. Note in the graft plan that the peaks of the proximal 6 internal stainless steel stents align with the peaks of subsequent stent; this confers increased rigidity of this portion of the stent graft, and allows for a rigid rhomboidal configuration of the funnel orifices (Fig 2b).

The case was performed under general anaesthesia following the placement of a spinal drain and temporary pacing wires from the left femoral vein. A 10mm Dacron conduit to the right subclavian artery and an 8mm Dacron left carotid to left subclavian artery bypass graft were performed. Via a right femoral artery cutdown, a wire was advanced to the aortic arch and through the aortic valve into the left ventricle. This was exchanged for a pre-curved stiff wire which was coiled in the heart.

Over this stiff wire, the graft was advanced until the nose cone was just through the aortic valve, though remaining above the sino-tubular junction. The gold markers showing the funnel positions could be clearly seen (Fig 3a). A 30cm 6 French sheath was placed in the innominate artery via the right subclavian conduit and positioned to mark the orifice of the vessel.

The main stent-graft was deployed during rapid overpacing with the proximal trigger wire released and pro-form deployed. The proximal internal sleeve was then cannulated via the 6F sheath and a Zenith Flex aortic limb (Cook Medical, Perth, WA) was deployed preserving the innominate artery bifurcation (Fig 3b).

The second funnel was then cannulated from the left brachial artery and a 13.5mm Fluency (CR Bard Inc, Surrey, UK) stent-graft was deployed. The left sublavian artery was then cannulated and an Amplatz occluder (AGA Medical, Plymouth, Minn) was placed at its origin to prevent retrograde flow from the bypass into the aneurysm (Fig 3c).

Discussion

While there are clear advantages in avoiding a full thoracotomy or cardiac bypass, long-term performance is untested as only a handful of cases have been performed. Furthermore the device is limited to treatment of arch disease and significant pathologies in the ascending aorta (Ishimaru Zone 0) will require alternative approaches.

In the two-branch format, a left carotid-subclavian bypass is still required for preservation of the left vertebral artery though modifications are in progress for placement of a third left subclavian artery sleeve to overcome this though this clearly adds to the endovascular complexity of the case. Even with this modification, a surgical cut-down to the neck vessels is required for branch delivery.

One considered alternative is a minithoracotomy with trans-ventricular antegrade cannulation, pre-loaded wires, and antegrade delivery of the branch stent-grafts to the sleeves with potential reduction in stroke risk and cranial nerve injury.

This also permits snaring of a through wire for easier passage of the main stent-graft especially in the tortuous arch, and with highly accurate deployment. As further graft refinements are made and experience grows with the device, more meaning comparisons with current accepted treatments will be possible.

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Managing TEVAR complications and disasters: techniques and lessons learn

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Introduction

Endovascular repair of the thoracic aorta is not straightforward and there are many pitfalls for the unwary. This chapter discusses problems that can occur during thoracic endovascular aortic repair and ways to avoid and treat them. The neurological complications of stroke and paraplegia are dealt with in another chapter.

Imaging

Multislice CT scan is routinely used to image from the vertebral and carotid arteries cranially to the femoral arteries caudally, assessing the full length of the thoracic and abdominal aorta and the iliac arteries. Software programmes which perform 3D reconstruction of the aorta, including centre line of flow, are important in both diagnosing and planning endovascular treatment and in the follow up of patients (1,2). In dissection multiple aortic branches can be compromised by the false lumen, and identification of the primary entry tear is essential. Additional imaging techniques such as magnetic resonance imaging, digital subtraction angiography and intravascular ultrasound may help in identifying secondary entry tears. Multiple aneurysms can coexist synchronously especially when they are caused by infection and so imaging the entire aorta is important.

Imaging of the iliac and femoral vessels is mandatory as the large size of the sheaths (up to 24 French) require vessels to have a minimum diameter of 8mm. Diseased femoral arteries may require endarterectomy and patch angioplasty if a large stenotic plaque is disrupted by the device.

In elective patients a duplex examination of the carotid, vertebral and subclavian arteries should be performed if the arch vessels are to be deliberatedly covered. In the emergency situation this may not always be possible, and intraoperative angiography can be used to identify arterial disease. Reduction in flow of a dominant left vertebral artery may result in a posterior circulation stroke and the left subclavian may give rise to a coronary graft using the left internal mammary artery.

Access

Conduits are required in about 5-17% of patients, usually women (3). Diseased arteries with focal stenoses may require angioplasty prior to insertion of the device. Serial introduction of dilators with increasing diameters may open stenosed arteries and the small pliant arteries of adolescents sufficiently to allow passage of the device. Rupture of iliac arteries can occur when a large sheath is pushed forcibly through small calcified tortuous arteries usually associated with a sudden give. When the sheath is removed, the blood pressure usually falls precipitously as the patient exsanguinates. This can be controlled immediately by reinserting the sheath if the wire has not been removed. An occlusion balloon can also be placed above the site of injury and inflated to control haemorrhage. This can also be introduced into the infrarenal aorta using the contralateral femoral artery if wire position has been lost. The balloon requires a long sheath to hold it in position as the rising blood pressure will force it distally. The ruptured iliac artery can be treated by a covered stent, but this may not be possible if there has been complete transaction of the vessel. Open access via a retroperitoneal approach can be performed, the arteries oversewn and a polyester graft sutured in place. Occasionally the iliac arteries are so badly damaged that in situ reconstruction is not possible. Oversewing the proximal artery and revascularisation with a femorofemoral cross over graft may be the only option.

Devices

All current devices have idiosyncrasies with which the user must be familiar. Device related complications will increase if many types of device are used in a unit so that all interventionalists may not have completed their learning curve. Usually two different devices can cope with most thoracic pathology. Certain devices have a longitudinal support which has to be orientated correctly to the outer curve. Others require a bare proximal stent to safely deploy the device and prevent the stent turning back on itself. Some can be safely deployed proximal to the final landing position and moved distally, others can only be moved proximally. Hooks, barbs and anchors can also dictate which direction the device can safely be moved. Most devices are now held to the introducing system during deployment to allow accurate positioning. The release mechanism is different for each system and

familiarity with the technique is essential. Problems of release need an action plan before they occur. It is possible to impart energy to any device in very tortuous aortas by keeping tension on it which can generate enough force to move it substantially away from its intended position.

The devices are usually deployed with a stiff guide wire which takes the racing line in tortuous vessels. Deployment in the arch can be affected by the wire taking a position on the inner curvature. The device will tend to move distally on deployment if not held in position by the introducer. In a tortuous aorta the haemodymanic forces on the device will tend to force it to migrate to the outer wall of a large aneurysm. It is therefore very important to allow sufficient overlap of devices to prevent complete dislocation resulting in a type III endoleak. Serial follow up imaging is important to determine the position of the device within large aneurysms and to judge the degree of overlap of devices.

Positioning

Devices which cause complete aortic occlusion during deployment cause very high blood pressures forcing the device distally. Hypotensive agents can be used to reduce blood pressure, cardiac arrest with adenosine can be used but overpacing the heart is the most popular (4).

The use of a femoral to brachial wire can help straighten a tortuous aorta and can help position a device in the proximal aortic arch. A catheter should cover the brachial wire into the aortic lumen to prevent cheesewiring the origin of the vessel. The use of a right brachial wire may increase the risk of stroke in some patients.

Compliance

Thoracic devices were developed from prototypes used to treat the infrarenal aorta, and they cope well in straight parts of the aorta. This does not apply to the aortic arch where very few devices are able to cope with the inner curvature. The rigidity of some devices with excellent column strength ensures that they stand proud of the inner curvature. Haemodynamic forces cause device collapse resulting in aortic occlusion which can be fatal (5,6). Recently the Proform from Cook and the cTAG from Gore have been introduced to accommodate the curvature of the aortic arch.

Inadvertent occlusion of branch vessels:

Debranching the arch vessels using extra-anatomic grafts allows arch pathology to be treated but there is evidence that the risk of stroke increases with the number of vessels occluded (7,8) Occasionally this happens inadvertently and serious consequences may follow including stroke and paraplegia. These can be recognised immediately if the procedure is under regional anaesthesia but will be delayed by general anaesthesia. Reduction in cerebral blood flow may only become clinically apparent when balloon dilatation causes stenosis of an arch vessel. Decreasing levels of consciousness are associated with a reduction in blood pressure measured by an arterial line in the corresponding radial artery. Urgent revascularisation must be performed if the neurological deficit is to be reversed. Brachial access should be quickly performed either percutaneously with the aid of an ultrasound scan surgically. A wire and catheter is passed into the aortic arch and a stent applied across the origin of the vessel where it is compromised by the stent graft.

The right brachial artery can be used to open up the origin of the brachiocephalic artery, and the left brachial artery can be used to open the origin of the left subclavian artery and even the left common carotid artery in the presence of a carotid subclavian graft. This may be necessary if a coronary graft using the left internal mammary artery graft has been covered. Sternal wires are an important sign of previous coronary revascularisation.

Cardiac dysrhythmias may be caused by the guide wire passing through the aortic valve and entering the left ventricle. The wire should be pulled back through the aortic valve which cures the problem immediately.

Dissection
Too much oversizing of the device in patients with dissection can result in device collapse and in conversion of a type B into a type A dissection (9,10). This is a disaster which requires immediate surgical conversion to prevent death from the consequences of myocardial ischaemia, aortic valve dysfunction and cardiac tamponade. Balloon dilatation should also be avoided in acute dissections for similar reasons. Devices with bare stents or with hooks and barbs should probably be avoided in dissection.

Inadvertent stenting from the true into the false lumen can occur with complex dissections with numerous lumens and may have serious consequences. If there is any doubt about the position of the wire it should be removed and catheter angiography performed to confirm its position in the true lumen. If it is in the false lumen it should be withdrawn and re-advanced. Intravascular ultrasound is invaluable but is not widely available. Similarly transoesophageal ECHO can be used to confirm wire position.
The TXD device is a bare stent which can open the distal lumen and compromised branches in acute dissection but needs a randomised clinical trial to prove its efficacy. (11) However we have had one death associated with use of this device. The primary entry tear covered with a device sized to the proximal un-dissected aorta and a TXD was deployed which successfully revascularised the visceral and renal vessels. The TXD excluded the false lumen in the distal thoracic aorta, but remodelling of the true lumen at the lower end of the covered device allowed continued perfusion of the false lumen. The patient died at 48 hours and post mortem confirmed rupture of the false lumen opposite the entry tear.

Embolisation
Patients with a large amount of free floating thrombus in the aorta are at risk of massive embolisation. This may cause ischaemia of the spinal cord, bowels and limbs. Emergency open embolectomy can be performed of the mesenteric vessels and those to the limbs, but paraplegia is usually irreversible. If massive it is usually fatal but small emboli can respond to infusions of vasodilators such as iloprost.

Stent outside a stent
This occurs when guidewire position has been lost after deployment of a proximal device. The wire is repositioned outside the existing device and in a large aneurysm a second device will pass easily alongside the first and can be maldeployed outside the proximal device. The wire should be withdrawn and reinserted within the proximal stent where its correct position can be confirmed by angiography. A second device can then be deployed crushing the maldeployed stent into the aneurysm sac.

Summary
Endovascular repair of the thoracic aorta is not without risk. Some problems can be anticipated and avoided while others may require emergency correction by either endovascular or open surgical techniques. Good imaging, planning and familiarity with the endovascular device are important in reducing complications.

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Spinal cord anatomy imaging. Is it useful for thoraco-abdominal aneurysm repair?

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Despite the different advances and an improved understanding of Spinal cord (SC) anatomy and pathogenesis of SC ischemia, debilitating postoperative paraparesis or paraplegia rate are still not negligible after open and endovascular procedure for thoracic or thoracoabdominal pathology treatment.

Single study have demonstrated the role of different anatomical variables in the pathogenesis of SCI, most of them related to SC vascular supply.

Knowledge of the spinal cord (SC) vascular supply is important in patients undergoing procedures that involve the thoracic and thoraco-abdominal aorta. However, the SC vasculature has a complex anatomy, and teaching is often based only on anatomical sketches with highly variable accuracy; historically, this has required a "leap of faith" on the part of aortic surgeons.

Fortunately, this "leap of faith" is no longer necessary given recent breakthroughs in imaging technologies and post-processing software. Imaging methods have expanded the non-invasive diagnostic ability to determine a patient's spinal cord vascular pattern, particularly in detecting the presence and location of the artery of Adamkiewicz.

CT is the imaging modality of choice for most patients with thoracic and thoraco-abdominal aortic disease, proving especially useful in the determination of feasibility and planning of endovascular treatment: thus the data set required for our analysis of spinal cord vascular anatomy is already available. We have concentrated our efforts on CT angiography, which offers particularly excellent imaging capabilities with state-of-the-art multidetector scanners.

Knowledge of the principal anatomical features of the SC blood supply of individual patients undergoing open or endovascular thoraco-abdominal procedures has several potential benefits.

For open surgery, analysis of the SC vasculature could tell us the aortic region that feeds the Adamkiewicz artery and thus needs to be reimplanted. For endovascular procedures, we can determine whether the stent graft will cover the Adamkiewicz artery, thus avoiding unnecessary coverage. CT data can also be used to stratify risk of spinal cord ischemia and guide the selective use of spinal cord injury prevention strategies.

Treatment of neurological complications in thoracic stent grafting

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Introduction

Endovascular repair is now considered to be the first option to treat many thoracic aortic pathologies in spite of limited evidence for its use[1,2]. There are no randomised controlled trials comparing endovascular with open surgery for thoracic aortic intervention. The current evidence base is from registries and large cohort studies which show reduced mortality and morbidity rates when compared to conventional open surgical repair[3,4]. Endovascular thoracic repair is associated with neurological complications such as stroke and paraplegia each affecting up to 10% of patients[5-11]. This chapter looks at the treatment of patients with stroke and paraplegia during endovascular thoracic aortic procedures.

Treatment of stroke

Stroke is a devastating complication of thoracic endovascular aortic repair and is the major cause of death from endovascular thoracic aortic repair in our experience. All the strokes are due to infarction and none are secondary to cerebral haemorrhage. Excessive drainage of cerebrospinal fluid used to treat paraplegia after thoracic endovascular repair can cause subdural haemorrhage so care must be taken not to drain more than 20-30ml of CSF per hour. The first manifestation of an intraoperative stroke is a sudden unexplained increase in blood pressure which is the body's physiological response to an ischaemic cerebral insult. Magnetic resonance diffusion-weighted and CT perfusion imaging can identify the ischaemic penumbra, which is an area of reversible ischaemia surrounding the cerebral infarct[12,13]. Acute neurological degeneration describes the increase in the size of the cerebral infarction due to the non-viability of the penumbra[14]. Clearly elevation of blood pressure is a useful response to cerebral ischaemia which helps to perfuse the penumbra and therefore it should not be treated aggressively with hypotensive medication. Early revascularisation of this area may help to reduce the size of the infarct and reduce the neurological deficit.

Cerebral angiography may not show any deficit in the cerebral circulation in which case treatment can only be supportive. This includes tight control of the blood glucose, prophylaxis for thromboembolic events with compression stockings and low molecular weight heparin, hydration with intravenous fluids, nutrition via a fine bore nasogastric feeding tube and urinary catheterisation to monitor the urine output. Early assessment of the neurological deficit and appropriate treatment includes physiotherapy, speech therapy, occupational therapy, psychology and psychiatry.

However if the cerebral angiogram shows occlusion of the middle cerebral artery then new techniques are available to revascularise the ischaemic penumbra in the acute scenario. Chemical thrombectomy can be achieved with either intravenous (iv) or

catheter-directed recombinant tissue plasminogen activator (tPA)[15, 16]. In the PROACT II trial complete flow in the middle cerebral artery was restored in 66% of patients[17]. However in the perioperative situation thrombolysis increases the risk of bleeding from the surgical wounds. New devices are approved which mechanically remove thrombus and restore arterial patency which require full heparinsation. These include the Merci retriever, which acts like a corkscrew to remove thrombus, and the Penumbra aspiration catheter where a proximal olive is used to physically draw the thrombus back into a catheter which has continuous negative pressure to aspirate the debris. Both of these techniques can restore vessel patency in up to 80% of patients[18,19]. However these devices can only be used for the middle cerebral artery, so catheter directed thrombolysis may need to be used in conjunction with these techniques to open smaller distal arteries. Some encouraging case reports of immediate treatment of embolic stroke have shown excellent clinical improvement. However, larger studies have shown that although arterial patency can be restored the clinical results have been disappointing. This may be related to the length of time taken to revascularise the ischaemic tissue. The necessary neuroradiological expertise required to perform these highly skilled procedures may not be immediately available on site.

If the patient has had deliberate occlusion of the left subclavian artery by the device with no revascularisation procedure, then consideration can be given to performing an urgent carotid subclavian bypass if the patient has a stroke. In our series the highest incidence of stroke was in patients who had this clinical scenario. Prevention is much better than cure and we now have a very low threshold for performing prophylactic carotid subclavian bypass in patients who have planned occlusion of the left subclavian artery by the device. Clearly right to left carotid carotid bypass should be performed with deliberate occlusion of the origin of the left common carotid artery. Likewise, revascularisation from the ascending aorta is necessary if all of the arch vessels are deliberately covered. Prophylactic carotid endarterectomy can be performed if there are bilateral severe carotid stenoses, but there is no evidence to support this course of action.

Survivors of stroke frequently have long term disabilities which require extensive inpatient rehabilitation and continued long-term support when they return home.

Treatment of paraplegia

The incidence of spinal cord ischaemia during thoracic endovascular repair is reported to range from 0-10% with a figure of around 5% for larger series[10,11, 20-25]. In patients with aneurysms, the Gore Tag pivotal trial reported an incidence of 3% in a series of 139 patients and the clinical trial for the TX2 device showed an overall incidence of 6%[5,6]. Others have demonstrated an incidence of 4% in a series of 326 with mixed pathology and in the EUROSTAR Registry the incidence was 2.5% and was increased four-fold with coverage of the left subclavian artery[7,21].

Co-existing infra-renal pathology or a previous aortic repair may reduce a substantial proportion of the collateral network supplying the spinal cord and increases the risk of paraplegia with thoracic endovascular repair. The contribution of the internal iliac artery to the distal spinal cord may be important and angioplasty of ostial stenoses may permanently reverse paraplegia[25]. Longer endoluminal devices occlude more intercostal arteries and have been shown to be associated with an increased incidence of paraplegia[26,27].

It is very important that a CSF drain is inserted immediately when the diagnosis of paraplegia is made. No delay should occur for imaging to try to confirm the diagnosis as this inevitably increases the duration of ischaemia to the spinal cord and may convert a potentially reversible deficit into a permanent one. The beneficial effect of reducing CSF pressure far outweighs the uncertainty of the underlying pathology. The

CSF drain should be kept at 12 cm of water/saline above the spinal column and no more than 20-30 ml of CSF should be drained per hour as the risk of subdural haemorrhage increases with excessive drainage. The drain should be clamped if this volume is exceeded and released the next hour. If the neurological deficit is not reversed with this protocol the systemic pressure can be elevated and the CSF pressure reduced to 10cm of saline. There is no clinical benefit in reducing the CSF pressure below this level. The drain is kept in for 3 days after which it is clamped for four hours. If the neurological deficit continues to be reversed at this time the drain is removed. Recurrence of paraplegia on clamping suggests that the perfusion of the cord is inadequate. Angioplasty of any stenosis of the internal iliac or subclavian arteries should be undertaken and carotid subclavian bypass can be performed if the left subclavian is deliberately covered without revascularisation. Failure of the spinal drain to reverse paraplegia despite adequate systemic blood pressure suggests that the drain is not therapeutic and it should be removed to avoid complications such as infection and dural fistula.

Permanent paraplegia requires a prolonged stay in a neurorehabilitation centre. Physiotherapy to build upper limb strength to enable wheelchair use should be commenced early. Intermittent urinary catheterisation may be required but some patients require permanent urinary catheters which can be placed suprapubically or transurethrally. In the long term patients usually find that they can control their bowel movements, but a permanent colostomy can help some patients. Building work to make their home suitable for wheelchair access may need to be undertaken, and some will require to be rehoused. The long term prognosis for patients suffering permanent paraplegia following thoracic endografting is poor.

Summary

Neurological complications of thoracic endoluminal repair remain an important risk with an incidence of stroke and paraplegia each affecting up to 10% of patients.

Certain patients can be identified who are at high risk of neurological complications. Consideration can then be given to prophylactic measures such as revascularisation of the left subclavian artery when it is deliberately covered, for stroke, and CSF drainage for paraplegia in patients who require a long device and those with a previous infrarenal repair.

Removal of thrombus from the cerebral circulation in patients with stroke improves the arterial patency but the clinical results remain disappointing and the necessary radiological expertise may not be readily available. Cerebrospinal fluid drainage can reverse paraplegia if it is performed as soon as the clinical signs are apparent before any imaging is undertaken.

Patients with permanent neurological deficits may require long term accommodation in neurorehabilitation centres. Those patients who are able to return home will require long term support and may never achieve full independence.

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Bridging stent-graft pullout force analysis in branch EVAR

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Purpose
To assess the pullout force (POF) of bridging stent-grafts in an aortic and iliac branch graft.

Methods
POF of Viabahn or Fluency with (Fluency+Zilver) and without a Zilver stent was measured when deployed into a Zenith thoracoabdominal cuff-bearing stent-graft. POF of Atrium i-Cast, Viabahn, Fluency, and Fluency+Zilver was measured when deployed into an iliac bifurcated graft. At least ten trials were performed for each stent in air at room temperature.

Results
The median POF (standard deviation; data range) required to dislodge each stent from the 6 mm diameter renal branch was: 1.89 N (0.33 N; 1.65-2.5 N) for 7 mm diameter Viabahn, 1.17 N (0.28 N; 0.68-1.57 N) for 7 mm Fluency, and 2.08 N (0.32 N; 1.59-2.62 N) for 7 mm Fluency with a supporting 8 mm Zilver stent ($p < 0.001$). For the 8 mm celiac branch, POF was 2.79 N (0.66 N; 2.31-4.16 N), 1.74 N (0.14 N; 1.51-1.91 N), and 2.73 N (0.56 N; 1.9-3.61 N) for 9 mm Viabahn, 9 mm Fluency, and 9 mm Fluency with a 10 mm Zilver stent, respectively ($p<0.001$). For the 8 mm internal iliac branch, POF was 3.53 N (0.74 N; 2.55-4.72 N) for 9 mm Atrium i-Cast, 3.82 N (0.32 N; 3.29-4.45 N) for 9 mm Viabahn, 2.32 N (0.29 N; 1.63-2.64 N) for 9 mm Fluency, and 2.61 N (0.60 N; 1.65-3.63 N) for 9 mm Fluency with a 10 mm Zilver stent ($p<0.001$).

Conclusion
There are significant differences in POF between different stent-grafts.

Key Words: bridging stent-graft, pullout force, branched-graft.

The effect of mismatch between native anatomy of visceral aorta and design of fenestrated stent-graft

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Introduction
Accurate measurement of native anatomy is required to plan devices for fenestrated endovascular aneurysm repair (fEVAR). Measurements are however, subject to inter and intra-observer variability, creating the possibility of errors and thus mismatch between the native anatomy and the stent-graft configuration.
The aim of this study was to examine the effect of mismatch between fenestrated stent-grafts and native anatomy on proximal seal.

Methods
A 36mm proximal main-body incorporating two fenestrations and a scallop was deployed according to a standard protocol within a series of phantoms depicting visceral aorta. One phantom was produced with perfect alignment between the visceral vessels and fenestrations. Six additional phantoms were created with incremental mismatch in both the circumferential (n=3) and longitudinal position of the renal vessels (n=3).
Qualitative assessment of apposition between the seal zone of the phantom and the stent-graft fabric was made by visual inspection and radiography. The degree of stent-graft distortion and misalignment of the scallop in relation to the superior mesenteric artery (SMA) as a result of stent-graft/phantom mismatch was also assessed.

Results
Fabric to lumen apposition (seal) was maintained in all phantoms. A circumferential discrepancy of 30 degrees did not result in scallop misalignment. Partial SMA shuttering was observed with a 45 degree and a discrepancy of 60 degrees resulted in complete shuttering with partial shuttering of the renal arteries. Attempts to correct shuttering of the SMA with a balloon expandable stent resulted in partial crushing of the stent. In the longitudinal direction, discrepancies in vessel separation between -5 and 8mm were tolerated without compromising target vessel patency.

Conclusions
Fenestrated stent-grafts appear to tolerate considerable mismatch with aortic anatomy without compromising seal. Additional factors such as the effect of mismatch upon deployment and durability of target-vessel stents merit further study.

Advanced catheter technology: is the answer to overcoming the long learning curve in complex endovascular procedures?

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Introduction
Advanced endovascular procedures require a high degree of skill with a long learning curve. We aimed to identify differential increases in endovascular skill acquisition in novices using conventional(CC), manually-steerable(MSC) and robotic endovascular catheters(RC).

Materials/Methods
10 novices cannulated all vessels within a CT-reconstructed pulsatile-flow arch phantom in the Simulated Endovascular Suite. Subjects were randomly assigned to conventional/manually-steerable/robotic techniques as the first procedure undertaken. The operators repeated the task weekly for 5 weeks. Quantitative (cannulation times, wire/catheter tip movements, vessel wall-hits) and qualitative metrics (validated rating scale (IC3ST)) were compared.

Results
Subjects exhibited statistically significant improvement when comparing initial to final performance for total procedure times and catheter tip movements with all catheter types. Sequential non-parametric comparisons identified learning-curve plateau levels at weeks 2 or 3(RCs, MSCs), and at week 4(CCs) for the majority of metrics. There were significantly fewer catheter-tip movements using advanced catheter technology after training (Week 5: CC 74 IQR(59-89) versus MSC 62 (44-81);p=0.028, and RC 33 (28-44); p= 0.012). RCs virtually eliminated wall hits at the arch (CC 29(28-76) versus RC 8(6-9); p= 0.005), and produced significantly higher overall performance-scores (p<0.02).

Conclusion
Advanced endovascular catheters, although more intricate, do not seem to take longer to master and in some areas offer clear advantages with regards to positional control, at a faster rate. RCs seem to be the most intuitive and advanced skill acquisition occurs with minimal training. Robotic endovascular technology may have a significantly shorter path to proficiency allowing an increased number of trainees to attempt more complex endovascular procedures earlier and with a greater degree of safety.

Endovascular treatment of in-stent stenosis/occlusion: new technique for recanalization of long SFA re-stenosis ("MAPACE technique")

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Introduction
In-stent re-occlusion is a frequent complication of endovascular stenting, especially in the superficial femoral artery (SFA). The options to treat in-stent occlusion are endovacular or open surgery intervention. Endovascular treatment is the less invasive option, (that means passage through the occluded stent and re-dilatation the lesion), but in some cases crossing the occluded stent is very difficult. We propose a new technique for long in-stent SFA occlusion recanalization, after antegrade failures.

Purpose
A prospective study protocol were proposed on January 2010 and it was approved by the ethics committee of our hospital. The objectives were evaluate the safety and reproducibility of the MAPACE Technique, in cases of long SFA in-stent occlusion revascularization.

Methods and Material
From January to December 2010, we enrolled all patients whose presented Critical Limb ischemia or claudication intermittens, previously underwent to endovascular treatment and stenting of the SFA. Patients were hospitalized in our Foot and Ankle clinic and presented at admission with diagnosis of in-stent occlusion by imaging screening (Doppler US or Angio-CT), classified as TASC C-D class. By antegrade ipsilateral access in a Common Femoral Artery, we positioned a 5F 10 cm sheath and the diagnostic angiography was performed to confirm the in-stent re-stenosis/occlusion. After several unsuccessful antegrade attempts to engage the occluded stent proximal edge, with patient in supine position, the ipsilateral Hunter's channel area was prepared for puncture and retrograde direct in-stent puncture performed ("MAPACE" Technique), followed by retrogradelly intra-stent wiring and antegrade long balloon angioplasty and haemostasis.

Results
18 patients (11 males and 7 females, mean age 74,3 ± 9 years) were enrolled. In 12 cases (66,6%) endovascular recanalization was reached by antegrade access, crossing the occluded stent and re-dilatation of the lesion. In 6 cases (33,3%), after several unsuccessful antegrade attempts to engage and cross the occluded stent, patients underwent to "MAPACE" technique. We obtain the success of the procedure in all patient treated by MAPACE Technique, without procedural or peri-procedural complications, such as haemorrhage, acute thrombosis or distal embolism. There were no post-procedural complications, such as haematoma in the in-stent puncture site.

Conclusion
"MAPACE" technique is a useful and safety alternative to treat a very important percentage of cases with in-stent restenosis /occlusion in SFA, after several failed attempts to engage and cross the occluded stent.

Simulated patient-specific rehearsal is more effective in preparing interventionalists for the carotid artery stenting procedure than a preoperative generic warm-up

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Introduction
Patient-specific simulated rehearsal (PsR) of a carotid artery stenting procedure (CAS) allows incorporation of patient-specific CT data into the simulation software, enabling the interventionalist to rehearse the case on an endovascular simulator prior to the procedure on the actual patient. This study aimed to evaluate whether PsR of a CAS procedure can enhance the operative performance compared to a virtual reality (VR) generic CAS warm-up procedure or no preparation at all.

Material and Methods
Participants were trained in CAS during a 10 session cognitive and technical VR course. Thereafter, in a randomized crossover study, each participant performed a patient-specific CAS case 3 times on the simulator, preceded by 3 different tasks: a PsR, a generic VR case or no preparation at all (control). Technical performances were assessed using simulator-based dexterity metrics and expert-based video ratings using generic endovascular and procedure specific rating scales for CAS.

Results
Twenty junior residents (surgery, cardiology, radiology) were recruited. Training plateaus were observed after 10 sessions for all participants. PsR was significantly better than generic warm-up and no warm-up for total procedure time (16.3±0.6 vs. 19.7±1.0 vs. 20.9±1.1 min, p=0.001) and fluoroscopy time (9.3±0.1 vs. 11.2±0.6 vs. 11.2±0.5 min, p=0.022) but did not influence the amount of contrast volume or the number of roadmaps used during the 'real' case. PsR was significantly better at enhancing the quality of the CAS performance as measured by the expert-based ratings (score 28 vs. 25 vs.25, p=0.020).

Conclusions
Patient-specific simulated rehearsal of a CAS procedure significantly improves the operative performance, compared to a generic VR warm-up or no warm-up at all. This technology may improve outcome and reduce complications for patients undergoing CAS in the clinical setting.

Comparación entre cirugía distal y endovascular en la revascularización de ejes distales en isquemia crítica en relación al vaso tratado y al angiosoma lesionado

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Objetivo
Comparar la efectividad de la revascularización en pacientes en isquemia crítica sometidos a procedimientos quirúrgicos distales abiertos (by-pass distal) o endovasculares (angioplastia con o sin stent) en función del angiosoma reperfundido.

Pacientes y métodos
Estudio retrospectivo 2006-2009 de 106 pacientes con isquemia crítica con pulso poplíteo sin distales, tratada mediante procedimiento quirúrgico o endovascular. Edad media 73,93 (35-90), Varon:Mujer: 3:1. 88% de diabéticos. 58% de fumadores. 16% de pacientes en insuficiencia renal crónica.

Se seleccionaron finalmente 92 casos de isquemia grado 5 ó 6 Rutherford clasificados según el angiosoma lesionado que fue: TA (40), TP (42) y peronea (10).

Los procedimientos fueron codificados como "revascularización directa" (RD) si el vaso tratado perfundía el angiosoma lesionado y como "revascularización indirecta" (RI) si correspondía a otro angiosoma. Se comparó la tasa de salvación de extremidad en función del vaso diana y el procedimiento. También se estudio la tasa de cicatrización de amputación menor.

Resultados
Seguimiento medio 18,63 meses (3-39). Se registraron 52 angioplastias distales y 40 cirugías de by-pass distal. 50 casos de RD y 42 casos de RI con una tasa de salvamiento de extremidad de 85% frente a 55% ($p<0,01$). No hubo diferencias de salvación de extremidad entre procedimientos quirúrgicos o endovasculares (73% frente a 75%). La revascularización directa consigue las mismas tasas de salvamiento de extremidad mediante cirugía abierta que Endovascular (85%-85%). En la revascularización indirecta el salvamiento de la extremidad mediante técnica endovascular es del 63% frente a solo 44% de la cirugía de by-pass (no sig.) También se analizan los resultados en cuanto a la cicatrización efectiva de las heridas/amputación menor siendo mejor la tasa de curación de heridas en RD.

Conclusiones
La revascularización del angiosoma específico sobre el que asienta la lesión isquémica se asocia a una menor tasa de amputación. Los procedimientos endovasculares ofrecen resultados de salvamento de extremidad comparables con los procedimientos quirúrgicos. En caso de no poder hacer una revascularización directa la cirugía endovascular ofrece mayores tasas de salvamiento de la extremidad.

A patient with aortoesophageal and aorto bronchial fistula after TEVAR

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Introduction

Endovascular stent graft placement has emerged as a minimally invasive alternative to open surgery for the treatment of aortic aneurysms and dissections. There are few reports of stent graft infections and aorto enteric fistula after endovascular thoracic aortic aneurysm repair; and first multicentric study (Italian survey) showed incidence of about 2%.

Case Report

We present you the case of 69 years old, male patient, who was admitted to our hospital due to dysphagia and chest discomfort. By means of chest radiography and Multislice Computed Tomography (MSCT), posttraumatic thoracic aneurysm of 65 mm in diameter was revealed. Patient was successfully treated by endovascular stent graft implantation using 12 % of oversize. Postoperative recovery was uneventful and he was discharged after control MSCT showed complete exclusion of the aneurysm. Nine months later he was admitted to regional hospital with severe chest pain in left hemi thorax and arm refractory on analgesic therapy. Inflammatory parameters were normal but thin inflammatory periaortic layer was evident on CT images. Patient was treated with symptomatic therapy and three weeks later sent to our hospital with same symptoms and additional haematemesis and inflammatory syndrome, while blood culture test was positive on Candida Albicans. MSCT showed collection between stent graft and esophagus with thin layers of gas. Gastroendoscopy was performed, and visible blood jet at the 28th cm from incisive teeth was visualized. Blackmoor sonda was used to control hemorrhage temporarily. Surgical treatment was performed in collaboration of two teams (esophageal and vascular surgical team). In condition of partial femoro-femoral extracorporal bypass (ECBP), we performed left thoracotomy through 4th intercostal space, resection of thoracic aorta and explantation of the stent graft, followed by in situ reconstruction by using Dacron graft. Follows esophagectomy, midline laparotomy, and omentoplasty of Dacron graft, then nutritive gastrostoma and cervical jejunostoma were constructed.

After almost four weeks of slow respiratory recovery with several evacuations of 500-1000 ml of pleural effusion (positive on Candida albicans), patient finally developed hemoptisia. Control MSCT revealed aorto bronchial fistula at the level of proximal anastomosis and left principal bronchus. According to patient general condition we decided to perform endovascular treatment with implantation of another aortic cuff of 26 mm and patient respiratory function recovered slowly, as was further general recovery. He was discharged to regional center

Disección de aorta toraco-abdominal tratada con autotrasplante renal e implante de endoprótesis fenestrada

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Paciente de 66 años, hipertensión arterial, fibrilación auricular permanente. Anemia de difícil tratamiento. Disección aguda de aorta tipo A intervenida en 2007 con colocación de tubo valvulado de Dacron de 26 mm. Accidentes cerebrovasculares isquémicos en 2007.

Episodios de dolor torácico de características atípicas. Se le diagnostica disección de aorta torácica descendente tratada con colocación de prótesis endovascular 32 x 200 mm Relay® (Bolton), en 01/2010. Por aumento progresivo del diámetro aórtico se realiza colocación de endoprótesis de aorta abdomi-

nal 28 x 16 x 16 mm Talent® (Medtronic), en 03/2010. En este procedimiento también se realizó angioplastia + stent 5 x 12 mm de arteria renal izquierda.

En el seguimiento clínico se sigue observando fuga persistente al nivel torácico y periprotésica a nivel abdominal, de difícil localización y con mayor expansión del saco aneurismático. Se realiza estudio Angiográfico y de eco-Doppler intra-vascular que localiza la fuga en nivel de la arteria renal izquierda. También se observa endofuga tipo I en la fijación aórtica de la endoprótesis abdominal. Se realiza implante de cuff aórtico, de stent recubierto Advanta® (Atrium) en arteria renal izquierda y se cateteriza la falsa luz con inyección de 20ml de Tissucol® (Baxter).
A pesar de los procedimientos realizados, en el estudio de angio-TAC de control se observa persistencia de la fuga del medio de contraste e importante derrame pleural bilateral.

La paciente presenta un deterioro físico y debilidad marcada. Anemización leve y progresiva. Se decide implantar endoprótesis fenestrada excluyendo el riñón izquierdo y consecuentemente también el origen de la renal derecha.

En 06/2010 se realiza autotrasplante renal derecho en fosa ilíaca derecha como paso previo a colocación de endoprótesis fenestrada.

Finalmente se implanta endoprótesis fenestrada Relay (Bolton) uniendo la endoprótesis torácica con la endoprótesis abdominal + colocación de stent en inicio del tronco celíaco + embolización de arteria renal izquierda, el 13/07/2010.

La paciente evolucionó de forma favorable y en el angio-TAC de control a los seis meses evidenciamos completa exclusión del falso lumen.

Two cases of surgical open conversion with endograft preservation (sacotomy) in patients with persistent type II endoleak

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Introduction

The need of re-intervention after endograft implantation occurs in up to 35% of cases, regardless of the type of endograft or endoleak. We report 2 cases of sacotomy due to a persistent type II endoleak.

Material and Methods

In January 2011, we observed two cases of persistent endoleak. The first 87-year old patient underwent endovascular aneurysm repair about 2 year before by means of a suprarenal device (Medtronic Endurant). A CT scan performed in emergency revealed a type II endoleak from lumbar arteries, an 8 cm abdominal aortic aneurysm and a pelvic haematoma. The second one was a 80-year old male with a previous implantation (2007) of a suprarenal aortic endograft (Medtronic Talent), treated over the years, for a persistent type II endoleak by multiple (4) endovascular procedures, by means of coils and glue.

Both patients were submitted to open conversion with aneurismal sac opening, endograft exposure without cross-clamping and suture-ligation of bleeding lumbar vessels and sacrale media within the sac. The endograft sealing was confirmed by the absence of bleeding from the aortic neck or from iliac arteries.

Results

No postoperative complications were recorded in both patients. At hospital discharge a CT scan confirmed the successful surgical approach by absence of endoleak.

Conclusion

Open surgical repair of failed EVAR can be performed in selected cases with preservation of the endograft, without worsening morbitity and mortality also if carried out in patients considered “unfit” for surgery.

Prevention of distal embolization in the endoluminal treatment of thoracic aortic lesions

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Ulcerative lesions of the thoracic aorta as a source of thrombus that produce distal acute ischemia is rare. Embolization of non-floating or floating thrombus generated in these lesions is reported in 12% and 75% respectively.

The recommended treatment for these lesions is medical (anticoagulant, thrombilysis), surgical (thrombectomy, thromboendarterectomy, prosthetic replacement) with high morbidity or endovascular treatment.

Objective

During the endovascular treatment of these lesions is easy to detach the thrombus of the thoracic aorta,for this reason the use of a distal protection system could be indicated.
We present a patient with thoracic aortic ulcers with multiple injuries and floating thrombus, with two major previous embolic events.
Male 59 years.Two multiple embolic episodes (Iliac, femoral, popliteal)
CT SCAN: Floating thrombus in the thoracic aorta.
Transesophageal echocardiography: Penetrating aortic ulcers and floating thrombus at different levels.

Anticoagulant therapy was performed and a GORE TAG endoprosthesis was implanted and distal embolization prevention was performed with a half-open stent in the supraceliac aorta as a filter.

When the stent was removed embolic material was found that had been detached from the contact with the wire guide (Observed by Transesophageal echocardiography).

Conclusion

For the treatment of floating thrombus in thoracic aorta, temporary placement of a stent as a filter in supraceliac aorta seems a useful technique to prevent distal embolization during the implant of a endoprosthesis.

Disruptive Endovascular Technology with Multilayer Stent as A therapeutic option in the Management of Thoraco Abdominal Aortic Aneurysm

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A 76 years old lady, ASA IV, was presented with 6.3cm thoraco-abdominal aortic aneurysm Crawford Type II.

Hybird repair with de-branching followed by TEVAR/EVAR were excluded because of the co morbidities and high mortality rate of the procedure. Her TAA Aneurysm was not suitable to be managed by branched or fenestrated grafts.

The patient had her multi-layered stent covering the whole aneurysm and all visceral vessels. 1 day post operatively her duplex scan showed the Aorta is 2.46 in the mid-distal abdomen with no obvious aortic sac visualized and no obvious endoleak. She was discharged home on second postoperative day well. Follow up CTA Aorta showed all the visceral branches are patent with good flow. Maximum aortic diameter shrunk to 4cm.

Multilayered stents may divulge a resolution in such complex thoraco-abdominal aneurysm. Treating the aneurysm sac rather than excluding it may be the future management opportunity.

Juxta-renal AAA anatomically difficult for EVAR, Requiring a combined branch and double fenestrations

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Introduction
In emergency, sometimes surgeons have to be creative and to use, not very consensual solutions. Availability of stentgrafts is a frequent limitation for urgent endovascular aortic aneurysm repair (rEVAR). Moreover, taylored devices are expensive and waiting time before production may be significant, limiting their use in daily practice.

Case presentation
The authors report a case of a 77 year-old Caucasian male with prior history of multiple laparotomies and abdominal radiotherapy due to rectal cancer, presenting at the emergency department with abdominal pain. The Computed Tomography Angiography (CTA) revealed an infra-renal abdominal aortic aneurysm (AAA) with contained rupture and hostile proximal neck anatomy (4 cm in diameter).

An emergent EVAR procedure was performed by combining a thoracic (Valiant® Medtronic) and an abdominal bifurcated endograft (Endurant® Medtronic). The procedure was uneventful and the patient was discharged on the 10th post-operative day. There were no clinical complications during follow-up (8 months). There were no endoleaks, migration or stengraft fadigue at 1 and 6 months.

Discussion
Emergency situations sometimes require creative solutions. In this case a thoracic endograft was used as a proximal cuff to overcome the absence of adequate proximal size of off-the-shelf abdominal endografts, in order to treat a symptomatic AAA. Although sub-optimal, this proved to be an effective solution with satisfactory mid-term results.

Succesful endovascular treatment of a ruptured suprarenal aneurysm

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Introduction
The management of ruptured thoracoabdominal aneurysm is challenging for surgeons due to the high mortality and morbidity associated even after successful complex open repair. The endovascular alternative in aneurysms that involve visceral and renal arteries necessitate the use of branched stent-grafts that are neither practical nor available for use in the emergency setting. We present a case of a ruptured suprarrenal aneurysm successfully treated by combining "endo-branching chimneys" and a thoracic stent-graft.

Case
A 74 year old woman was transferred to our institution in shock due to the rupture of an aneurysm extending from the celiac axis to the renal arteries. Open surgical repair was considered futile. In the angiography suite a pigtail catheter was placed percutaneously in the ascending aorta via the right humeral artery. The celiac axis and the superior mesenteric artery were cannulated through and open left axilary acces and similarly both renal arteries were cannulated through the left common femoral artery. Four Viabahn (W.L Gore) stent-grafts were serially deployed in all the branches except the right renal artery, in which complete deployment was not technically possible. Next, a Valiant Thoracic (Medtronic) was placed in the aorta via the right femoral artery to exclude the aneurysm. Finally, a mid line laparotomy for hemoperitoneum evacuation was performed.

The postoperative period was complicated with renal failure, spontaneous spleenic ruptured requiring splenectomy. The patient developed respiratory and urinary tract infection as well as rectal ulceration with haemorrhage. There follow a slow res-

piratory but the patient was finally discharge after an overall 108 postoperative day. At seven months follow up the aneurysm remains excluded with the visceral and renal endobranches patent.

Consideration
From the technical point of view the main concern is the complete exclusion of the aneurysm without type I endoleaks while a proper perfusion to the visceral branches is achieved. In this respect some aspects deserves attention:
- Overlapping..
- Length. "
- Aneurysm morphology.
- Oversizing.
- Deployment.

Although it seems a very feasible technique we should also take into account that the high standard requirements in the postoperative support as well as the economic burden associated make reasonable that these procedures be conducted in centers of excellence.

Conclusions
This case shows how the "off- label" use of an otherwise common endovascular stock allows the successful treatment of increasingly more complex aneurysms even those which visceral branch involvement and rupture. Nevertheless, the experience is still limited and the uncertainty about the long term outcomes make that we have to await further information to really appreciate the role of this technique.

Tratamiento endovascular con ramas como último paso en paciente con aneurisma toraco-abdominal secundario a polianeurismosis degenerativa

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Introducción
La reparación quirúrgica de los aneurismas tóraco-abdominales presenta altos índices de morbimoratlidad perioperatoria. Esta situación se agrava en caso de precisarse reintervenciones o en pacientes de alto riesgo quirúrgico. El tratamiento de esta patología mediante prótesis preformadas con ramas puede ser una alternativa válida y segura en este tipo de pacientes.

Objetivos y Métodos
Presentar un caso de tratamiento endovascular con ramas como alternativa a tratamiento quirúrgico en paciente joven con historia de múltiples reintervenciones por enfermedad aórtica degenerativa polianeurismática, con implicación de ramas viscerales en el episodio actual.

Resumen del Caso
Paciente varón de 45 años de raza negra sin antecedentes médicos de interés, diagnosticado de aneurisma de arteria subclavia izquierda y aorta torácica-abdominal tipo I de Crawford, con screening negativo para enfermedades del colágeno. Fué tratado en Abril de 2000 realizándose derivación carótido-subclavia y exclusión de aneurisma torácico mediante endoprótesis, enrasada en D2. Se precisó canulación iliaca izquierda mediante prótesis de Dacron para la introducción del dispositivo. A los 3 meses, en un segundo tiempo, se realizó interposición de injerto protésico tóraco-abdominal con anastomosis distal en pico de flauta englobando todas las arterias viscerales, más revascularización de 2 intercostales mediante extensión protésica. Dicha intervención se realizó bajó circulación extracorporación con canulación a través de vasos femorales derechos. La evolución postoperatoria fue satisfactoria, dándose al paciente de alta a los 9 días de la intervención.

El paciente mantuvo seguimiento en consultas externas con control angiográfico mediante TC anual. A los nueve años de seguimiento es diagnosticado de degeneración aneurismática en zona anastomótica distal de 54 mm de diámetro mayor con implicación de todos los troncos viscerales y aorta infrarenal libre de enfermedad, decidiéndose actitud expectante. Se solicitó nuevo control mediante angioTC a los 6 meses, objetivándose crecimiento del saco aneurismático de 10 mm, por lo que se propone al paciente para intervención.

Como tratamiento de elección, se optó por exclusión de la degeneración aneurismática distal mediante endoprótesis preformada con ramas.

Como primer paso, se realizó un test de oclusión del Tronco Celíaco que confirmó la presencia de circulación retrógrada procedente de la arteria Mesentérica superior, permitiendo la embolización del mismo con el fin de evitar endofugas tipo II. Se indicó colocación perioperatoria de drenaje de líquido cefaloraquídeo como sistema de protección espinal. Mediante acceso quirúrgico femoral izquierdo y axilar derecho, se implantó la endoprótesis preformada revascularizando mesentérica superior y ambas renales utilizando stents recubiertos con refuerzo posterior mediante stents convencionales autoexpandibles.

Con control angiográfico satisfactorio y excelente evolución postoperatoria, el paciente fue dado de alta a los 4 días de la intervención.

Conclusión

Los resultados de la reparación endovascular con prótesis preformadas con ramas en aneurismas tóraco-abdominales son excelentes a corto plazo en la literatura, reduciendo de forma significativa el impacto quirúrgico en los pacientes comparado con la cirugía abierta. Esta técnica puede ser de elección en pacientes con alto riesgo quirúrgico o procedimientos quirúrgicos previos que aumenten el riesgo ante la necesidad de nuevas reintervenciones. A pesar de todo, aún no se dispone de evidencia sobre la durabilidad y viabilidad de estos procedimientos a largo plazo.

Challenging rEVAR

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Introduction

In emergency, sometimes surgeons have to be creative and to use, not very consensual solutions. Availability of stentgrafts is a frequent limitation for urgent endovascular aortic aneurysm repair (rEVAR). Moreover, taylored devices are expensive and waiting time before production may be significant, limiting their use in daily practice.

Case Presentation

The authors report a case of a 77 year-old Caucasian male with prior history of multiple laparotomies and abdominal radiotherapy due to rectal cancer, presenting at the emergency department with abdominal pain. The Computed Tomography Angiography (CTA) revealed an infra-renal abdominal aortic aneurysm (AAA) with contained rupture and hostile proximal neck anatomy (4 cm in diameter).

An emergent EVAR procedure was performed by combining a thoracic (Valiant® Medtronic) and an abdominal bifurcated endograft (Endurant® Medtronic). The procedure was uneventful and the patient was discharged on the 10th post-operative day. There were no clinical complications during follow-up (8 months). There were no endoleaks, migration or stengraft fadigue at 1 and 6 months.

Discussion

Emergency situations sometimes require creative solutions. In this case a thoracic endograft was used as a proximal cuff to overcome the absence of adequate proximal size of off-the-shelf abdominal endografts, in order to treat a symptomatic AAA. Although sub-optimal, this proved to be an effective solution with satisfactory mid-term results.

The "dark side" of endovascular abdominal aortic aneurysm repair

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Objective

To describe an unusual sequence of catastrophic complications after endovascular repair of an abdominal aortic aneurysm in a young patient.

Methods & Results

A 51-year-old man presented in extremis with severe bilateral lower limb ischaemia due to thrombosis of a bifurcated endograft (Endurant). This had been implanted 4 months earlier at another unit. The patient, being sexually active, had opted for an endovascular approach to minimize post-operative erectile dysfunction. Plain x-ray showed the left limb of the endograft to be kinked. He underwent thrombectomy, restoration of the right limb flow and fem-fem crossover Dacron bypass. After a stormy spell in ICU, he gradually improved with moderate right foot drop due to prolonged ischaemia. Unfortunately, the Dacron graft became infected, he suffered anastomotic haemorrhage and the prosthesis had to be removed. Recanalization of the occluded left iliac limb had been achieved this time and the problem area was relined with an Excluder limb. Both femoral arteriotomies had been closed with vein patches. Unfortunately, numerous bleeding episodes followed from both groins necessitating exclusion and obturator bypass from the external iliac to the distal superficial femoral artery. He was finally discharged home after 3 months and several procedures. He remains well 10 months later.

Conclusions

Although minimally invasive, endovascular repair is still a major procedure with potentially serious complications both in the short and in the long-term. This should be borne in mind when offering the repair to relatively young patients.

Initial experience in Viabahn-assisted exclusion of iatrogenic femoral pseudoaneurism

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Introduction

In last decade, high number of interventional procedures for the treatment of cardiovascular diseases was associated to a growing rate of vascular access complications, especially in the femoral discrict.

Endovascular management of this complications by using stent graft can be a valid alternative to surgery in high-risk patients for general or local conditions.

Objectives

Aim of our study is to demonstrate feasibility and safety of Viabahn-assisted exclusion of iatrogenic femoral pseudoaneurysms in presence of well-defined demographic and anatomical conditions.

Material used

From January 2008 to January 2010 we observed in our insti-

tute 7 patients (mean age 81.3) presenting femoral pseudoaneurysms, post-catheterization in 6 cases and post-surgery in one case. In four cases pseudoaneurysm involved common femoral artery and in three cases superficial femoral artery was dilated. Mean pseudoaneurysm sac diameter was 2.9 cm. Patients were all asymptomatic but a patient suffering for femoral groin infection. We deployed 7 Viabahn stent grafts at level of the origin of femoral pseudoaneurysm, accurately preserving patency of deep femoral artery in all cases.

Methodology used
We retrospectevely analyzed the results of our not randomized series of patients.

Results of the study
A technical succes was achieved in all cases, with a complete exclusion of femoral pseudoaneurysms in all cases. In one case we observed a leg ischaemia due to an acute occlusion of stent-graft and an open repair and removal of stent graft was carried out with restoration of blood flow.

At one month follow-up stent grafts were all patent with a significative reduction of sac diameter. No rupture of femoral pseudoaneurysms was observed and symptomatic patient showed a progressive disappearance of groin infection.

Conclusions of the study
Viabahn-assisted exclusion can be a minimally invasive alternative in the treatment of femoral pseudoaneurysms. This option still remains helpful in old high-risk patients and in pseudoaneurysms originating from common femoral or superficial femoral artery, with care in preserving patency of the deep femoral artery.

Tratamiento endovascular de los pseudoaneurismas iatrogénicos post artroscopia de arteria poplítea

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Los pseudoaneurismas de arteria poplítea tras artroscopia de rodilla son extremadamente raros, suponen un cuadro de difícil resolución en el momento agudo, añadiendo un problema grave a unos pacientes que suelen tener las arterias sanas y sin patología vascular previa. El manejo quirúrgico precisa abordar una zona de la arteria poplítea de difícil acceso, salvo en decúbito prono, con una rotura arterial y un gran hematoma asociado o ligar la arteria poplítea proximal y distal a la lesión y posteriormente revascularizar mediante un by-pass, la existencia de una fístula arteriovenosa (FAV) dificulta todavía más la solución.

El tratamiento endovascular es una alternativa sugerente con pocas reseñas en la literatura. Presentamos nuestra experiencia con dos casos de pseudoaneurisma de arteria poplítea a nivel de 2ª porción tras meniscectomia artroscópica tratados de forma endovascular.

Material y métodos: Analizamos el manejo de dos pacientes con pseudoaneurisma de arteria poplítea tras meniscectomia por artroscopia. Mujer de 44 años con obesidad mórbida y que a los 10 días de la intervención acude a nuestro hospital por una tumoración pulsátil en hueco popliteo de 47x45 mm. de diámetro asociada a thrill y disnea de pequeños esfuerzos, el índice tobillo/brazo es de 0'67, se observa la existencia de una (FAV) de alto flujo.

Varón de 59 años que no es trasladado de otro hospital a los 4 días de intervenirse de menisco con un gran hematoma en muslo y pantorrilla y un pseudoaneurisma de 57x56mm. de diámetro. En ambos se les colocó un stent de nitinol forrado de PTFE (Viabahn®) de 6x100 mm. y de 6x50 mm. respectivamente.

Resultados: Se consiguió la exclusión del pseudoaneurisma en ambos casos así como el cierre de la (FAV) cediendo la disnea. El otro paciente preciso la realización de fasciotomías y evacuación del hematoma. No hubo complicaciones ulteriores, estando permeables ambas reparaciones y asintomáticos a los 14 y 8 meses.

La dificultad de canalización con la guía de la porción distal de la arteria poplítea en el caso de la (FAV) tras múltiples intentos por el alto flujo, fue solventada con el abordaje de la arteria pedia a través de la que se pasó una guía de 0'014" que fue cazada con un lazo.

Conclusiones: Los stents de nitinol forrados tipo (Viabahn®) son una alternativa eficaz para tratar las complicaciones iatrogénicas de la arteria poplítea. La canalización retrógada y posterior lazado de la guía permite solventar la dificultad de atravesar la lesión de forma anterógrada.

Revascularisación Endovascular del Pie y de las Arterias Tibiales a Traves de Caminos Alternativos, Utilizando la arcada Profunda del Pie

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Introducción

El tratamiento endovascular del pie y de las arterias tibiales tiene, actualmente, una reconocida y significativa utilidad. En los utimos aňos el numero de tratamientos destinados al salvataje de la pierna y del pie, en particular en pacientes diabeticos, aumenta continuamente.

En casos seleccionados, el tratamiento endovascular del pie puede ser muy dificultoso, debido a la presencia de calcificaciones vasculares, que limitan y reducen las opciones tecnicas.
En estos casos, los caminos convencionales para revascularizar el pie y las arterias tibiales, pueden no ser practicables y el encontrar rutas alternativas puede ser la unica solución.

Caso

Mujer de 56 aňos, con diagnosis de Critical Limb Ischemia y arteriopatia obstructiva cronica, con vasos calcificados. Un primer intento de revascularisación endovascular habia sido ineficaz.

La paciente presentaba diabetes de tipo I, dislipidemia y cardiopatia isquemica, como factores de riesgo.

La concentración de oxígeno transcutanea (TcpO2) a nivel del pie era de 13 mmhg y lesion III C seg. TUC a nivel del I dedo y el resultado de amputación del IV y V dedo.

El estudio angiográfico, precedente al tratamiento, demostraba estenosis múltiples de la arteria femoral superficial y de la arteria poplitea. A nivel de la trifurcación tibial resultaba permeable solo la arteria tibial posterior, la arteria interosea presentaba múltiples estenosis, la arteria tibial anterior estaba obstruida. A nivel del pie era permeable la arteria plantar medial y ramos tarsales.

Durante el tratamineto se cateterizó la arteria interosea y a traves de un ramo perforante profundo se cateterizó la arcada profunda (que conecta la arteria plantar medial con un ramo tarsal dorsal) y desde allì se cateterizó en forma retrograda la arteria tibial anterior. Al final del intervento resultaban permeables la tres arterias tibiales y la arcada profunda, desde la cual originaba un ramo tarsal que llegaba al LOOP y revascularizaba las arterias digitales.

Comentarios

Se trata de un caso complejo, que se presentaba con vasos muy calcificados y con el resto de una guìa a nivel del origin de la arteria pedidia, como resultado de un intervento anterior. Se trataba de un verdadero intervento de salvataje del pie.

Es un caso didactico, que pone en evidencia la existencia de caminos alternativos para la revascularisación del pie y de la pierna, y la posibilidad de cateterizarlos y dilatarlos, aumentando el flujo de sangre al pie y a los dedos. Durante el procedimiento se combinaron distintas tecnicas, útiles a la revascularisación extrema. Se obtuvo un resultato excelente, con permeabilidad de todas las arterias tibiales y excelente flujo para el pie y los dedos.

Conclusiones

En casos de revascularisación extrema, es posible cateterizar la arca profunda del pie, sea para revascularizar en forma retrógrada, un vaso tibial, sea para revascularizar el pie, permitiendo de aumentar el flujo de sangre hacia el LOOP y los dedos, a traves de caminos secundarios.

Traumatismo de troncos distales de miembros inferiores. ¿Tratamiento de elección endovascular o abierto?

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CASO PROBLEMA: Paciente de 24 años que sufre herida incisa por arma blanca en cara anterior de pierna derecha que, tras 22 días de evolución, presenta dolor a nivel gemelar con desarrollo de masa hiperpulsatil. Se realizan ecodoppler y AngioTAC que confirma la existencia de pseudoaneurisma (PSA) de grandes dimensiones (5 cm) en origen de arteria peronea.

INTRODUCCIÓN: No existen muchos casos publicados sobre el tratamiento adecuado para la resolución de traumatismos vasculares que producen pseudoaneurismas de troncos distales de miembros inferiores.

OBJETIVOS: Comunicar un caso complicado de traumatismo vascular con intento de resolución endovascular y el desenlace final en cirugía abierta para la reparación completa.

MATERIAL UTILIZADOS: Embolización parcial con coils de diferentes diámetros en saco aneurismático.

MÉTODOS UTILIZADOS: Se realizó arteriografía diagnóstica y terapéutica con intento de embolización del PSA con múltiples coils sin que se consiguiera la trombosis completa del mismo. En ecodoppler de control a las 24 horas se aprecia el PSA dependiente de la arteria peronea de 5 cm permeable con coils en su interior y colección hemática intramuscular por posible rotura del mismo.

RESULTADOS DEL ESTUDIO: Ante el fracaso del procedimiento endovascular se decidió cirugía con abordaje de 3ª porción poplítea y control del tronco tibioperoneo, procediéndose a la apertura del PSA con evacuación de abundante trombo, restos hemáticos y diez coils metálicos, apreciándose punto sangrante en cara posterior de la bifurcación del tronco tibioperoneo en origen de la arteria peronea que se suturó con puntos sueltos de monofilamento del 6/0. Fue dado de alta en 8 días con pulsos distales conservados en MID y sin clínica de síndrome de ciático poplíteo externo CPE habiendo iniciado la deambulación.

CONCLUSIONES DEL ESTUDIO: Consideramos que la cirugía abierta sigue siendo la técnica de elección para reparar lesiones traumáticas de las arterias distales de miembros inferiores y, en ocasiones, es una técnica de rescate ante el fracaso de las técnicas endovasculares.

Es muy importante tanto la elección de la técnica como el material a utilizar para asegurar el éxito del tratamiento endovascular. No existe clara evidencia sobre la idoneidad del tratamiento endovascular para la reparación de los traumatismos vasculares en miembros inferiores.

Treatment of a congenital vascular malformation with endovenous laser and foam sclerotherapy

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Venous malformations (VMs) are the most common form of congenital vascular malformations (CVMs) and comprise some 80% of those presenting for therapy. They are low-flow lesions affecting the venous system as inborn errors throughout the body.

We present a 14 year-old male patient complained of swelling and deformity on his right leg since birth was admitted to our hospital. He also suffered heaviness, cosmetic and functional impairment in his leg. Physical examination had revealed no abnormality (bruit, thrill, hyperpigmentation or big

varicose veins) except a congenital venous malformation (CVM) which was located on the lateral side of the cruris and the dorsal side of the foot like a buffalo hump. Duplex US showed multiple malformed venous vessels with a trunk between 8-20 mm in diameter. All deep veins and arteries of the lower extremity were normal in size and function. There were no evidence of arterio-venous (AV) malformation. MR-angiography confirmed venous malformation (VM) of the right leg with normal superficial and deep venous system including iliac veins and inferior vena cava (IVC).

Lymphoscintigraphy showed an atypical lymphedema of the leg along the VM. Lymphatic transport function and clearance were normal except dermal backflow below the right knee. Duplex US and T2 image of MR showed that the VM located deep enough to perform endovascular approach by laser. It was decided that the patient was suitable for the endovascular treatment. Under general and tumescent anesthesia, truncular VM was successfully lasered by 980 nm diode laser (radial fiber, 14 W, mean energy delivery 130 J/cm along a 28 cm segment).

The patient had an uneventful postoperative course and he was discharged at the postoperative 6th hour. In the following days Duplex US revealed that the proximal segment of the VM was completely obliterated but the distal ½ segment was partially obliterated possibly due to the larger branches.

Then two sessions of foam sclerotherapy under US guidance were performed by 1% and 2% polidocanol respectively to obliterate the existing side branches.

The patient was advised to wear compression stockings after the operation. In the follow-up visit it was observed that he had no pain due to venous stasis and all major truncular veins were oblıterated except some small branches.

Diagnosis, characterisation and preoperative anatomic evaluation of congenital VMs are essential for the effective management.

Endovascular exclusion of congenital VMs can be done with a high degree of technical success, low morbidity, and short hospital stay in selected patients.

Which Side First And How? Carotid Complex Cases session

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A 59 year old gentleman with bilateral high grade carotid stenosis and previous laryngeal carcinoma and neck radiotherapy presented with recurrent right amaurosis fugax 6 weeks previously and a single left cortical TIA one week previously.

On carotid Doppler the right ICA stenosis was 90%, the left 70%; both lesions were hypoechoic. MRA confirmed the Doppler findings and demonstrated a bovine type I arch.

The plan was to stent both carotid lesions.

The right sided lesion was technically more straightforward but less clinically urgent (on account of it giving rise to ocular symptoms six week ago, albeit recurrent). The left sided lesion had given rise to a cortical event one week ago and was clinically more urgent but technically more challenging.

The decision was made to stent the right first and the left 24 hours later, both with proximal protection/endovascular clamping. The rationale was that we did not want to perform a slightly more lengthy procedure on flow arrest on the left carotid with a critical stenosis in the right ICA.

The procedures were carried out according to plan with use of the Piton guiding catheter (Medtronic Invatec), which utilises a wire bridge to prevent catheter prolapse whilst catheterising recurrent or bovine type arches to facilitate stenting of the left sided lesion.

The case highlights complex clinical and technical decision making plus use of a new guiding catheter designed for difficult carotid access.

Double-chimney Technology Treating Secondary Type I Endoleak after Endovascular Repair for Complicated Thoracic Aortic Dissection

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Endovascular repair continues to pose a formidable technical challenge in aneurysm, dissection and proximal type I endoleak involving the aortic arch. While covering the aortic arch by the stent-graft to obtain better seal, maintaining blood flow to the vital supra-aortic branches is difficult. We present a new endovascular procedure: double-chimney technology.

A 36 year old woman, who had underwent a complicated descending aortic dissection repair, presented a severe secondary type I endoleak. First of the procedures, the bilateral common carotid arteries(CCA) were exposed, and a sheath was placed in a retrograde fashion respectively. Through the sheaths, two guidewires were advanced into the ascending aorta. An SINUS stent was delivered in advance, with a short segment protruding into the aortic arch lumen and extending distally into the proximal left CCA. Subsequently, a RELAY stent-graft was introduced from the aortic approach until the proximal fabric edge was adjacent to the innominate artery. The endograft repair was completed with complete coverage of the orifices of the innominate artery and the left CCA. The second SINUS stent was then introduced and deployed to open a channel for flow to the innominate artery. A follow-up CTA performed 1 year indicated no proximal endoleak with complete thrombosis of the thoracic aortic false lumen, as well as free flow into the innominate and left carotid arteries.

The double-chimney technology might offer a new option to simultaneously preserve the innominate artery and the left carotid artery for total reconstruction of the aortic arch.

Tratamiento endovascular por vía retrograda de la isquemia cerebral debida a patología severa de troncos supra aorticos

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Circulo Católico de Uruguay

Objetivo: Presentar un paciente joven con severa patología post-rádica de troncos supraórticos, que determinó una isquemia cerebral manifestada principalmente por síndrome isquémico ocular bilateral y convulsiones generalizadas que obligan al paciente a permanecer en reposo absoluto. Tratado mediante stenting de arteria carótida primitiva izquierda, único eje supraórtico permeable.

Reporte del caso: Hombre de 42 años, con severa patología post-rádica de troncos supraórticos y de cayado aórtico que presentó un síndrome isquémico ocular bilateral asociado a convulsiones generalizadas y claudicación invalidante de miembros superiores a predominio derecho. El dúplex ultrasonográfico de 4 vasos de cuello y la angiografía digital de cayado aórtico y troncos supraórticos evidenciaron una oclusión completa de tronco braquiocefálico, carótida primitiva e interna derecha y arteria subclavia derecha prevertebral. Estenosis filiforme de arteria subclavia izquierda y estenosis de 90% en el ostium de carótida primitiva izquierda. Dadas las groseras deformaciones torácicas que hacen un tórax inabordable quirúrgicamente y un cayado aórtico anatómicamente hostil con alto poder embolígeno, se decide revascularización de miembro superior derecho mediante un bypass protésico femoroaxilar derecho y a posteriori, implante de stent expandible por balón en el ostium de la carótida primitiva izquierda por vía retrograda a través de abordaje quirúrgico de carótida primitiva en cuello.

Excelente evolución clínica con regresión completa de su sintomatología cerebral y ocular. A los 6 meses el paciente permanece asintomático retomando su vida social y laboral.

Conclusiones: El tratamiento endovascular de la patología supraórtica por vía retrógrada constituye una buena opción cuando existe un alto riesgo de complicaciones a través del cayado aórtico.

Embolic protection system failure during internal carotid artery stenting. Case report

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Introduction: Up to date, carotid artery stenting is indicated in selected cases, in high volume center. Authors report the case of carotid artery stenting complicated by the failure of the embolic protection system.

Clinical Case: a 83 yrs-old man was admitted because a left hemispheric TIA. Duplex scan showed a 95% left internal carotid artery stenosis, 15 mm of length, and the occlusion of the controlateral internal carotid. The cerebral CT was negative. It was addressed to left internal carotid artery stenting. The supraortic arteriography shoved, a long plaque with critical stenosis of the left internal carotid artery and confirmed the occlusion of the controlateral internal carotid. The distal internal carotid artery was smoothly kinked. Because the tight stenosis of the left carotid artery, for enabling the passage of the embolic protection system, it was performed a predilatation with a 2 x 20 mm ballon, inflated at 8 atm, for just few seconds. Then it was deploied the embolic protection system (FilterWire EZ – Boston-Scientific®) at the level of distal internal carotid artery. Because the kinked course of the distal carotid, the stenting was performed by the delivery of an Rx Akkulink® (Abbott-Vascular) 7-10x40 mm, at the level of the carotid stenosis, followed by postdilatation with a 5,5-20 mm ballon, with a successful recanalization. The next step was the retrieval of the embolic protection system; but once the basket was reloaded in the retrieval sheat, at the passage of the device over the stent, the soft tip was engaged between the stent struts; during the up and down movement of the retrieval sheat, in the aim to disengage the soft tip, this last detached from the device and was jammed between the struts. At this point the tip was lost without any possibility of retrieval. Then it was decided to embed the tip into the arterial wall. In this aim we released a second Rx Akkulink®, 7-10x30 mm, stent over the first. The second stent allowed the steady locking of the lost tip between the two stent without any blood flow impairment.

The patients did well and he was discarged at 3rd day.

Conclusion: Less invasive carotid artery stenting can replace thromboendarterectomy in high risk, selected patients. Nonetheless it is a skill-requiring procedure and must be performed in high volume cases center, in complementary surgical and radiologic vascular enviroment, with the avalilability of the different materials you can need for the procedure.

Cutting the Viabahn, and the aneurysm... Endovascular treatment: is it always it?

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A 78 year old patient was referred to our clinic for the treatment of a large (10cm) saccular aneurysm of the right subclavian artery causing increasing dyspnoea due to compression of the trachea. The patient was an ex-smoker, suffered from hypertension and had a history of a groin hernia repair. Minimal invasive endovascular treatment was planned because of his age and general condition.

Access was challenging but achieved through dual approach (right common femoral artery and right brachial artery) using a snare. A Viabahn 8/100 was first inserted though the groin, but because of tortuosity of the proximal subclavian artery, had do

be inserted and deployed via brachial access. Unfortunately, the olive of the delivery device got stuck and could not be retrieved... so the delivery device was pushed forward after being cut at the brachial side and eventually retrieved via by the sheath in the right groin. A completion angiogram after postdilation showed a correct position of the stent-graft with exclusion of the aneurysm without any evidence for an endoleak.

The postoperative course was complicated by a stroke and increasing stridor and dyspnoea. AngioCT showed a successfully excluded subclavian aneurysm but an enlargement of the aneurysm caused by perforation and hematoma in the aneurysm wall during the procedure, leading to increased compression of the trachea and atelectasis of the right lung. Elective intubation and right posterolateral thoracotomy were performed to drain the large saccular aneurysm and the aneurismal wall was closed. Weaning was prolonged but successfully.

Post-hoc… should we have chosen a safer and less invasive treatment?

Eendovascular management of abdominal aortic rupture

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Introduction

Spontaneous rupture of a non-aneurysmal abdominal aorta is a rare, life-threatening event. It is due to penetrating atherosclerotic ulcer, dissection, inflammation, infection, trauma or neoplasia. Few vascular specialists have accumulated enough experience in dealing with these pathologies. We describe the endovascular management of two such patients.

Methods and Results

Case 1: A 77-year-old man was admitted to a peripheral hospital with a 3-day history of abdominal pain and fever one month following a myocardial infarction. Abdominal CT revealed a collection in the left psoas muscle which was misdiagnosed as an abscess and was treated conservatively.

Three days later, the patient deteriorated, became hypotensive and his haemoglobin dropped to 7.1 g/dl. Repeat CT documented a contained ruptured of abdominal aorta involving its bifurcation and the left common iliac artery. He was transferred to our unit for definitive management. On arrival he was in hypovolaemic shock and underwent emergency endovascular repair using a bifurcated endograft (Excluder, Gore). He had a slow but uneventful recovery and was discharged home on the 14th day.

Follow-up CT at 6 weeks confirmed successful relining of the ruptured segment without contrast extravasation and decrease of the retroperitoneal haematoma. Reviewing his films, a spinal osteophyte was detected to be located exactly opposite the perforated left common iliac artery. There was no sign of infection and the perforation seemed to have been caused by the osteophyte.

Case 2: A 69-year-old man was admitted with lumbar pain and severe hypertension. CT angiography revealed spontaneous rupture of a heavily calcified, non-aneurysmal visceral aorta.

The rupture involved the superior mesenteric artery which appeared to be occluded and extended from just below the celiac trunk down to the right renal artery. He was transferred to our unit and was treated by emergency endovascular implantation of an aortic cuff (23 x 33 mm, Excluder, Gore) along with stent grafting of the right renal artery (6 mm x 10 cm, Viabhan, Gore) using the periscope technique.

Final angiography showed the celiac artery not to be patent and, as a result, its origin was catheterized and the vessel was salvaged by deploying a 9 x 40 mm balloon-expandable stent. The exact aetiology of the rupture could not be confirmed, but it was presumed to be related to the heavily calcified aortic wall. The patient had an uneventful recovery. Follow-up CT at 1 month revealed no endoleak and the patient was symptom-free.

Conclusions

Spontaneous rupture of a non-aneurysmal abdominal aorta is a rare and potentially fatal condition. Endovascular repair appears to be a useful option for such challenging cases.

IVUS y síndrome aortico agudo

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El síndrome aórtico agudo es una entidad que agrupa una serie de patologías de la aórta torácica que incluye el hematoma aórtico, la úlcera aórtica penetrante y la disección aórtica. Cada una de ellas independiente pero a su vez interrelacionadas.

Hasta hace poco tiempo el diagnóstico se basaba exclusivamente en la imagen de la Tomografía Axial Computerizada y la ecografía transesofágica. La TAC presenta el problema de la radiación, el contraste y el ser una prueba estática lo que nos impide determinar si alteracines hemodinámicas como la disección estática o dinámica de diferente pronóstico y tratamiento. La Ecografía transesofágica nos permite determinar con bastante exactitud las características e incluso determinar ante que entidad del síndrome aórtico nos encontramos si bien no puede ver más allá del tronco celiaco lo que nos impide determinar con exactitud si existen problemas y de que tipo con respecto a la aorta a nivel visceral e infrarrenal. Precisa además de colaboración-sedación del paciente y el disponer de personal muy entrenado y experimentado

El ultrasonido intravascular (IVUS) una cada vez más en auge y usada herramienta diagnóstica, nos permite ver con exactitud toda la aorta desde el cayado aórtico a la iliaca externa. Permitiéndonos determinar no sólo, ante que patología nos encontramos, sino distinguir si es una afectación estática o dinámica. Nos permite tomar medidas precisas a la hora del tratamiento endovascular si se necesitara, así como, tomar la actitud terapeútica quirurgica o endovascular más adecuada. Se realiza con anestesia local, incluso en la propia cama del paciente si bien, precisa de curva de aprendizaje

Presentamos un video demostrativo de cada una de las entidades que componen el síndrome aórtico agudo poniendo en claro la utilidad del IVUS en el diagnóstico preciso.

Entrapped balloon angioplasty catheter in stent restenosis of superior vena cava

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Superior vena cava (SVC) stenting can provide rapid symptomatic relief in most patients with superior vena cava syndrome (SVCS). Stenting may also be indicated in cancer patients in whom radiation induced SVCS. Patients with entrapped catheters in superior vena cava is a particular challenge because little is known about the incidence and clinical outcome.

A 64 year-old male patient with symptoms of SVCS including facial edema, cyanosis and respiratory distress admitted to our hospital. Three years ago, he had been treated for inoperable bronchial carcinoma with chemo-radiotherapy. Endovascular therapy with balloon angioplasty/stenting of the SVCS had been performed in another hospital 6 months ago. MR-venography of the SVC revealed the high grade in-stent restenosis where the previous stent was deployed. The patient was scheduled for balloon angioplasty and re-stenting. During the angioplasty procedure the balloon bursted and the balloon catheter get entrapped by the previously placed stent in superior vena cava. After failed interventions for retrieval of the burst balloon catheter, following day we performed a median sternotomy and explored the region where the balloon catheter was still present and realized that the tumour and radiotherapy

caused severe fibrosis in the mediastinum. The balloon catheter could be removed incompletely from the SVC via right upper extremity and a remnant of balloon catheter left in the SVC. Then a bypass between the right atrium and the left innominate vein was performed with a 10-mm Dacron® graft.

The patient was discharged at the 7th day without complication and symptoms free. He received a combination of aspirin and clopidogrel postoperatively. The post operative 3 week time was uneventful and the patient did not required further reintervention for signs of SVCS.

The risk of further traumatizing the superior vena cava by forcefully removing the foreign body should be considered. Small fragments may be left within the superior vena cava like in our case with SVCS but open by-pass surgery is the only alternative way to relief SVCS if endovascular treatment has failed. The success of surgery is possibly determined primarily by the clinical status of the patient before the operation. Intraoperative decisions about removing or leaving in situ the catheter remnants or stents should depend upon the location and size of the fragment.

Juxta-renal AAA anatomically difficult for EVAR, Requiring a combined branch and double fenestrations

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A 76 Yr old male was admitted to a hospital in after feeling unwell. His investigations revealed a low haemoglobin, thrombocytopaenia and a possible leaking abdominal aortic aneurysm.. CT scan on admission showed a juxta-renal AAA with a para-aortic mass, reported in Cyprus as a possible rupture. The patient self-discharged and flew back to England. On arrival the patient presented to our institution. The CT was re-reported as an AAA with a para-aortic mass suggestive of a soft tissue mass or abscess.

On CT angiogram the neck diameter at the renal arteries was 35mm. The renal arteries origins were at the same level at 11 o'clock and 2 o'clock positions. The SMA origin was at 12 o'-clock 5mm above the renal arteries. This made planning a fenestrated EVAR a challenging option.

He developed impaired renal function a day after his CT scan, which has remained elevated since. He was assessed by a Consultant Anaesthetist to be unfit for open surgery.

MRA confirmed the findings of a AAA and demonstrated a fluid collection with septations and fluid levels in the para-aortic area with vertebral erosions. A diagnosis of chordoma, giant cell tumour and abscess were suggested. CT guided aspiration of this mass/collection yielded some serosanguinous collection which was sterile. He was started on steroids.

Repeat scan in 6 months later showed a significant reduction in the retroperitoneal mass but the L2 and L3 vertebral bodies showed scalloping giving a suspicion of Tuberculosis. Investigations failed to prove this.

Seven months post-presentation he presented with accelerated hypertension, acute confusional state and acute renal failure. Investigations with CT head, MRI brain, MAG3 scan and MRI of Kidneys failed to show any cause for his acute presentation. He recovered but was discharged with chronic renal impairment.

Currently his AAA is 8cm on CT scan. He then presented with shortness of breath on exertion and was diagnosed on V/Q scan to have multiple PE's and treated with anticoagulation. He had started to develop weakness in his legs.

Due to his renal impairment a mixture of CO2 and contrast was used for the procedure. A Cook main body 38x140mm was deployed with two renal fenestrations, stented with an Atrium 7x22mm stents. A downward branch was stented into the SMA using a Fluency 9x60mm stent. The main body was then extended with a 24x80mm tube graft. Below this a 24mm bifurcated body was deployed, with a contra-lateral body of 81mm. The contra-lateral limb was extended with a 73x24mm and the ipsi-lateral was extended with a 56x20mm.

A good radiographic appearance was obtained. No evidence of an endoleak. Flow maintained into the SMA, both renal arteries and the common iliac arteries. A follow up CT scan has confirmed patent target vessels and no presence of an endoleak.

Hepato-Spleno-Renal Bypass for Abdominal Aortic Aneurysm

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Purpose: To report a salvage maneuver for accidental coverage of both renal arteries during endovascular aneurysm repair (EVAR) of an infrarenal aortic aneurysm (AAA) and survey our surgical colleagues in the UK for their use of this bypass procedure.

Methods: A 74-year-old woman who had an EVAR complicated by renal failure secondary to malposition of the stent-graft underwent successful delayed renal revascularization with hepatorenal and splenorenal bypasses. This case prompted a literature review and preparation of an online 6-part questionnaire regarding the incidence and management of renal impairment following EVAR. The survey invitation was sent to all listed members of the Vascular Society of Great Britain and Ireland.

Results: Responses from 68 (10.5%) of the 650 vascular surgeons invited to participate in the survey were analyzed. The combined experience of those who completed the survey was >1500 EVAR procedures per annum. Forty percent (27/68) of the respondents had experienced a case of bilateral renal artery occlusion during EVAR. Two thirds (67%, 18/27) of these surgeons stated a preference for revascularizing the kidneys endovascularly, 7 surgeons would convert to open repair, 1 surgeon favored iliorenal bypass, and another suggested splenorenal bypass. Following intervention, 15 (56%) of 27 surgeons achieved revascularization that resulted in a return to baseline serum creatinine, 7 (26%) achieved partial recovery of the patient's serum creatinine, 3 (11%) had a patient on permanent dialysis, and 2 (7%) had patients who died (after open repair and endovascular procedure, respectively).

Conclusion: Bilateral renal artery occlusion caused by malposition of a stent-graft is probably underreported. If revascularization of the kidneys by endovascular techniques fails, there is no consensus as to the optimal approach. Hepato-spleno-renal bypass can provide a good functional result in this situation. Delayed revascularization should be considered if the kidneys show concentration of imaging contrast.

Prevention of type II endoleaks by colils and fibrin glue embolization of the aneurysmatic sac

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Introductions
Type II endoleaks are the most common "complication" after EVAR. Their incidence is various in the many series reported and their significance and treatment have been long debated. It seems to be generally agreed that the treatment of type II endoleaks is recommended in case of growth of aneurysm diameter.

Objectives
The purpose of this study is to evaluate if the routinely intrasac embolization with coils and fibrin glue during EVAR is a safe and effective procedure to reduce the incidence of type II endoleaks and the incidence of re-intervention after EVAR.

Material and methods
From January 2009 to August 2010 63 patients underwent EVAR, emergency procedure are not considered here. 42 patients have been treated in 2009 without sac embolization (group A) while, from January 2010, 21 patients underwent EVAR + routine intra sac embolization at the end of the endovascular procedure (Group B): 20 of these patients have been treated by intra sac positioning of coils (19 cases Tornado® and

1 case Balt®), 17 patients were treated also with injections of fibrin glue (TissueColl®), 1 patients had only coils and one only fibrin glue. All patients underwent a 30 days postoperative CT scan.

Results
The 30 days the incidence of type II endoleaks in Group A was 14.3% (6 cases) and in group B was 4.8% (1 case). In Group B no adjunctive surgical procedure were needing and no type I endoleaks were observed.

Conclusions
The sac embolization with coils and fibrine glue at the time of endograft placement seems to be a safe procedure for prevention of type II endoleaks. Considering that literature reports a global incidence of re-operation for type II endoleaks of 55%, seen the reductions of incidence of type II endoleak after this procedure, we can estimate a reduction of re-interventions of about 5.3% with a relevant cost saving for the national health system. Moreover, the absence of type I (A or B) endoleaks in all the cases treated seems to confirm the effectiveness of the technique also in the stabilization of the sac giving high fixation to the endograft.

Complex Cases (carotid) - "Belt and Braces"

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A 51 year old female with previous head and neck radiotherapy for nasopharyngeal carcinoma presented with right hemispheric TIA. She had bilateral > 90% high grade long segment ulcerated carotid bifurcation lesions. On CT there was low density material packing both carotid bulbs and hypoechoic plaque bilaterally on Doppler ultrasound.

She was treated (by placement of a right carotid stent) within one week of index symptom with flow reversal embolic protection plus the NAV6 EmboShield filter.

There are a number of technical aspects of this case that should generate discussion: the requirement for pre- and post-dilatation in cases like this, management of flow reversal intolerance, the most appropriate stent design given the patient's history, advancement of the filter retrieval system through the stent to the base of the filter whilst on flow reversal followed by cessation of flow reversal (allowing the stent to be "washed through" into the filter before filter retrieval). Lastly, the length of time that these patients need to be on dual antiplatelets given the potentially different healing paradigms in patients with radiotherapy lesions compared with patients with de novo atherosclerosis.

Synchronous Bilateral Carotid- Subclavian Bypass and TEVAR to Treat TAAA Complicated by Aberrant Origin of Right Subclavian Artery

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Introduction
Variations in vascular anatomy of the aortic arch and great vessels are not uncommon and influence planning and treatment of thoraco-abdominal aortic aneurysm (TAAA).

Report
We report a case of TAAA secondary to aneurismal degeneration of Chronic Type B dissection. The complicating feature was an aberrant origin of the right subclavian artery from the descending aorta, distal to the origin of the left subclavian artery.

Discussion
TEVAR with Boston Relay NBSTM thoracic stent graft was performed successfully to treat the aneurysm. Synchronous carotid subclavian bypass was undertaken to reduce risk of spinal and vertebro-basilar ischaemia. The technical considerations are discussed.

Modified Endovenous laser treatment (ELT) of lower limbs? varicose veins: our experiences

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Objective
We assessed the safety and efficacy of modified endovenous laser treatment (ELT) of the saphenous vein combined with a surgical strategy for treatment of deep venous insufficiency in the lower extremity, based on experience.

Methods
Since September 2007 to June 2010, 831 ELT procedures have been performed (great and small Saphenous vein and extra-Saphenous veins) using a diode laser 980 nm wavelength (LASEmaR1000-Eufoton, Italy) by a kit that includes optical fibers of 600 micron and 400 micron fibers for small extra-Saphenous veins (KIT INVE, Eufoton, Italy). Local Echo-guided anesthesia have performed in all cases. Laser power is variable regarding veins diameter from 6 to 12 watts settled in semi-continuous mode and the energy supplied is personalized to morphologic vein characteristics: 50-80J/cm for vein diameter of 1,5-3,5 mm; 80-100J/cm for vein diameter of 3,5-6 mm; 100-140J/cm for vein diameter of 6-8; up to 140J for vein over 8 mm of diameter. Power is personalized to echographyc vein patterns (diameter, wall thickness, anatomic deep). In the 82% of all patients other techniques have been associated.

Results
All cases (100%) presented the subjective symptomatology's fading, with an objective improvement of symptomatology after 1 month of the operation.

3 months after operation, 99.9% of all cases presented a complete occlusion of vein treated, and in the 0.01% of cases has been detected an early recanalization of Saphenous vein (initial learning curve only). At 6 months after operation has been detected a recanalization of Saphenous vein in the 1.5% of 145 operated patients. At 12 months after operation has been detected a long regurgitation without usual relapses in the 0.46% of 32 operated patients. No major complications occurred. One DVT (0.0012%) occurred. Local transient paraesthesia at the ankle and midcalf level occurred in 5 patients (0,006%). In the 74% of patients we observed that vein treated disappear after 6 months.

Conclusions
The endovenous laser treatment (ELT) of Saphenous and extra-Saphenous veins is a minimally invasive surgical intervention, that is performable by a Day-Surgery ever under ultra-sound guide and by a topical anesthesia. It can ensure good clinical and aesthetic results by a short time of convalescence. The laser treatment efficacy is linked to the standardization of pre-operative and operative clinical procedures. Interventions must be standardized for the part that pertains to the methodology, but it must be personalized to the patient's vein. Combined techniques if indicated permit to obtain the best results and the best satisfaction of patient.

Keywords: vein, laser, elt, evlt, elves, endovenous, varices, insufficiency

Stent dislodgement during revascularization of acute renal artery thrombosis

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Acute renal thrombosis is an emergent pathology that is at present underdiagnosed due to the unclear onset of symptoms. Endovascular treatment consists of revascularization, which is currently acheived by use of a stent.

We report the case of a 68-year-old male who presented acute renal failure and was referred to our unit for revascularization of the right renal artery, that had shown signs of acute thrombosis in an emergent CT scan.

We followed our usual approach, which is percutaneous puncture of the right femoral artery. Selective catheterization was very difficult due to a marked angulation of the renal artery in relation to the aorta. Due to this, we were unable to place a long introducer sheath into the renal artery so as to perform selective angiographies and ensure an exact deployment of the stent. Once the stent was placed, angiography showed that its dislodgement was too proximal in the renal artery ostium, as well as a persistent occlusion of the vessel together with risk of migration of the stent into the aorta. After repeated failed attempts to catheterize the stent through both femoral and brachial approaches, we decided to retrieve the stent. This was achieved using an angiographic snare and a long introducer sheath through the femoral access. The patient presented no clinical complications related to the procedure, although in the end the right renal artery could not be revascularized.

Our case shows that an adequate planning of treatment is essential for a successful outcome of the procedure. Access through the brachial artery would probably have avoided all of these technical complications. Nonetheless, we were able to successfully retrieve the stent using a snare and introduce it into the sheath; Awareness of this strategy is worthwhile in cases of dislodgement or migration of small diameter stents.

Embolización renal mediante dispositivo Amplatzer vs coils como tratamiento concomitante a nefrectomía en hipernefroma renal

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Introducción
El carcinoma de células renales o hipernefroma representa aproximadamente el 3% de las neoplasias diagnosticadas cada año, y representan más de 95000 muertes al año en el mundo occidental. La embolización de la arteria renal preoperatoria como tratamiento concomitante a nefrectomía ha demostrado ser útil en la reducción de su morbimortalidad a lo largo de los años. La realización de esta técnica junto a nefrectomía en un mismo acto quirúrgico conserva las ventajas del tratamiento reduciendo considerablemente la morbimortalidad asociada.

Objetivos
Analizar los resultados de la embolización arterial renal con dispositivo Amplatzer vs coils como procedimiento concomitante a nefrectomía en hipernefromas.

Métodos/Pacientes
En 10 pacientes se realizó embolización de la arteria renal concomitante a nefrectomía por hipernefromas. El procedimiento fue realizado por un cirujano vascular en un quirófano convencional con un arco radiológico en C móvil.

En todos los casos se utilizó dispositivo Amplatzer para la embolización. En 4casos,se precisó la inyección de 2cc de trombina intracatéter posterior al implante.

La oclusión completa de la arteria renal se confirmó mediante angiografía intraoperatoria en todos los casos. Se analizaron datos demográficos como la edad y el tamaño del tumor. Se analizaron a su vez los tiempos quirúrgicos, la morbimortalidad peri/postoperatoria, las perdidas sanguíneas, las necesidades transfusionales y el deterioro de la función renal postoperatoria. Se compararon los datos obtenidos con una muestra similar obtenida en la bibliografía donde la embolización se realizó con coils. En análisis estadístico se realizó mediante tests no paramétricos. La significación estadística se estableció con $p<0.05$.

Resultados
Para la embolización con Amplatzer, el tiempo quirúrgico global fue de 122,30min., incluyendo embolización y resección tumoral. Se perdió una media de 316,5ml de sangre por paciente, precisando dos pacientes transfusión de dos concentrados de hematíes. No existió mortalidad intra/periopeartoria. Dos pacientes precisaron vigilancia intensiva durante 24horas.

El tiempo de hospitalización medio fue de 5,8días. Ningún paciente presentó deterioro de su función renal al alta. En el análisis estdístico, se objetivaron diferencias significativas en el tamaño del tumor y el tiempo quirúrgico global a favor de la embolización con Amplatzer.

Conclusiones
La embolización renal concomitante a nefrectomía en hipernefromas, es una técnica accesible y con muy baja morbimortalidad. La embolización mediante dispositivo Amplatzer presenta resultados similares a la embolización con coils, mejorando significativamente los tiempos quirúrgicos.

Disección aórtica. ¿La resolveremos algún dia?

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Paciente varón de 45 años de edad que ingresa en nuestro hospital con el diagnóstico de insuficiencia renal aguda secundario a hipertensión maligna.

En las pruebas complementarias se detecta una disección aórtica desde una arteria subclavia derecha aberrante retroesofágica, hasta las arterias iliacas.

Se realiza by-pass carótido subclavio bilateral y cobertura de la entrada de la disección con endoprótesis TAG (Gore) 31x150mm y un stent autoexpandible en iliaca común izquierda. El paciente presenta mejoría de la función renal y control de su tensión arterial.

En el TAC de control a los 15 días del postoperatorio presenta desplazamiento distal de la endoprótesis con reperfusión de la luz falsa desde la entrada proximal y disección retrógrada que afecta a carótida derecha.
Se decide realizar un by-pass desde la aorta ascendente a ambas carótidas para realizar extensión proximal de la endoprótesis.

Tras la derivación de ambas carótidas se colocan dos prótesis Valiant (Medtronic), una distal cónica 34-30mm a nivel de cayado aórtico y otra proximal 40-36mm a nivel de aorta ascendente. En la liberación de la endoprótesis proximal se produce malposicionamiento del primer stent con semiobstrucción de la luz aórtica.

La mala colocación de la endoprótesis se corrige mediante parada circulatoria, arteriotomía de aorta ascendente y recolocación del stent.

Reparación Híbrida de Disección Aórtica Crónica Tipo B en paciente con Síndrome de Marfan

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Introducción. Los pacientes con Síndrome de Marfan son propensos a la dilatación y ruptura aórtica. La reconstrucción de la raiz aórtica y la aorta descendente ha generado pacientes con mayor supervivencia que presentan expansión de la disección distal aórtica. Este caso clínico propone una corrección híbrida para los Marfan con esta patología.

Objetivos. Presentar el tratamiento y evolución de un paciente con Síndrome de Marfan y Disección Aórtica Crónica tipo B.

Material y método. Un varón de 40 años, con historia previa de derivación Bentall , desrramado de troncos supraaórticos y corrección de cayado y aorta descendente con doble stengraft, se presentó por dilatación de la luz falsa abdominal.

Se realizó una reparación aórtica total en dos etapas; revascularización subclavia izquierda inicial seguida de sustitución de aorta infrarrenal por injerto de Dacron cónico-recto, devascularización visceral aórtica e implante de stengrafts desde stentgraft torácico previo a injerto de Dacron actual.

Resultados. En el postoperatorio inmediato se evidenció fuga Ib en la unión de los injertos endovasculares y la reconstrucción Dacron que se empleó como leak inducido para permitir la completa recuperación sin déficit neurológicos.
En el sexto mes presentó un cuadro isquémico intestinal con respuesta a tratamiento médico.
En el octavo mes de su seguimiento el paciente realiza vida ambulatoria y se encuentra a la espera de compensación medular para interrupción de leak distal.

Conclusiones. La reconstrucción aórtica de los pacientes con Síndrome de Marfan precisa un seguimiento cercano. Las técnicas híbridas parecen una alternativa segura a corto y medio plazo para estos pacientes. La aparición de complicaciones neurológicas pueden revertirse con endoleaks inducidos .

Percutaneous treatment of acute mesenteric ischemia and liver failure

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Objective. Acute liver failure is a life-threatening emergency with a poor survival. We report a rare clinical case of acute thromboembolic occlusion of the celiac axis and superior mesenteric artery in which endovascular recanalization using percutaneous balloon expandable stent was carried out successfully.

Case Report. A 67-year-old man was admitted to our vascular department proceeding from other hospital with the diagnosis of acute liver failure by occlusion of the celiac trunk and superior mesenteric artery. Twelve hours earlier, the patient underwent a right nephrectomy due to a hypernephroma. His past medical history was significant for arterial hypertension, atrial fibrillation and congestive heart failure. No signs of peritonitis were found on physical examination, but a leukocytosis (14580 x 103 /µL) with a critical alteration of hepatic enzymes (AST 4337 U/L, ALT 2190 U/L, LDH 10170 U/L), and severe coagulation disorder (INR 3.73, Quick 28%, aPTT 59 seconds) was present. Contrast-enhanced abdominal computed tomography (CT) showed filling of contrast only in the inferior mesenteric artery. Because of the patient's poor condition and the major surgery performed the previous day, an endovascular approach was decided. He was successfully managed by a femoral and brachial access and the use of a percutaneous balloon expandable stent placed in both visceral arteries. The patient improved markedly in the immediate postoperative period and a laparotomy was not necessary. He was discharged with oral anticoagulation and 100 mg of AAS daily. He remains symptoms-free, and a CT-scan has showed patency of both stents six months after the procedure.

Conclusions. Acute liver failure by ischemia is an extremely rare condition that occurs when at least the celiac axis and the superior mesenteric artery is occluded avoiding the supplementary perfusion by collateral pathways. Endovascular techniques may be the treatment of choice in patients with no signs of peritonitis (bowel ischemia) and high operative risk. This approach keeps away from aortic clamping and surgical control of visceral arteries. The primary stent placement by balloon expandable decreases the risk of distal embolization. According to the literature, this seems to be the first clinical case of a combined acute thromboembolic occlusion of the CA and the SMA treated successfully with stenting.

Hybrid repair of aneurysm of the aberrant right subclavian artery: a challenging case

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Introduction. The aberrant right subclavian artery (ARSA) is one of the most common anomaly of the aortic arch, with an incidence rate of 0.5-2. The ARSA can often become aneurismatic. In the majority of these cases, patients are asymptomatic and the diagnosis is occasional. Difficulty swallowing solids ("dysphagia lusoria") may gradually develop8,9. Episodes of thromboembolism and rupture have been reported with high mortality rate 5 . Due to the anomalous anatomy, there is no one ideal standardized management of ARSA aneurysms (ARSAA). Objectives: We report a case of ARSAA, successfully treated with an hybrid approach.

Material and Method. A 72-year-old male patient with history of hypertension, dysphagia, emerged 3 years earlier was referred to our unit for a ARSAA. The patient complained a sudden onset of dysphonia. he experienced An acute chest pain radiating to the back was experienced three months earlier. The computed tomography scan (CT-scan) showed the anomalous origin of the supra-aortic vessel, including a bovine aortic arch, a regular left subclavian artery (LSA) and a huge ARSAA (5.1 cm in maximum diameter - fig.1). The aneurysm caused an esophagus compression. Due to the anomalous anatomy, we avoided the surgical treatment. A staged hybrid

treatment (surgical and endovascular repair) without thoracotomy was perfomed. Through a bilateral supraclavicular approach, a left carotid to the right subclavian bypass (CSB) with 6 mm polytetrafluoroethylene (PTFE) prosthesis was performed.

A 10F sheath introducer was inserted through a surgical femoral access, whereas a 6F sheath introducer was percutaneously placed controlaterally. A 12x7mm Amplatzer iliac plug (AGA Medical,Golden Valley,MN,USA) was inserted through the 10F sheath and placed at the origin of the ARSA.

Another Amplatzer iliac plug (10x7mm) through the 10F sheath was placed at the origin of the LSA. The Bolton Relay Thoracic Stent-Graft (TEVAR) (38x34x150mm; Bolton Medical Inc.,Sunrise,Fla,USA) was introduced via the right CFA on a backup Maier guidewire.

During TEVAR, a controlled hypotension (≦ 50 mmHg) was induced by using the rapid ventricular pacing (RVP) technique. The intraoperative angiography control confirmed the correct position of the device, the patency both of the common carotid arteries and of the CSB with a good perfusion of the vertebral arteries.

Results Postoperatively, we observed the Claude Bernard Horner syndrome on the right eye. The patient was discharged on the fourth post-operative day in good general condition with a complete recovery of the neurological symptoms.

The CT scan follow-up, performed at 1, 3, 8, 12, 24 and 36 months, showed the technical success of the TEVAR, the complete ARSAA exclusion and the good perfusion of all supra-aortic trunks including the carotid-subclavian bypass (fig.2). At clinical follow-up, symptoms of dysphonia disappeared.

Conclusion In case of appropriate anatomy the ARSAA can be successfully treated with the hybrid treatment (surgical and endovascular approach). We reckon that this minimally invasive technique avoid thoracotomy and could be the treatment of choice in high-risk patients.

Fístula aorto-esofágica. complicación tardía post implante de endoprótesis en el arco aórtico. Tratamiento quirúrgico

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Introducción: La fístula aorto-esofágica, está descripta como una grave complicación de TEVAR. Generalmente se presenta como una verdadera urgencia quirúrgica y el tratamiento con cirugía abierta es habitualmente fatal.

Material y Método: Presentamos 2 casos en los cuales se implantaron Endoprótesis en el Arco Aórtico por diferentes patologías (Disección Aórtica Tipo B en el primero y Transección Aórtica post traumático en el segundo). La Fístula Aorto-esofágica se manifestó entre el primer y cinco años post implante.

Tratamiento: La táctica quirúrgica fue la misma en ambos casos. Cirugía Híbrida: By pass desde la Aorta Ascendente a los Troncos Supraaórticos e Implante de endoprótesis cubriendo todo el Cayado Aórtico excluyendo la fístula Aorto-esofágica. En un caso se Implantó una Endoprótesis intraesofágica.

Resultados: Un paciente falleció a las 72 horas post cirugía. La causa estuvo dada por un Taponamiento Cardíaco, producto de la desinserción de la anastomosis del By Pass a los Troncos Supra aórticos provocada por el Stent descubierto de la Endoprótesis sobre dicha anastomosis.

El otro paciente se encuentra asintomático y de alta medica, bajo control.

Conclusiones

• La fístula Aorto esofágica puede presentarse como una complicación "tardía" post Implante de una Endoprótesis en el Arco aórtico.

• El sitio de lesión fue en el piso del Cayado Aórtico en ambos casos.

• El seguimiento por imágenes debe ser estricto ya que una modificación en la estructura metálica de la Endoprótesis puede indicar el inicio de ésta grave complicación.

• La "Cirugía Híbrida" fue para nosotros la indicada, con sobrevida inmediata.

• Recomendamos el uso de Endoprótesis con Stent cubierto proximal para evitar el decúbito del Stent libre sobre la anastomosis del By Pass a los Troncos supraaórticos

Cuan corto puede ser el cuello proximal aórtico en un Aneurisma de Aorta Abdominal, cuando es tratado con una prótesis SETA balón expandible

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Objetivo: De acuerdo con la literatura, en los aneurismas de aorta abdominal infra-renales, la longitud del cuello aórtico proximal para poder asentar una prótesis stent – graft no debería de ser menor a 10 mm. A pesar de esto, en nuestra práctica clínica del tratamiento de aneurismas infra-renales, el cuello proximal puede ser menor a 10 mm. Por lo tanto nuestro objetivo es validar el riesgo de endoleaks, si los hubiera, en el tratamiento de aneurismas infra-renales con cuello corto o sin cuello, utilizando una prótesis SETA balón expandible, stent-graft.

Material y Método: Fueron 101 pacientes que presentaban un aneurisma de aorta abdominal infra-renal, con un cuello proximal menor a 10 mm. de longitud, en los que se les coloco una prótesis SETA, stent-graft, en un periodo de tiempo comprendido entre noviembre del 2000 y diciembre de 2010. La efectividad de nuestro procedimiento fue evaluado mediante TC multicorte a los 30 días y anualmente post procedimiento. Fueron tratados 86 pacientes con un dispositivo bifurcado y los 15 restantes con un aorto-monoiliaco.

Resultados: En cuellos mayores de 3 mm. no se observaron endoleaks. Solo se observaron cuatro endoleaks, en cuellos menores a 3 mm, inmediatamente después del procedimiento. Un paciente que presentó una ruptura del aneurisma, murió por falla multi orgánica posteriormente, y un paciente requirió cirugía abierta. Otros dos pacientes que presentaron endoleaks se perdieron en el seguimiento a largo plazo.
Conclusión: En cuellos mayores a 3 mm de longitud, la prótesis SETA, balón expandible stent-graft, es un dispositivo seguro y no demostró presentar endoleaks en el seguimiento a largo plazo.

Disección aórtica retrógrada tipo A posterior al manejo endovascular de la disección aótica tipo B crónica

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Introducción.

Las técnicas endovasculares han emergido como una alternativa para el manejo de la patología aórtica, con las cuales se han obtenido tasas bajas de morbilidad y mortalidad que ha disminuido las estancias hospitalarias y en unidades de terapia intensiva. Sin embargo existen complicaciones relacionadas con el procedimiento, una de las cuales es la Disección Aórtica Retrograda tipo A que a pesar de su relativa baja incidencia, tiene una alta mortalidad.

Objetivos y Métodos
El siguiente reporte presenta una disección aórtica retrógrada tipo A como complicación de una colocación de una endoprótesis torácica por una disección aórtica tipo B crónica. Mediante la revisión de la literatura disponible se detallarán las posibles causas predisponentes y las medidas preventivas para evitarla.

Resumen del caso
Paciente varón de 60 años con antecedentes de hipertensión arterial de difícil manejo, cefaleas frecuentes y con diagnóstico de Disección Aórtica Tipo B crónica.

Se le practicó derivación carótido-sublclavia izquierdo y colocación de endoprótesis aórtica tipo Relay NBS PLUS (Bolton Medical, Sunrise, FL) 38 x 34 x 200mm y Oclusión subclavia izquierdo con Amplatzer (AGA Medical Corp. Plymouth, MN), obteniéndose un resultado angiográfico satisfactorio.

Cinco días después presentó paro cardiorespiratorio sin pródromos. Se documentó derrame pericárdico de aspecto fibrinoso en la ecocardiografía, y a pesar de maniobras falleció.

Se confirmó por necropsia el diagnóstico taponamiento cardiaco secundario a disección aórtica retrógrada tipo A.

Discusión
La disección retrógrada aórtica tipo A es una complicación poco frecuente después de la colocación de una endoprótesis torácica, con una incidencia variable entre 1 y 6,4%. Sin embargo se asocia a elevados índices de mortalidad que han sido reportados cercanos al 50%.

Dicha complicación puede presentarse de forma variable en el tiempo desde las primeras horas posteriores al procedimiento hasta varios meses después. Además la sintomatología es diversa y algunos casos pueden ser asintomáticos. Las causas etiológicas que se han propuesto pueden relacionarse con el procedimiento, el dispositivo colocado o con progresión natural de la enfermedad, especialmente cuando se asocia a Síndrome de Marfan.

Conclusión
La disección retrógrada aórtica tipo A es una complicación potencialmente letal posterior a la terapia endovascular en las patologías de la aorta torácica, sobre todo en los casos de disección tipo B. Sus causas son diversas por lo que se debe tener atención especial sobre las características anatómicas del paciente y las propias al dispositivo seleccionado. Además es importante el protocolo de seguimiento, por su variable tiempo de presentación.

Ovarian vein insufficiency associated with leg varicose veins: an experience of single institution in Japan

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Introduction
It is reported that 1.65% of lower limb varicose veins are associated with ovarian vein insufficiency (OVI). Ovarian varices occur in 10% of the general population of women, and may cause pelvic congestion syndrome (PCS). However, articles of OVI or PCS in Japan are very few and there are only several case reports.

Objective
To report our cases with OVI who were presented with leg varicose veins, and compare prevalence with previous literatures.
Material and Method: 809 legs of 733 patients (511 females) with varicose veins were treated between April 2007 and December 2010. All patients were investigated with Duplex scan. Enhanced pelvic CT scan was performed when clinical or ultrasound scanning suggested PCS, which is suspected by varices at the thighs, buttocks, and vulva, and presence of epigastric or pudendal veins reflux. The symptoms of PCS, such as pelvic pain, perineum discomfort, dyspareunia and dysuria were also carefully questioned. If dilatation of ovarian veins or parauterin varices were seen on CT scan, patient underwent selective pelvic phlebography and diagnosed as PCS by visualization of ovarian or internal iliac veins insufficiency. A pressure gradient between left renal vein and inferior vena cava was measured at the same time to identify nutcracker syndrome and pressure gradient >3mmHg was considered significant.

Result
Four women (0.78%) had left-OVI but there was no patient with nutcracker syndrome. Two patients underwent coil embolization of the left ovarian vein. Another two cases were followed conservatively because they had hardly any symptoms of PCS. [Case 1] A 43-year-old Gravida 3 Para 3 woman had been suffering from edema and pain of right crus and ankle. It is aggravated by menstrual period and reticular veins were seen at right lateral thigh and crus. Duplex scan showed no reflux at great and short saphenous veins but muscular deep vein in thigh.

Foam sclerotherapy for reticular veins did not reduce her symptoms. Left-OVI was seen by selective pelvic phlebography and she underwent coil embolization of the left ovarian vein. The ankle pain and edema has been improved for 6 months. [Case 2] A 64-year-old Gravida 3 Para3 woman was presented with varicose veins at upper posterior thigh and crus of the left leg. She also had been suffering from chronic discomfort of lower abdomen and urinary frequency. There was no reflux at SFJ but great saphenous vein (GSV) from an external pudendal vein on Duplex scan. Left-OVI was detected in selective pelvic phlebography. Coil embolization of the left ovarian vein followed by foam sclerotherapy for the vulval varices and the selective GSV stripping was performed. The patient is free from discomfort of lower abdomen and leg varicose veins after the treatment for three years.

Conclusion
Prevalence of OVI in our series was lower than other report. OVI is not very common as a cause of lower limb varicose veins but can lead atypical symptoms which would not be improved by ordinary treatment for leg varicose veins. Coil embolization of the ovarian vein was safe and effective for OVI.

Incidental renal artery occlusion during deployment of a planned chimney abdominal aortic endograft

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Chimney grafts appear to be a good alternative to fenestrated grafts in cases of abdominal aortic aneurysms with unfit necks. Technically it is a complex endovascular procedure, and careful planning is essential to the success of the procedure.

We report the case of a 72-year-old male who was admitted for an elective endovascular repair of the abdominal aorta. The CT scan had shown a short neck, and a chimney graft using a covered stent for the renal artery was the treatment chosen to exclude the aneurysmal sac. We first catheterized the left renal artery using a guidewire and angiographic catheter, which proved to be unstable since we lost the renal catheterization during the endograft deployment. Before endograft dilation with a balloon-catheter and after multiple attempts we were able to place the guidewire between the graft and the aortic wall and finally catheterize the left renal artery. A covered stent was placed in the renal artery and peristaltism of the excretory renal system was observed, as complete patency of the artery was once again achieved.

This case shows that, although difficult, it is possible to re-catheterize the renal arteries after accidental occlusion during EVAR. Efforts should be made to revascularize because of the important clinical impact that a renal artery obstruction represents.

Tratamiento endovascular de aneurisma de arteria esplénica roto

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Introducción
Los aneurismas de la arteria esplénica son infrecuentes (0.04-0.8%) siendo mas prevalentes en mujeres que en hombres, con una relación de 4:1, El 80% cursan de forma asintomática aunque hasta un 10% pueden debutar con una rotura y una elevada tasa de mortalidad.

Objetivos
Exponer el manejo endovascular como tratamiento de una rotura de un aneurisma de arteria esplénica a propósito de un caso.

Material utilizado
Varón de 59 años con antecedentes de hipertensión arterial y fumador ocasional. Ingresa en urgencias por dolor abdominal intenso, mareo, sudoración profusa y pérdida de conocimiento. A su llegada presenta una TA de 70/40.
En el angio-TC se objetiva un aneurisma de arteria esplénica de 10x9, 5cm, con líquido libre perihepático, periesplénico y en ambas gotieras paracólicas. En la sala de angiografía se le practica un estudio selectivo, vía femoral derecha, de la arteria esplénica objetivándose un gran aneurisma sacular dependiente de la misma.

Método utilizado
Se coloca un introductor de 5F y 55cms de longitud (Cook) que se avanza hasta el interior del saco aneurismático. Gracias a la imagen 3D del TC se logra orientar catéter y guía para alcanzar el cabo distal del saco y colocarlos en la arteria eferente. Esta se emboliza mediante la utilización de 1 Amplatzer Plug 4 (9-avpo38-008) y el uso de 2 coils tornado (Cook). Para embolizar el saco, dado su gran tamaño, se emplea la funda

teflonada de una guía recta de 150cm de alma móvil, retirando completamente ésta y empujando la funda con suero a presión. Se emplean 3 guías en total. Proximalmente se emboliza la artería aferente con un Amplatzer Plug II (9-avp2-010) y el uso de 2 coils tornado. En el control angiográfico se objetiva exclusión completa del saco sin presencia de fugas en su interior.

Resultados del estudio
El postoperatorio transcurre sin incidencias. En el TC realizado al alta se objetivan pequeños infartos esplénicos sin repercusión clínica y ausencia de paso de contraste al saco. En el TC de control a los 4 meses, no se aprecian cambios.

Conclusión del estudio
La mortalidad de un aneurisma de arteria esplénica roto es muy elevada (75%). Clásicamente el tratamiento de urgencia es quirúrgico con resección del aneurisma acompañado o no de esplenectomía con una mortalidad en torno al 40%. El tratamiento endovascular es cada vez más aceptado como alternativa para los aneurismas de arteria esplénica mediante el uso de coils o el empleo de stent recubiertos. Aunque existen pocas referencias del tratamiento endovascular de estos aneurismas rotos, pensamos que es una buena alternativa por su baja morbi-mortalidad. Además, dado que se conserva la circulación colateral del bazo, el infarto esplénico es parcial conservando así su función disminuyendo el riesgo de sepsis por neumococo y meningococo.

En el caso descrito, el uso del Amplatzer nos parece un método efectivo para embolizar la arteria esplénica sin riesgo de migración de coils. El empleo de la funda teflonada de una guía de alma móvil en una aneurisma de grandes proporciones puede resultar un método eficaz para favorecer la trombosis del saco.

Reparación endovascular de aneurisma de aorta yuxtarenal mediante la técnica en chimenea a las dos arterias renales

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Introducción
Aproximadamente un 20-50% de los pacientes con un aneurisma de aorta abdominal (AAA), que no son candidatos para una cirugía abierta, no tienen un anatomía favorable para los dispositivos convencionales disponibles para la reparación endovascular de los mismos (EVAR). El cuello aórtico proximal es uno de los factores limitantes y representa el indicador más importante para el éxito o fracaso de esta técnica.

Caso Clínico
Varón de 66 años con antecedentes de HTA, DMNID, hipercolesterolemia, exfumador, cardiopatía isquémica sin revascularización coronaria, insuficiencia renal leve (Creatinina: 1,4mg/dl), bloqueo auriculo-ventricular de primer grado, bocio multinodular y claudicación intermitente glútea en el miembro inferior derecho a corta distancia.

A la exploración presentaba pulso femoral izquierdo con ausencia de femoral derecho, poplíteos y distales bilaterales, así como un abdomen muy globuloso con discreta hiperpulsatilidad.

En el AngioTAC abdominal y de miembros inferiores se evidenciaba un AAA yuxtarrenal bilobulado de 6.3 cm de diámetro con una marcada ateromatosis calcificada en toda la aorta e ilíacas, una estenosis significativa en la arteria iliaca externa derecha (IED) y el resto de ejes arteriales permeables.

En la radiografía de tórax se apreciaba un ensanchamiento del mediastino superior y signos de broncopatía crónica, realizándose TAC de tórax que informaba de elongación de la aorta torácica y bocio multinodular.

Por las comorbilidades del paciente y un riesgo anestésico ASA IV, se descartó la opción de una cirugía abierta y se planteó el tratamiento endovascular del AAA como única opción; al tratarse de un aneurisma yuxtarrenal, se discutieron como opciones terapéuticas una endoprótesis fenestrada o una EVAR en chimenea, decidiéndonos por esta última por la disponibilidad inmediata de los dispositivos necesarios así como por su menor coste económico.

Se realizó la exclusión endovascular en técnica de chimenea, bajo anestesia general, mediante una endoprótesis bifurcada Endurant (Medtronic®) de 36x16x145 mm, utilizándose como vía de acceso la femoral derecha tras angioplastia de IED con balón de 7mm, stents recubiertos expandibles con balón en ambas arterias renales ADVANTA (6x38 y 7x38 mm) (vías arterias humerales), tres extensiones a iliacas comunes y stent autoexpandible en IED (8x40 mm) al finalizar el procedimiento.

El paciente fue dado de alta de la Unidad de Reanimación Postquirúrgica en menos de 24 horas y no precisó transfusiones; a la exploración pulsos femorales, poplíteos y tibial posterior derecho presentes. La radiografía abdominal de con-

trol confirmaba un buen posicionamiento de las endoprótesis, siendo dado de alta con función renal conservada (Creatinina: 1,7 mg/dl).

En el AngioTAC al mes, no se evidenciaban endofugas estando los stents renales permeables; la función renal se mantenía estable (Creatinina: 1,7 mg/dl).

Conclusiones
En nuestra experiencia esta técnica es una alternativa en AAA con zonas de anclaje proximales desfavorables, cuellos aórticos cortos o con una excesiva angulación, permitiendo además utilizar dispositivos convencionales de rápida disponibilidad y sin elevado coste económico.

Postprocedure CT evaluation of endovascular and hybrid repair of complex aortic aneurysms: a pictorial review

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PURPOSE/AIM OF THE EXHIBIT
1.- To introduce the different strategies available in the management of complex thoracoabdominal aortic diseases.

2.- To illustrate the ability of multidetector CT with MPR, MIP and VR reconstructions to improve the readers' understanding of the grafts and it's relationship to normal arterial branches.

CONTENTS
1.- Define thoracic, thoracoabdominal and abdominal aortic aneurysms with complex anatomy

2.- Describe techniques of management of complex aortic diseases:
• Hybrid repair: combined surgical and endovascular strategies
• Complex endovascular techniques
- Fenestrated endografting
- Branched endografting

3.- Illustrate imaging findings using helical CT angiography of the different techniques described above: Normal findings including localization of the surgical and stent grafts in relation to the arterial branches

CONCLUSIONS/ SUMMERY
Knowledge of endovascular techniques, including hybrid repair, of complex aortic diseases is crucial for radiologists to provide the referring clinician information to determine appropriate clinical care.

MDCT, including vascular reformations, is the diagnostic test choice for treatment assessment.

Función renal en pacientes con AAA tratados mediante endoprótesis con oclusión intencionada de rama renal accesoria.

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Objetivos: El objetivo de este trabajo es relatar la experiencia en tratamiento endovascular de aneurisma de aorta abdominal en pacientes con ramas arteriales renales accesorias.

Material y métodos: En el periodo de febrero de 2008 hasta diciembre de 2010 se intervinieron 8 varones, portadores de AAA, mediante implante de endoprótesis con oclusión inten-

cionada de al menos una de las ramas arteriales renales accesorias. La edad media fue 72 (63-84) años. Ninguno de los pacientes tenía un aclaramiento de creatinina (según fórmula MDRD-4) menor de 55 ml/min/1.73 mE2. Antes del procedimiento se valoró por gammagrafía la posible repercusión de la oclusión de la rama accesoria sobre la función renal. Se recogieron datos referentes a función renal antes y a los 1, 3, 10, 30 y 90 días después de la intervención.

Resultados: No hubo fallecimientos y ningún paciente requirió hemodiálisis durante el periodo de seguimiento. En el postoperatorio inmediato 4 pacientes presentaron un cuadro de dolor leve en flanco abdominal que cedió con analgésicos. En el preoperatorio ningún paciente presentaba insuficiencia renal significativa (estadio mayor de 2 según clasificación DOQI). Se produjo incremento de los niveles de creatinina entre las primeras 24 y 72 horas siguientes a la intervención, con descenso posterior en todos los pacientes, salvo en un caso. A los 30 y 90 días todos presentaron niveles de creatinina en plasma semejantes a los basales.

No se observaron endofugas dependientes de las arterias renales ocluidas por la endoprótesis.

Conclusiones: El implante de endoprótesis con oclusión intencionada de ramas arteriales renales es una posible opción terapéutica en el tratamiento de AAA, con bajo riesgo para la función renal. La gammagrafía renal es importante en la valoración preoperatoria.

Exclusion of thoracic aorta aneurysm using the Amplatzer thoracic graft: preclinical evaluation in a large swine model

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AGA Medical Corporation

Introduction
Currently stent grafts for the thoracic aortic aneurysm exclusion are the covered stent grafts, which require a large delivery sheath for delivery and the grafts do not incorporate into aortic wall. Amplatzer Thoracic Graft (ATG) is designed with the features of low profile, recapturable, repositionable and integration of the aortic wall.

Objectives
To evaluate ATG for the exclusion of aneurysms in a swine model under Good Laboratory Practice (GLP) conditions.

Material used
Thoracic Aortic Aneurysms (TAA) were surgically created in 18 swine (58.2-87.6 kg) using a fusiform Dacron graft. ATG is a self-expanding tubular prosthesis consisting of two nitinol and two polyester layers of braid. It was mounted into a delivery catheter with a lock mechanism allowing fully recapture and reposition of the graft during implant. The graft was anchored at the proximal landing zone of the aneurysm with a folded and smooth nitinol braid edge.

Methodology used
About 2 weeks after the model creation, the graft was implanted using a 12F sheath. Angiography was performed to monitor the exclusion of the aneurysm. Pressure measurements were performed above, in the middle of and below the graft, respectively. Animals were followed up at 1 week, 1 month, 3 months and 6 months, and afterwards euthanized for pathology examination.

Results of the study
The maximal diameter of the aneurysm was 30-36 mm (32.3±1.7 mm). The length of the aneurysm was 40-60 mm (47.9±4.9 mm). The diameter of aorta nearby the aneurysm was 15-19 mm (16.8±1.3 mm). The diameter of the graft used in this study was 18-21 mm (18.9±1.1 mm). Graft implantation was technically successful in all 18 cases. Recapture and reposition of the graft were tried at 10 implants without any issues. Aneurysm exclusion rates by angiography and ultrasound were 83.3% after implant, 94.4% at 1 week, and 100% at 1 month, 3 months and 6 months. All implanted grafts remained stable in the implanted position throughout the course of the study. Three animals were out from the study after 1 week follow up. Two of the three animals died at day 8 from ileus/duodenal rupture and bleeding gastric ulcer respectively; the other animal was euthanized at day 14 because of lameness and health concerns. Although increased joint fluid was observed, the brain was normal microscopically and the exact cause for the lameness remained unclear. One animal was sudden death when feeding. Pathology demonstrated generally optimal healing of the grafted aorta and aneurysm characterized by inclusion of the graft in organized, maturing and stable neointima. All the aneurysms were full excluded and filled by organized thrombus.

Conclusions of the study
Endovascular exclusion of TAA was achieved using a novel metal/fabric hybrid graft in an animal model. The ATG offers the advantages of low-profile introduction, reposition / recaptureability and incorporation into aortic wall with neointimal coverage of the graft surface for aneurysm exclusion.

Endovascular abdominal aneurysm repair using the Cook Zenith Graft. A single center experience

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Introduction. Benefits of endovascular aneurysm repair have been published in several reports. The Zenith endograft is a third-generation device that is widely used for EVAR.

Objective. The aim of this study is to present our single-center results of the Cook Zenith endograft after a mean follow-up of 66.4 months.

Material and Methodology. Between September 1998 and October 2003, 143 patients underwent elective endovascular aneurysm repair using the Cook Zenith endograft. Data from these patients were reviewed from a prospective database in October 2008. Primary outcome measures were overall survival, intervention-free survival, and freedom from aneurysm rupture. Secondary outcome measures were early and late postoperative complications, including endoleaks.

Results of the study. Mean follow-up was 66.4 months. Overall survival was 72.1% at 5 years and 63.8% at 8 years. There were no reinterventions-related deaths. Six patients had late aneurysm rupture, which was fatal in three. Freedom from aneurysm rupture was 98.1% at 5 years and 91.0% at 8 years. Late complications occurred throughout the follow-up period, with a tendency for aneurysm rupture and surgical conversion to occur at a later stage in follow-up period. Aneurysm sac enlargement during follow-up was associated with late aneurysm rupture and with need for reintervention.

Conclusion of the study. Elective EVAR using the Cook Zenith endograft provides excellent results through a mean follow-up of >5 years.

There is a low aneurysm-related mortality and an acceptable rate of postoperative complications and reinterventions. The occurrence of late complications throughout the follow-up period stresses the need for continued postoperative surveillance in EVAR patients.(Accepted for publication J Vasc Surg 2011)

Lesión radionecrótica a nivel de la arteria innominada

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INTRODUCCIÓN

Las lesiones radionecróticas a nivel de los troncos supra-aórticos (TSA) son extremadamente raras. Su tratamiento, debido a la dificultad de acceso quirúrgico, la gran fibrosis producida por la radiación y la proximidad de importantes estructuras vasculo-nerviosas susceptibles de ser lesionadas, supone un reto para el cirujano vascular.

OBJETIVO

Presentamos dos casos de lesión radioterápica de la arteria innominada con sangrado agudo y alto riesgo quirúrgico, que fueron tratados satisfactoriamente mediante colocación de endoprótesis.

CASOS CLÍNICOS

Se trata de dos pacientes que acudieron a urgencias por presentar un sangrado activo por radionecrosis: la primera, a nivel de hemotórax izquierdo después de mastectomía y radioterapia para el tratamiento de cáncer de mama; la segunda, a través de una fístula cutánea sangrante a nivel esternal como secuela del tratamiento quirúrgico y radioterápico por cáncer de tiroides. La arteriografía intraoperatoria realizada por punción femoral, mostró en ambos casos la existencia de un pseudoaneurisma en el origen del tronco braquiocefálico. Mediante abordaje quirúrgico de carótida común derecha se colocó una endoprótesis Wallgraft (Boston Scientific) por vía retrógrada, logrando la exclusión del pseudoaneurisma y la es-

tabilización hemodinámica de las pacientes. La oclusión del origen de la arteria subclavia derecha fue bien tolerada y no presentó repercusión clínica posterior.

Una paciente permaneció asintomática, con remisión de la lesión en angio-TAC de control a los 6 meses de evolución.

La otra, por el contrario, presentó un cuadro de mediastinitis a los 3 meses de seguimiento a través de la fístula cutánea que no respondió a antibioterapia, falleciendo a pesar del sellado completo del pseudoaneurisma.

CONCLUSIÓN

Aunque las lesiones vasculares actínicas suelen ser estenooclusivas, se presentan dos excepcionales casos de pseudoaneurisma por radionecrosis de los TSA. Las técnicas endovasculares, en comparación con la cirugía convencional, permiten un rápido diagnóstico y tratamiento de este tipo de lesiones, mejorando la morbi-mortalidad asociada al tratamiento quirúrgico y logrando el manejo óptimo del paciente en una situación vital crítica. La evolución a largo plazo, sin embargo, depende de la progresión de la enfermedad y de sus complicaciones clínicas.

Tratamiento Endovascular en caso de arteriopatia polidistrectual de la pierna y de las arterias del pie, con utilizo de DEB a nivel del LOOP.

Palena, L.M.; Cester, G.; Manzi, M.

Policlinico Abano terme.

Introduccion

Desde sus primeras aplicaciones, la PTA de las arterias tibiales y del pie se ha demostrado tecnicamente posible y segura.
La patologia polidistrectual, generalmente presente en los pacientes diabeticos, hace si que el tratamiento endovascular sea complejo, con necesidad de revascularisación a distintos niveles del árbol vascular arterioso.

Actualmente el mayor desafío es vencer la re-estenosis de los vasos tratados mediante PTA. La solución podria estar en los nuevos materiale disponibiles, en particular en los balones liberadores de farmaco, que deberian garantizar la disminución de las re-estenosis, mejorando la permeabilidad de las arterias tratadas.

Caso

Paciente de 70 aňos, sexo masculino, con diagnosis de Critical Limb Ischemia y arteriopatia polidistrectual de la pierna y del pie, precedentemente sometido a tratamiento endovasccular a nivel de la arteria femoral superficial, con implante de multiples stents.

El paciente presentaba diabetes de tipo II, hipertensión arteriosa y dislipidemia, como factores de riesgo.

La concentración de oxígeno transcutanea (TcpO2) a nivel del pie era de 7 mmhg y el paciente presentaba dehiscencia sobre amputación del cuarto dedo (lesion III D seg. TUC).

El estudio angiográfico, precedente al tratamiento, demostraba obstrucción de la arteria femoral superficial con reabitación de la arteria poplitea, obstrucción de los tres vasos tibiales al origen y reabitación de la arteria tibial posterior. A nivel del pie permeabilidad de las arterias plantares y del tracto proximal de la arteria pedidea, obstruida la arcada pedalico-plantare.

Durante el tratamineto fueron dilatadas la arteria femoral superficial, la poplitea, las arterias tibiales, la arteria plantar lateral, la pedidea y la arcata pedalico-plantar, utilizando el balon liberador de farmaco a este último nivel.

Comentarios

La situación inicial imponia el tratamiento completo de todo el árbol arterioso de la pierna y del pie, incluida la arcada pedalico-plantar. Durante el procedimiento se decidió de utilizar un balon liberador de farmaco en la arcada, con el objetivo de aumentar el run-off de las arterias digitale, incrementando el flujo sanguìneo hacia los dedos y mejorando la permeabilidad de las arterias tibiales en el tiempo.

El procedimiento fue realizado con multiples guias, combinando distintas tecnicas (recanalizacion subintimal, pedal-plantar LOOP technique, etc), en un verdadero tratamiento de Limb and Foot Salvage, obteniendo un resultato excelente, con permeabilidad de todas las arterias de la pierna y del pie, restableciendo el flujo sanguineo hacia todos los dedos.

Conclusiones

El caso demuestra que es posible el tratamiento endovascular, en casos extremamente complejos, combinando distintas tecnicas y distintos materiales. Los balones liberadores de farmaco representan una alternativa en la batalla contra la re-estenosis. En los casos con patologia muy extendida, visto que actualmente no es posible tratar todos los vasos comprometidos, utilizar esta tecnologia distalmente podria garantizar un run-off adecuado y de consecuencia mejorar la permeabilidad de las arterias a monte, mejorando a su vez el flujo distal.

Nueva técnica para tratar la obstruccion intra-stent a nivel de la arteria femoral superficial (¿MAPACE Technique?), en paciente diabético, con diagnosis de CLI

Palena, L.M.; Cester, G.; Manzi, M.

Policlinico Abano terme (1)

Introduccion
La re-obstrucción es una complicación frecuente del posizionamento de stent, en el tratamiento endovascular, en particular a nivel de la Arteria Femoral Superficial. Las opciones terapeuticas son la cirugia vascular o el tratamiento endovascular. El tratameitno endovascular es la opción menos agresiva, pero en la mayor parte de los casos resulta dificultoso atravesar el stent obstruido. Proponemos un caso tratado con acceso endovascular, poniendo en practica una nueva tecnica dedicada a la revascularización de el stent obstruido (MAPACE Technique).

Caso
Paciente de 57 aňos, sexo femenino, con diagnosis di CLI. El paciente habia sido precedentemente sometido a tratamiento endovascular a nivel de AFS, con implante de multiples stents, el estudio Eco-colordoppler demostraba obstrucción de los stent anteriormente implantados. Los factores de riesgo eran Diabetes tipo II, hipertensión arteriosa, dislipidemia y cardiopatia isquemica. El paciente no presentaba lesiones ulceradas al pie pero presentaba claudicatio intermitens a 50 metros. El estudio angiografico, precedente al tratamiento, demostraba obstrucción de la arteria femoral superficial con reabitación de la arteria poplitea y rotura de los stents anteriormente implantados.

A nivel de los vasos tibiales la arteria tibial anterior y posteriore estaban obstruidas, la arteria interosea se presentaba obstruida al tracto proximal y permeable el tracto distal. A nivel del pie los ramos perforantes de la arteria interosea revascularisaban la arteria plantar lateral y un ramo tarsal.

Despues de numerosos intentos, infaustos, de cruzar el stent obstruido a traves del accesso anterogrado a nivel de la arteria femoral común, se decidió de crear un accesso retrogrado, directo a nivel del tracto distal del stent, con recanalización del stent, rendez-vous, posicionamiento de una guia en direccion del flujo y revascularización de la arteria Poplitea e de la arteria interosea, con excelente resultado final.

Comentarios
Restablecer el flujo sanguineo en los casos con stents obstruidos puede resultar muy dificultoso, sobre todo en los casos de obstrucción cronica. La alternativa es realizar una recanalización subintimal, que comporta implantar un nuevo stent (doble stent), con el claro riesgo de re-obstrucción. Esta nueva tecnica, "MAPACE Tecnique" permite de realizar la revascularización de o de los stent obstruidos, a nivel de la arteria femoral superficial, sin aumentar significativamente el tiempo del tratamiento, evitando el implante de nuevos stents.
No se verificaron complicaciones durante o post-tratamiento (trombosis aguda, embolia o hematoma).

Conclusiones
La tecnica "MAPACE" es una segura y efectiva alternativa para el tratamiento de revascularización de los stent obstruidos, despues de numerosos intentos fallidos de cruzar a traves del stent con el accesso anterógrado.

Endovascular urgent treatment of ruptured bilateral iliac aneurysm

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Introduction: Iliac Aneurisms aren't so frequent, but most often they present ruptured and in this case they are burdened with high postoperative mortality rate that's higher in case of hypogastric aneurisms.

A 57-yrs-old man was urgently admitted because an abdominal pain lasting more than 24 hours. At the physical examination there was an abdominal tenderness, with hypotension and low haemoglobin.

Clinical case: The patient had a significant medical history, of terminal chronic renal insufficiency, chronic obstructive pulmonary disease, coronary disease already grafted, cirrhosis, arterial hypertension, and known iliac artery aneurysm.

The patient underwent an aortic graft 11 yrs before because an abdominal aortic aneurysm. The 5 yrs MR-angiography showed the regular patency of the graft but also the presence of around 3 cm bilateral hypogastric aneurysm, Confirmed by arteriography.

The urgent abdominal CT performed at the admission showed the bilateral hypogastric aneurysms of which the one of right was dominant with 9 cm diameter, presenting a contained rupture. Considering the comorbidities and because the pt was stable, it was decided to treat him by endovascular procedure. We emploied an ANACONDA® endograft.

The arteriographic control showed a type 1 leak because the left hypogastric aneurysm wasm't covered, so we overcame it by a Zenith extension leg of the same daiàmider but the arteriography showed the persistence of the leak although reduced; we considered it as cause of an inefficient sealing at the level of the overlapping zone between the left leg and the extension; so we performed the ballooning of this area with the resolution of the leak. The anterograde arteriography showed the patency of the endograft although the presence of a leak type 3 at the level of the overlapping zone between the body and the left leg that we fixed with another Cook limb extension of the same diameter.
The pt did well and he was discharged after 5 days. The 1 month post-EVAR abdominal CT confirmed the regular attitude and patency of the graft with occlusion of the hypogastric aneurysm.

Conclusion: The surgical treatment of ruptured hypogastric aneurisms, because the anatomic location, is a complex act, burdened with high mortality rate. Up to date the endovascular approach can be considered the first line treatment of ruptured hypogastric aneurisms

Is it worth the EVAR treatment in complicated abdominal aortic aneurysm ?

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Vascular Surgery Unit (1); Interventional Radiology (2)

Introduction: EVAR decreased overall morbidity and mortality associated with Abdominal Aortic Aneurysm (AAA), but not all the patients are regularly fit for EVAR because complex anatomic features.

Objectives: Authors prospectively compare results of EVAR treatment in complicated and normal AAA. End point: postoperative major complications (acute limb ischemia, end stage renal insufficiency, infections, stroke,paraplegia) and mortality, matched with preoperative variable.

Material used: From January 2005 to December 2010, 109 pts (100 men and 9 women) underwent EVAR treatment. We considered as complicated AAA: aortic anastomotic AAA (4 pts), more than 7 cm of diameter (17 pts), class C - D - E AAA (22 pts), an aortic and/or iliac angulation more than 60° (23 pts) and an associated iliac aneurysm (17 pts).

Methodology used: Continous variables were evaluated by t Student test and categorical variables by $\chi 2$ test. We compared Group 1 (complex AAA) 48 pts and Group 2 (normal AAA) 61 pts.

Result of the study: The mean age was 72.4 yrs (range: 51 – 87) (DS:7.1). Group 1 mean age was higher (74.8 vs 70.6) $p<0.05$.
Group 1 had older pts (58% vs 32%) $p<0.005$, more cardiac pts (88% vs 80%) p=ns, the AAA was more than 6 cm (48% vs 16%) $p<0.005$, more branch graft occlusion (6.5% vs 5%) p=ns, more leaks (10.5% vs 6.5%) p=ns, more hybrid procedure (15% vs 3%) $p<0.05$, more technical pitfalls (8.5% vs 6.5%) p=ns, more aorto-uniliac graft (10.5% vs 5%) p=ns and higher mortality (4.5% vs 3.5%) p=ns.
Higher postoperative major complication rate was found in:

Group 1 young pts (15% vs 3.5%) p=ns, than Group 2 (12% vs 11%) p=ns,
Group 2 big AAA (20% vs 10%) p=ns, than Group 1 (9% vs 8%) p=ns,
Group 1 cardiopatic pts, (17% vs 7%) p=ns, than Group 2 (8% vs 12%) p=ns,
Group 1 aorto-uniliac graft (40% vs 5 %) $p<0.01$, than Group 2 (0% vs 12%) p=ns,
Group 2 hybrid procedures (50% vs 10%) $p<0.05$, than in Group 1 (14% vs 7%) p=ns,
higher postoperative mortality rate was found in
Group 1 young pts (15% vs 0%) $p<0.05$, than Group2 (5% vs 0%) p=ns,
Group 1 little AAA (12% vs 5%) p=ns than Group2 (4% vs 0%) p=ns,
Group 1 cardiopatic pts, (17% vs 2.5%) p=ns, than Group 2 (0% vs 4%) p=ns,
Group 1 aorto-uniliac graft pts (20% vs 5%) p=ns, than Group 2 (0% vs 4%) p=ns,
Group 1 hybrid procedures (14% vs 5%) p=ns, than in Group 2 (0% vs 3.5%) p=ns,
During the FU, we obtained 98% cumulative survival rate at 5 yrs in Group 1, and 86% at 9 yrs in group 2.

Conclusion of the study: Pts with Complex AAA are significantly older, with bigger AAA and require more hybrid procedures.

Complex AAA postoperative major complication rate is only affected by the aorto-uniliac graft while postoperative mortality rate is affected by younger age. EVAR in complex anatomic features is a skill.

Experiencia inicial con la endoprótesis Aorfix. Resultados de lo 40 primeros pacientes

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Objetivos: Describir los resultados iniciales de los primeros 40 pacientes con Aneurisma de Aorta Abdominal (AAA) tratados con la endoprótesis Aorfix® (Lombard) en nuestro centro.

Material y métodos: De Junio-2007 a Enero-2011 fueron intervenidos 40 pacientes (2 mujeres), de edad media 71,33 años (55-87), con HTA (83,3%), dislipemia (63,3%), cardiopatía isquémica (40%) e insuficiencia renal (30%) como principales problemas asociados. Todos presentaban un AAA infrarrenal quirúrgico que cumplía con los requisitos para la técnica endovascular. De ellos, 18 presentaban aneurisma de 1 ó 2 ilíacas y 8 una angulación mayor de 45°. La anestesia fue raquídea (73,3%). El acceso vascular fue la disección femoral bilateral. El tiempo medio quirúrgico fue de 77,5 minutos (45-190). En 13 casos fue preciso emplear extensiones distales y 2 necesitaron extensiones proximales.

Resultados: En 4 casos se detectó una endofuga inicial, 2 tipo II y 2 tipo IV. En un caso fue preciso reparar una rotura de arteria ilíaca externa. Se produjo una disección Stanford B aguda retrógada hasta subclavia izquierda, tras balonear la endoprótesis, con una endofuga tipo Ia por llenado de la falsa luz en el saco. Se reparó mediante una endoprótesis torácica (Relay, Bolton) y un Stent aórtico XL (Jotec) entre ambas prótesis, que solucionó ambos problemas.

Tras un seguimiento medio de 17,3 meses (1-38), el 86% presentan una trombosis del saco, de ellos, en el 92,3% hay una reducción significativa del diámetro aneurismático.

Tres pacientes presentan una endofuga tipo II sin complicaciones. Se ha reintervenido un paciente por endofuga tipo Ib mediante extensión ilíaca. Un paciente ha fallecido por causa ajena al aneurisma. No hubo complicaciones en los casos angulados.

Conclusiones: Aorfix® tiene un comportamiento igual de bueno que el resto de dispositivos en casos convencionales. Su flexibilidad y adaptabilidad permiten abordar cuellos muy angulados con resultados esperanzadores.

Tratamiento híbrido de malformaciones en el arco aórtico. A propósito de un caso

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INTRODUCCIÓN: Hasta hace muy poco la cirugía era la única opción terapéutica en el tratamiento de patología en el arco aórtico, asociándose a cada procedimiento tasas de morbimortalidad nada despreciables. La combinación con técnicas endovasculares, llevadas a cabo por equipos multidisciplinares, se presenta como una alternativa válida logrando buenos resultados en el tratamiento de malformaciones complejas de arco aórtico.

OBJETIVOS: Describir y analizar la técnica adoptada en la resolución de una malformación infrecuente del arco aórtico mediante la combinación de cirugía convencional y técnicas endovasculares llevada a cabo en nuestro hospital.

MATERIAL Y MÉTODO: Paciente varón de 73 años, exfumador, diabético, dislipémico y cardiópata filiado, que, tras dos años de evolución consulta por tos irritativa "incurable" y ronquera. Se realiza una aortografía torácica que revela una variante de la normalidad en el origen de troncos supraaórticos consistente en: primer tronco común que se bifurca en A. Carótida derecha e izquierda, seguido del origen de A. Subclavia izquierda (ASI), y pegado a ella, salida en cara medial del arco de A. Subclavia

derecha (ASD) aneurismática en segmento proximal, que cruza hasta llegar a hemicuerpo derecho. Tras el diagnóstico, se realiza bajo anestesia general en un quirófano híbrido la implantación endovascular de prótesis Aórtica Relay Plus® (36x145mm) provocando la oclusión intencionada de ASD, junto a bypass subclavio-subclavio con injerto de Dacron® anillado (8mm) y ligadura de ASD aneurismática. No se dan complicaciones intraoperatorias. Finalmente, se comprueba mediante angiografía la exclusión de la anomalía y el buen funcionamiento del bypass ASD-ASI.

RESULTADOS: Tras 5 días de postoperatorio el paciente es dado de alta con pulsos distales positivos en ambas EESS, con las heridas en proceso de cicatrización y sin tos irritativa ni ronquera. Un mes tras el procedimiento, permanece asintomático y en el TAC de control no se objetivan endofugas.

CONCLUSIONES: El aneurisma de arteria subclavia es una identidad infrecuente y con una expresión clínica muy escasa, que cuando existe, produce disfagia por compresión o bien disfonía o ronquera por parálisis del nervio laríngeo recurrente. La prueba complementaria de elección para su diagnóstico es la arteriografía, ya que, además de descartar la existencia de aneurismas a otro nivel, sirve para evidenciar el eventual origen anómalo de la arteria subclavia afecta. Hasta hace poco, la única posibilidad era el tratamiento exclusivamente quirúrgico, lo que suponía altas tasas de morbimortalidad asociadas al procedimiento.

En la última década, el manejo terapéutico de esta afección ha experimentado un notable avance. El creciente interés que despiertan las técnicas endovasculares y la formación de equipos multidisciplinares suponen una alternativa válida y efectiva frente a la cirugía aislada, consiguiendo muy buenos resultados con una disminución considerable de las complicaciones y entrando a formar parte del arsenal terapéutico del que disponemos para resolver malformaciones complejas en el arco aórtico.

Towards Safer Carotid Artery Stenting: Validation of the Scoring System for Anatomic Suitability for CAS with Simulated Procedure Rehearsal.

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INTRODUCTION: Carotid artery stenting (CAS) is a technically demanding procedure with a risk of causing strokes. A scoring system based on anatomic criteria has been developed by experts to facilitate appropriate case selection for CAS. Recent advancements in simulation science also permit case evaluation through patient-specific simulated rehearsal (PsR), by incorporation of DICOM datasets into the simulation software. This enables the interventionalist to rehearse the case on an endovascular simulator prior to the procedure on the actual patient. This study aimed to validate the expert derived scoring system using the PsR technology and to evaluate whether patient cases of varying difficulty, graded according to the scoring system, influence performance parameters.

MATERIALS: Novice interventionalists were recruited into the study. Three patient cases of varying difficulty were selected out of a database, according to the scoring system (maximum score of 9). One case was considered easy (score :< 4.9), one intermediate (5.0-5.9) and one difficult (> 7.0). These real patient cases were incorporated into the simulation software and hardware after 3D levelset segmentation of the CT datasets.

METHODS: All novice interventionalists were pretrained in the CAS procedure by standardized cognitive and technical training sessions. Following training, each participant performed the patient-specific CAS cases on a high fidelity simulator in a randomized order. Technical performance was assessed using simulator-based dexterity metrics. The quality of the procedure was assessed by expert-based video ratings using the global rating scale (GRS) and the procedure specific rating scale (PSRS) for CAS.

RESULTS: Twenty novice interventionalists were enrolled. The interventionalists took significantly more time to perform the difficult CAS case (median 31.6 vs. 19.7 vs. 14.6min, $p<0.0001$) in comparison to the intermediate and easy case; more fluoroscopy (20.7 vs. 12.1 vs. 8.2min, $p<0.0001$), contrast volume (56.5 vs. 51.5 vs. 50.0ml, $p=0.0060$) and roadmaps were used (10 vs. 9 vs. 9, $p=0.0040$). Furthermore the total time needed to catheterize the CCA (2.8 vs. 7.0 vs. 15.8 min, $p<0.0001$) and to catheterize the ICA (1.3 vs. 1.1 vs.1.7 min, $p=0.0020$) increased significantly with increasing case severity. The quality of the performance, as measured by expert-based ratings, declined significantly as the cases became more difficult for both the GRS (median scores 30 vs. 27 vs. 25 $p<0.0001$) and also the PSRS (median scores 24 vs. 22 vs. 19, $p<0.0001$).

CONCLUSION: The Delphi derived anatomic scoring system for CAS can adequately predict the difficulty of a CAS procedure as measured by patient-specific rehearsal on an endovascular simulator. This scoring system, with or without the additional use of PsR, can guide novice interventionalists in selecting appropriate patients for CAS. This may reduce the perioperative stroke risk and improve patient safety.

Utilidad del stent aórtico XL en el tratamiento endovascular de la patología aórtica

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Objetivos: Mostrar la utilidad y polivalencia del Stent aórtico XL (Jotec) en 3 diferentes situaciones que se pueden presentar cuando se emplean técnicas endovasculares para el tratamiento de la patología aórtica.

Material y métodos: Caso1: paciente de 71 años que presenta Aneurisma de Aorta Abdominal (AAA) al que se le implantó endoprótesis aorto-biilíaca (Jotec). En la angiografía de control se evidenció endofuga tipo la persistente tras remodelado con balón. Se implantó Stent XL desde aorta diafragmática hasta bifurcación protésica.

Caso 2: paciente mujer de 73 años con AAA que tras implantar endoprótesis Aorfix (Lombard), presentó disección Stanford B retrógrada hasta subclavia izquierda, además de endofuga tipo I por llenado de falsa luz en el saco. Tras implantar una endoprótesis torácica (Relay, Bolton), se colocó un Stent XL entre ambas prótesis, colapsando la falsa luz y eliminando la endofuga.

Caso 3: Paciente de 72 años que presenta una disección Stanford B crónica desde subclavia izquierda hasta femoral común derecha. Tras presentar agudización con dolor lumbar y aneurisma de la falsa luz, es tratado mediante endoprótesis torácica (Jotec) y 2 Stent XL en la aorta abdominal, desde la prótesis torácica hasta la bifurcación en ilíacas, consiguiendo la trombosis de la falsa luz a nivel torácico y minimizando el llenado a nivel abdominal.

Resultados: En los sucesivos controles, los casos 1 y 2 presentan trombosis del saco aneurismático sin complicaciones y en el caso 3 únicamente se aprecia un leve llenado de la falsa luz abdominal, sin crecimiento en el diámetro, estando el paciente asintomático.

Conclusiones: El Stent aórtico XL es una herramienta útil en el tratamiento de las disecciones aórticas y de las complicaciones del tratamiento endovascular de los aneurismas de la aorta abdominal.

Tratamiento endovascular del aneurisma de aorta abdominal, seguimiento a los 5 años

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INTRODUCCIÓN: El tratamiento endovascular del aneurisma de aorta abdominal reduce la agresión quirúrgica, con disminución de la morbilidad y mortalidad perioperatoria, pero aún se están dilucidando sus resultados y complicaciones a largo plazo. El seguimiento resulta fundamental en los pacientes sometidos a este tipo de cirugía, principalmente de cara a la detección de endofugas.

OBJETIVOS: Analizar los resultados del tratamiento de aneurismas de aorta abdominal mediante implante de endoprótesis de forma electiva a los cinco años de seguimiento.

MATERIAL Y MÉTODOS: Se recogieron los pacientes intervenidos de forma programada entre enero de 2001 y febrero de 2006: 81 pacientes, el 100% varones, con una edad media de 71 años (rango entre 51 y 86). Se llevó a cabo un análisis retrospectivo de morbi-mortalidad perioperatoria, estancia hospitalaria, mortalidad global, endofugas y reintervenciones en un período de 5 años tras la cirugía.

RESULTADOS: El éxito técnico inicial fue del 95%, con implante de dispositivos bifurcados en el 75% d los pacientes, 25% aorto-monoilíacas y 2% de reconversiones de bifurcada a

aorto-monoilíaca. La estancia en UVI fue de 1,3 días y en planta 4,4. La morbilidad perioperatoria global fue del 11%. A los 5 años se produjo un 10% de pérdidas para el seguimiento, y un 33% de mortalidad, fundamentalmente a expensas de neoplasias y causa cardiovascular, con 2 éxitus relacionados con el aneurisma. En cuanto a complicaciones, la más frecuente fue la existencia de endofugas, un 23% de los pacientes seguidos, con predominancia de las tipo 2 (70%) y un 9% de reintervenciones durante el seguimiento.

CONCLUSIONES:
El tratamiento endovascular del aneurisma de aorta aporta en nuestra experiencia buenos resultados, con un porcentaje bajo de reintervenciones y complicaciones a largo plazo.

Valoración prospectiva de los eventos embólicos cerebrales en el stenting carotídeo: flujo reverso transcervical vs abordaje transfemoral con filtro distal

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Introducción
La embolización cerebral durante el stenting carotídeo constituye una importante fuente de complicaciones neuroisquémicas perioperatorias siendo hoy en día la neuroprotección un standard de uso en el intervencionismo carotídeo.

Objetivos
Valorar la incidencia de aparición de nuevas lesiones isquémicas cerebrales tras el stenting carotídeo, comparando la neuroprotección con flujo reverso transcervical frente al abordaje transfemoral con filtro distal.

Material utilizado
En un periodo de 22 meses, 64 pacientes consecutivos diagnosticados de estenosis carotídea significativa tras estudio ultrasonográfico fueron tratados mediante angioplastia y stent carotídeo, siendo secuencialmente asignados a dos grupos de tratamiento: acceso transcervical con flujo reverso (n=31) y abordaje transfemoral con filtro distal (n=33).

Métodos utilizados
Además de la monitorización clínica, en todos los casos se realizó una Resonancia Magnética Nuclear (RMN) de difusión-perfusión dentro de las 24 horas anteriores y posteriores a la cirugía.

Ambas secuencias de imágenes fueron comparadas de forma ciega e independiente por un neuroradiólogo no implicado en el estudio, siendo cualquier nueva señal hiperintensa en la secuencia de difusión perfusión interpretada como una lesión postoperatoria isquémica. Todos los pacientes fueron revisados clínica y ultrasonográficamente a los 30 días, 6 meses y 1 año.

Resultados del estudio
44 de los 64 individuos reclutados (69%) fueron considerados sintomáticos en el momento del diagnóstico, sin encontrarse diferencias significativas entre los grupos transcervical / transfemoral en la distribución de esta característica ($p = 0,748$) ni de ninguna otra variable epidemiológica basal.

No se observaron eventos neurológicos durante las intervenciones, en el postoperatorio inmediato, ni en el seguimiento en ninguno de los dos grupos, permaneciendo todos los pacientes sin fluctuaciones en su estado neurológico. En la comparación de las secuencias de difusión perfusión pre y postoperatorias se encontraron nuevas lesiones en 4 de los 31 pacientes del grupo transcervical (12,9 %) y en 11 del grupo transfemoral (36,3%), todas ellas asintomáticas, siendo estos resultados estadísticamente significativos ($p=0,03$) a un nivel de significación del 5%. En el análisis multivariante, la edad (Riesgo Relativo – RR- 1,022, $p<0,001$) el estado síntomatico (RR 4,109, $p <0,001$) y el tipo de stent empleado (celda abierta frente cerrada, RR 2,021, $p<0,04$) se comportaron como factores de riesgo independiente de embolización en el grupo transfemoral y no en el transcervical.

Conclusiones del estudio
Los resultados de este estudio sugieren de manera firme la existencia de diferencias significativas en la tasa de embolización aguda asintomática perioperatoria detectada mediante estudios de difusión cerebral entre el stenting carotídeo transfemoral con dispositivo de protección embólica distal y el abordaje transcervical con flujo reverso, pudiendo ser éste último una alternativa terapéutica más segura en pacientes especialmente susceptibles como los grupos sintomáticos y de edad avanzada.

Spontaneous Aortic Rupture due to Human Immunodeficiency Virus Associated Vasculitis: A Case I Wish I Hadn't Done

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Human Immunodeficiency Virus (HIV) associated vasculitis is a rare but important complication of HIV infection with potentially disastrous complications. Improvements in antiretroviral therapies and prolonged survival of HIV positive patients has meant that increased consideration is being given to the long term sequelae of HIV infection including cardiovascular complications. We report the case of a sixty-seven years old gentleman who was admitted to our services with spontaneous contained rupture of the suprarenal abdominal aorta as a side effect of accelerated atherosclroisis from antiretroviral therapies. His background medical history was significant for hypertension complicated by hypertensive nephropathy. On routine screening his VDRL serology was positive, thus a diagnosis of late latent syphilis was made and a course of benzylpenicillin commenced. He was negative for both Hepatitis B and C.

This man had recently been diagnosed with HIV-1 and was found to have been infected with treponema pallidum. It was thus decided to proceed with an endovascular repair. Access was achieved via bilateral groin incisions and a left brachial incision. The aortic main body graft comprised a Medtronic talent™ aortic graft (30mm x 30mm x 28mm). The right renal artery 'chimney graft' was a gore viabahnTM endoprosthesis (8mmx 50mm x 120mm) deployed via the left brachial artery.

The patient recovered well in the immediate post-operative period and was recommenced on antiretroviral therapy on the first post-operative day inspite we advised the infection control to stop his antiretroviral medications but our request was declined.

Follow-up CT scan demonstrated that the aortic stent was in a good position with complete patency of the right renal artery Histopathology of arterial wall specimen's demonstrated chronic inflammatory changes within the adventitia consistent with aortitis.

Two months later, however, he required emergency readmission and repeat CT angiogram confirmed recurrent rupture below the previous stent. The decision was made to reattempt endovascular intervention, involving placement of two further endologix stents (25mm x 25mm x 55mm and 34 x 34 x 80 mm) overlapping with the previous stent. He recovered well from this procedure and remained stable. His postoperative duplex scan on 3rd postoperative day did not show any endoleak. On day five postoperatively, this gentleman had a further hypotensive episode and following discussion with the patient and his partner the decision was made that he would not be for further intervention. He passed away two days later.

Subacute anterior spinal cord ischaemia with Lower limb monoplegia. A Clinical dilemma of a challenging scenario

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Lower limb monoplegia is an extremely rare presentation thoaco-abdominal aortic aneurysms.A 70 year old female who presented with a persistent right lower limb monoplegia. Following examination it was thought that this lady had anterior spinal artery syndrome after a MRI spine was undertaken which displayed a 8.5 cm Crawford type II thoracoabdominal aortic aneurysm (TAAA). After staged hybrid procedure she had complete exclusion of her TAAA and full resolution of her monoplegia.

This case depicts the ever challenging representations of TAAA.

Carotid artery endarterectomy (CEA) for symptomatic carotid artery disease (SCAD), crescendo transient ischemic attacks (CTIAS) stroke in evolution (SIE): indications and Results: a 5-Year experience.

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Indications for Emergency CEA are Litigious as acute carotid occlusion natural history without Surgery is Atrocious. Menace of CEA is Significantly Higher in Patients who are Neurologically Unstable.

Our aim is to conciliate Emergency CEA clinical success and efficacy in plummeting morbidity and mortality. Composite Primary Endpoints are Stroke/Death .Secondary endpoints are five year stroke free and survival free rate.

Between October 2002- October 2008, 1847 patients were evaluated with carotid stenosis>60%.The Predicted Probability of Receiving CEA; SCAD (300)Vs CTIAs (45) Vs SIE (14) was Tabulated for All Patients by Using Multiple Logistic Regressions to Control for Co-morbidity and Anatomical High-risk Factors .We Used Propensity Scoring To Adjust For Baseline Characteristics and Selection Bias By Matching Co-variables. Fast Track Clear Pathway for Symptomatic CAD Patients Permitted us to Identify, Triage and Manage in a Short Time Frame.

Mean Age was Similar Between SCAD, 68.6years; CTIAs, 69.1, p>0.05 but SIE patients were younger (67.2 years) than SCAD (p<0.01) or CTIAS (p<0.05) Groups .Co-morbidity Severity Score were Similar Between SCAD/CTAIs but Higher for SIE (p>0.05).

Total Stroke was 1.1% and Total Death was 0.8%.Combined Stroke / Death was 1.9% but 7% in SIE.

5-Year Stroke Free Survival for SCAD;87.9% +/- 3.53%, CTIAs;93.3% +/- 8.05% (p=0.818),SIE;92.9% +/- 11.07% (p=0.184) . 5-year Intervention Free Survival for SCAD;87% +/- 3.65%, CTIAs: 91.1% +/- 9.66% (p=0.889),SIE: 92.9% +/- 11.07% (p=0.23).

Crescendo TIAs are managed by CEA within 24 Hours. Patients that occlude under observation should be explored. Only Selected Patients are considered for Emergency CEA and Indicated if it propounds Improved Outcomes over Medical Treatment.

Thoracic abdominal endovascular aneurysm repair (TEVAR) in the management of Acute Aortic Syndrome (AAS). An early experience with de-branching, chimney techniques and Multi-Layer stenting.

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Acute aortic syndrome is a devastating diagnosis with high morbidity and mortality rates. AAS includes aortic dissection, intramural haematoma, penetrating atherosclerotic ulcer, traumatic transection or a thoracic aneurysm that has become unstable. We convey our early experience in management of AAS.

33 TEVAR procedures were performed for 31 patients (13 females: 18 Males) over a period of 36 months of which six were

emergencies. The mean age was 64.6 years. 17 patients were ASA Grade III or more with 3 patients with ASA grade Ve.

Risk factors were hypertension (n=20) followed by hypercholesterolaemia (n= 17), smoking (n=14) and ischaemic heart disease (n=9). 17 procedures were for thoracic abdominal aneurysms type three, 7 thoraco-abdominal aneurysms type four, 4 aortic dissection Type B, 1 infantile adult aortic coarctation and 2 spontaneous supra visceral aortic ruptures.

Seven patients underwent a one/ two stage hybrid debranching of visceral vessels followed by TEVAR. Fourteen patients underwent chimney or Snorkel Endografting of Subclavian or renal vessels. Two patients underwent multilayered stenting for thoraco-abdominal aneurysms with visceral involvement. One patient had a CPS stent for infantile adult coarctation.

Primary endpoints were 6% mortalities within 30 days for the two acute emergencies of which one was a HIV patient with syphilitic aneurysm. 30 day morbidity was one acute tubular necrosis and one lower respiratory tract infection.
Aneurysm free survival time was 19months. No patients developed aneurysm rupture, paraplegia or stroke. Four cases of endoleak were witnessed however no aneurysm expansion was experienced. Two patients experienced distal graft migration and required re-intervention.

We display from our experience that minimal invasive techniques with TEVAR and debranching, chimney or snorkel grafting of visceral vessels is safe, prudent and economically viable. The development of multilayered stenting technique looks ever promising for future management of complex aortic pathologies.

Aorto-Uni-iliac Vs Bifurcated Endovascular Aortic Repair: Technical Success, Secondary Intervention Rate and Quality-adjusted cost analysis

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Our endeavor is to contrast clinical and technical outcome of BIF vs AUI in high risk EVAR patients.

From 2002 to 2007, 82 high-risk patients underwent elective EVAR (BIF, n=52 [63.4%]; AUI, n=30[36.6%]). Mean Age 74yrs (BIF vs AUI, p=0.835), Male% (BIF vs AUI, 86.5%vs76.7%, p=0.260) and Mean Aneurysm Diameter (BIF vs AUI: 5.4cmvs5.3cm, p=0.514).

The predicted probability of receiving AUI was tabulated for all patients by using multiple logistic regressions to control for SVS co-morbidity and anatomical severity scores. We used propensity scoring to adjust for baseline characteristics and selection bias by matching co-variables, creating a pseudo-randomized control design. Primary endpoints were 30-day mortality, 4-year survival and 4-year intervention free survival.
Mean Proximal Endograft diameter was significantly lower with BIF (29.3 vs 30.9, p=0.031). Mean number of devices used was similar (3.0vs3.4, p=0.165).

BIF and AUI had similar 30-day mortality (1.9%vs0%, p=0.453), 4-year all-cause survival (72.1%vs74.0%, p=0.882, h=0.92 [95%CI=0.30-2.78]) and 4-yr Aneurysm-related Survival (98.1%vs100%, p=0.448). There was no graft migration or structural failure. There was no intervention required for Type II (23.1%vs36.7%, p=0.191). 4-yr Limb thrombosis Rate (7.6% vs 10%, p=0.723) and 4-yr Intervention-free survival (BIF 89.8% vs AUI 85.9%, p=0.612, h=0.71 [95%CI=0.18-2.76]) were similar. 4 year Fem-Fem cross over patency rate is 92.6% [95%CI=75.6%-98.6%].

There were no significant differences in procedure time, mean blood units and change in estimated glomerular filtration rate between groups (p>0.05). Length of Stay/HDU (4.2 vs. 7.4 p=0.021/ 0.87 vs. 1.2days, p=0.656) were similarly low, with the majority of patients discharged directly home (BIF vs AUI: 92%vs80%, p=0.103).

By using propensity scoring for the primary endpoints, the proportions of AUI patients were equal to BIF for all levels of probability and were unchanged as the probability of AUI increased. We established at 4 years that clinical and technical outcomes were not compromised with AUI compared to BIF in this high-risk cohort.

Combined Arterial And Venous Lower Limb Chronic Ulceration (CAVUS). An 8 years longitudinal observational study in a tertiary referral centre.

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Aim: The aim of this prospective study is to describe the role of endovascular surgery in the management of CAVUS.

Methods: Between July 2004 and August 2007, out of 345 revascularisation, 17 patients (6 males:11 females) were found with CAVUS and were offered one stage management with angioplasty /stenting along with level two dissection and SFJ ligation. Mean age is 74.3(range 54-87) and ulcer duration ranged from 6 months to 23 years. All but 1 were Rutherford category 5 and 14 patients were in TASC C and D. Patients were followed at 6week, 3,6,12, 18 months.

Results: 19 legs were treated in this study. 50% had angioplasty and stenting. All patients had Saphenofemoral ligations. Preoperative mean ABI'S were 0.60(Range 0.42-0.86) which increased to mean 0.81 in the postoperative period. The mean increase in absolute pressures was 18.3mmHg and the mean increase in digital pressures was 0.20. Ulcers healed within mean 5.4 months in 14(82%) patients. Technical and device success was achieved in all but one patient. There was one mortality at 6 month. No patient had minor or major amputation. TLR was necessary in 2 patients and TER was performed in 3 patients. 3 patients were lost to follow-up at 18 months.The sustained haemodynamic improvement was achieved with ABI improvement of 0.15 in rest of the patients.

Conclusion: Endovascular surgery for revascularisation along with sapheno-femoral ligation is an alternatine to the lengthy bypass procedures in the high risk aged patients with less morbidity and mortality with good long term results.

Simultaneus endovascular thoracic aortic aneurysm exclusion and open mini-invasive abdominal aortic aneurysm repair.

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Objective: to report our experience with combined simultaneous descending thoracic aortic stent-graft and abdominal aortic open repair by mini-invasive left subcostal transperitoneal approach and fast-track program.

Methods: three patients affected by thoracic and abdominal aortic pathologies with hig risk for open thoracoabdominal repair, were considered to be eligible for combined endovascular and open minimally invasive surgical repair. All patients were affected by infra-renal aorto-iliac aneurysm and they first underwent open surgical repair by means of aorto-bifemoral bypass with left subcostal minilaparotomy. Simultaneously commercially available endografts were inserted throught a limb of the aorto-bifemoral graft with standardized endovascular technique. In one patient the esclusion of the left subclavian artery was needed but was unnecessary its revascularization due to the back bilateral hypogastric revascularization. In the other two cases a descending thoracic stent graft escluded successful the descending thoracic aortic aneurysm. A lumbar drainage was put in each patients.

Our multidisciplinary approach consisted furthermore in epidural anaesthesia-analgesia and postoperative early rehabilitation by early feeding and ambulation.

Results: stent-graft deployment was technically successful in all cases after minimally invasive aortic open repair. No spinal cord ischemia and no endoleaks was observed . Patients were discharged homeward in 4th (2 of them) and 5th (the third of them) day after surgery.

Conclusion: conventional endovascular thoracic aortic repair in simultaneous combination with minimally invasive abdominal aortic open surgical repair and a multidisciplinary approach, including, stress free anaesthesia and enforced early feeding and ambulation, is safe and speeds up recovery after complex elective surgical procedures.

Technical Superiority and Clinical Excellence of Duplex Ultrasound Arterial Mapping (DUAM) vs Magnetic Resonance Angiogram (MRA), as the sole imaging modality in Bypass Surgery (BS) and Endovascular Revascularisation (EvR) For Critical lower ischemia (CLI) patients. 6 years Comparative Study in a tertiary referral vascular centre.

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EvR for CLI should be complemented by non-invasive imaging modalities for arterial mapping. DUAM can precisely discriminate between echolucency due to thrombus vs atherosclerotic occlusion.

Our endeavour is to appraise DUAM as the exclusive imaging modality when planning for CLI EvR. Primary endpoint is sensitivity and specificity of DUAM, compared to MRA or DSA. Secondary endpoints were procedural, hemodynamic, clinical outcomes, Cost-effectiveness and amputation free survival.

DUAM was the sole pre-operative mapping modality. MRA was only used where DUAM was inconclusive due to heavy calcification.

From 2002 to 2009, 3490patients were referred with peripheral vascular disease. 483patients underwent revascularisation for TASC C/D lesions (EvR:n=310; BS:n=173).

DUAM displayed 97%sensitivity and 98%specificity in identifying lesions requiring intervention. MRA was utilized in 62 patients (12.8%) with 82% specificity. DUAM accurately identified the total number of target lesions for revascularisation (TLR) however MRA overestimated it. The expenditure of DUAM is lower than both DSA and MRA.

Of 421procedures based on DUAM, immediate clinical improvement was comparable between EvR and bypass surgery(BS), with improvement to Rutherford category 3 or less 98% in EvR and 97% in BS(P=0.71). 6-year freedom from binary re-stenosis was 72.8%EvR and 65.3%BS (P=0.7001,hr=1.10,95%CI=[-0.69to1.74]). 6-year Amputation Free Survival was 72.9%EvR and 71.2%BS(P=0.9765, hr=0.95,95%CI=[-0.60to1.51]).

Comparing procedures performed based on DUAM to those based on MRA, 6-year binary re-stenosis was 69% for DUAM procedures Vs 57% for MRA procedures (P=0.02, hr=0.255,95%CI=[0.09-0.71]).

DUAM is an outstanding pre-operative imaging tool and epitomizes a minimally invasive modality to road-map EvR for CLI and offers precise consecutive data with hemodynamic outcome and limb salvage superior to EvR based on MRA. We believe that DUAM is economically proficient, primary modality for managing patients with CLI.

Catheter-directed thrombolytic therapy for acute infrarenal abdominal aorta thrombosis based on chronical peripheral arterial disease

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Introduction: Acute abdominal aorta occlusion – thrombosis is a rare, life threatening condition due to high mortality rates and challenging management. Objectives: To show a succesufully endovascular treatment of life threatening condition – thrombosis of infrarenal abdominal aorta. To draw attention of necessity of guidelines for peripheral and aortic catheter-directed fibrinolytic therapy.

Material and methods: A 54 years old man with a long history of claudication intermittens in both lower extremities presented to the emergency department, complaining of sudden onset (2 hour before) of paresthesias in both legs and followed severe pain in left leg. The computer tomography angiography (CTA) was performed, where trombosis of distal portion of abdominal aorta, iliac and left superfitial femoral arteries were presented. A decision was made to perform catheter-directed intraaortal trombolytic therapy.

Intra-aortal (intra-trombus) fibrynolytic therapy through radial access was started with alteplase 10 mg/h (with bolus 10mg before). After therapy patient complained of more severe pain in left leg In the followed digital subtraction angiography control established recanalization of abdominal aorta and on left side severe iliac artery stenosis, complete thrombosis of femoral superfitial artery and weak visualization of crural arteries. Left femoral artery was recanalized and 2 self-expandable stents were implanted. In result there were renewed flow in femoral and infrapopliteal arteries. Decision was made to continue more fibrynolytic therapy with the same regime(alteplase 10 mg/h). In post-thrombolytic DSA control (after 24 hours) there were renewed arterial flow in left leg and left common iliac artery stenosis was corrected.

Results: The patient was discharge from hospital in third day after thrombolytic therapy without any clinical ischaemic symptoms in both legs.

Conclusion: Catheter-direct thrombolysis is a good option for endovascular treatment of acute infrarenal aorta thrombosis with a narrow indications, good alternative to open surgery, with short recovery curve. There is a necessity for more investigations in this field.

Prevalence of Malignancies post AAA repair: an eight years comparable longitudinal study of EVAR vs Open Repair in a tertiary referral university vascular centre

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EVAR patients are thought to be at higher risk for cancer than open repair (OR), due to exposure to high doses of irradiation intra-operatively and CTA scan follow-up.

We aim to quantify metachronous malignancy following EVAR or open repair (OR). Primary endpoint is development of malignancy following AAA-repair, and malignancy/cardiovascular related mortality. Secondary endpoints are prevalence of previous, or synchronous malignancy, irradiation exposure and all cause survival.

Between 2002 and 2010, 2973 patients were reviewed with a

diagnosis of AAA. 409patients underwent AAA repair (267:EVARs, 142:OR). Pre-operative and follow up CTA and X-Ray radiation doses, as well as intra-operative EVAR radiation exposure were calculated and analysed.

Mean radiation exposure during EVAR was 11.4minutes, compared to 4.8minutes in OR patients who required some form of endovascular re-intervention (P=0.021). Mean intra-operative radiation dosage was 19236.28mGycm2, in contrast to 7125.13mGycm2 in OR patients (P=0.006). Total radiation dosage including CTA and X-Ray was 81.37msv in EVAR and 36.71msv in OR(P<0.001).

43 EVAR patients had malignancy VS 25 OR patients. Metachronous malignancy transpired in 3% of EVAR and 5.6% of OR(P=0.027). No metachronous malignancies occurred in patients requiring endovascular re-intervention.

At 8years, all cause survival was 62%. 60% in patients with malignancies and 69% in non-malignant (P=0.276). In malignant-EVARs, mortalities were 56%cardiovascular related, 33%malignancy related. In non-malignant-EVARs, mortalities were 62%cardiovascular related and 38%other causes.

In OR, all cause survival was 61%. 64%in malignant-OR and 60%in non-malignant(P=0.107). In malignant-OR, mortalities were 56%cardiovascular related 22%malignancy related. In non-malignant OR, 72% were cardiovascular related .

At 8years, median survival in EVAR patients was 37months for malignant and 46months for non-malignant patients (P=0.162,HR=1.639,95%CI=0.652to7.331). In OR patients, median survival was 35months in malignant and 43months in non-malignant patients (P=0.179,HR=1.957,95% CI=0.704to14.139).

EVAR is not an independent risk factor for post-AAA repair malignancies. EVAR and OR had identical all cause survival at 8 years inspite higher secondary intervention in the EVAR arm. Cardiovascular burden is more treacherous than any neoplastic pathology.

A mid to long term experience of clinical efficacy and cost per quality-adjusted. Life years with pararenal endovascular aortic repair (PEVAR) without fenestration for para-renal AAA compared with open surgical repair.

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EVAR affords more propitious peri-operative and long-term survival than Open Surgical Repair (OSR). However, up to 70% of AAAs are anatomically incompatible with EVAR.

We aim to gauge the feasibility of applying commercially-available endografts to pararenal aneurysms compared with OSR. Primary endpoints were aneurysm-related survival and cost per Quality-Adjusted–Life-Years (QALY).

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From 2002-2009, 1868 patients with pararenal AAA were investigated. 118 had intervention and were described by consultant radiologists as 'unsuitable for EVAR'. 66 had OSR and 52 had Pararenal EVAR (PEVAR).

PEVAR patients were older (74.3yrs vs. 70.8 yrs, p=0.014) with higher mean SVS co-morbidity severity scores (p=0.0001).

All procedures were within 14 days of diagnosis. Mean aneurysm diameter was larger in OSR (OSR 6.6cm vs. PEVAR 5.9cm, p=0.010). For PEVAR 83% of endografts were 34mm/36mm.

3-year aneurysm-related survival was significantly higher with PEVAR (100% vs. OSR (92.4%+/-4.37%), p=0.045). PEVAR provided an incremental cost-effectiveness ratio of €29,586 saved per QALY gained.

3-year freedom from secondary intervention (PEVAR 83.4% vs OSR 95.5%, P=0.301) and all-cause survival (PEVAR 57.1% vs. OSR 84.8%, p=0.195) were similar.

30-day morbidity halved with PEVAR (15% vs. 30%, p=0.059). Length of hospital stay (p=0.0007) was lower and number of patients fit for discharge to their home (p=0.006) higher with PEVAR.

PEVAR granted our patients longer Q-TWiST and Superior Freedom from MACE up to three years. Despite 3-year survival rate of 57%, PEVAR is cost-effective and offered as Endo-bailing for patients living on borrowed time, abolishes the socio-economic catastrophe of managing a rupture PAAA.

Contrast induced nephropathy and chronic kidney disease (CIN/CKD) as a consequence of utilising non ionic iso-osmolar contrast media (IOCM) vs low-osmolar contrast media (LOCM) following lower extremity endovascular revascularisation (EvR): A 5 years parallel group observational study.

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The purpose of this study is to appraise the incidence of CIN and to compare the effect of IOCM and LOCM on renal function/CKD during follow up in patient who underwent EvR. Primary endpoints: serum creatinine and incidence of CIN. Secondary endpoints: incidence of CKD in patients with normal renal function preoperative.

Contrast media used were, Omnipaque 647mg/ml (Dec2003–Sept2005) and Visipaque 270mg/ml (Oct2005–Dec2008). Creatinine obtained preoperative, postoperative at Day0-3, 30days, 3months, 6months and 12months.

315 patients underwent EvR of which 262 patients were included. Number of patients received Omnipaque / Visipaque were 68/194. 142 were male. Mean age was 74.81 +/- 9.303 in Omnipaque vs 72.08 +/-11.866 in Visipaque.

There is significant difference in the effect of renal function by the types of contrast used over 12 months period, p= 0.03. In Omnipaque group, mean GFR significantly decreases at 3months (62.56 +/- 26.89) and 12months (63.67 +/-22.74). In Visipaque group, mean GFR increases at 3months (64.07 +/- 27.67) and 12months (67.17 +/- 30.99). The latter showed improvement on renal function after 6 months.

Mean GFR significantly decreases with age regardless of contrast type used, p=0.004.

30 patients had re-intervention within 12 months. One patient required subsequent haemodialysis for CIN and no CKD on follow up thereafter.

There is no significant incidence of CIN/CKD in 12 months follow up. Different types of contrast use have a significant impact on renal function over time. Use of IOCM is not nephrotoxic and enhances renal function compared to LOCM.

Five-year irish trial of CLI patients with TASC II type C/D lesions undergoing subintimal angioplasty or bypass surgery based on plaque echolucency

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Purpose: To report a 5-year observational parallel group study comparing the effectiveness of subintimal angioplasty (SIA) to bypass grafting (BG) for treatment of TASC II type C/D lesions in the lower limb arteries of patients with critical limb ischemia (CLI).

Methods: Of 1076 patients referred with PVD from 2002 to 2007, 206 SIAs in 190 patients (104 women; mean age 73613 years) and 128 bypass grafts in 119 patients (77 men; mean age 70614 years) were enrolled in the study. All patients had Rutherford classification 4–6 ischemia manifested as rest pain and/or tissue loss. Primary endpoints were (1) survival free from amputation and (2) sustained clinical improvement [+2 Rutherford category and/ or ABI increase 0.15 without target lesion revascularization (TLR)]. Secondary end points were major adverse events (MAE), the binary restenosis rate, freedom from TLR, and a special quality-adjusted life year (QALY) endpoint (Q-TWiST) that incorporated both length and quality of life to evaluate treatments. A cost analysis was performed.

Results: At 5 years, clinical improvement was sustained in 82.8% of the SIA group versus 68.2% of the BG patients (p50.106). Five-year all-cause survival was similar for SIA (78.6%) and BG (80.1%; p=0.734), as was amputation-free survival (SIA 72.9% versus BG 71.2%;p=0.976). Hyperfibrinogenemia (p=0.009) and C-reactive protein (p=0.019) had negative effects on survival without amputation. Five-year freedom from binary restenosis rates were 72.8% for SIA versus 65.3% for BG (p=0.700). While the 5-year freedom from TLR rates (SIA 85.9% versus BS 72.1%, p=0.262) were not statistically significant, the risk of MAE (p<0.002) and length of hospital stay (p<0.0001) were significantly reduced. Q-TWiST significantly improved (p<0.001) and cost-per-QALY (SIA J5663 versus BG J9172, p<0.002) was reduced with SIA. The 5-year risk of re-intervention (p>0.05) and mean number of procedures (p=0.078) were similar.

Conclusion: Five-year freedom from MAE was enhanced by 20% in the SIA group, withsubstantial cost reduction and better Q-TWiST. SIA is a minimally invasive technique thatexpands amputation-free and symptom-free survival. SIA is poised to bring about a paradigm shift in the management of CLI.

The rational use of renal artery stenting in renovascular hypertension therapy: a single center experience

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Introduction: Endovascular surgery in renal artery stenosis is now the treatment of choice.

Objectives: Our aim is to evaluate the improvement in blood pressure and renal function of patients undergoing renal stenting.

Material used: Fifty-two patients were submitted to renal stenting for steno-obstructive lesions. Fifty-five stents were implanted in 52 patients (3 bilateral).

Methodology used: Preoperative study consisted of: contrast-enhanced ultrasound, dynamic renal scintigraphy and computed tomography angiography. In all cases, renal artery stenosis was hemodinamically significant and greater than 75%. All patients received 300 mg clopidogrel the day before the procedure, followed by clopidogrel 75 mg / day associated with ASA 100 mg / day for 6-12 months, then ASA 100 mg indefinitely. The follow-up (6 and 60 months) was performed by means of contrasted-enhanced ultrasound and if a restenosis was discovered, an Angio-CT scan was performed.

Results of the study: Reduction in blood pressure in the early stages (3-6 months) was observed in 31 patients (59.6%). In 25 of this group (80.6%), a return to preoperative values of blood pressure within 12 months was registered. A reduction in creatinine values less than 1.4 mg / dl was reached in 36 patients (69.2%), while in 10 (19.2%) remained unchanged and in the remaining six (11.6%) worsened.

The primary patency was 84 .6% at 2 years and assisted at primary level of 94.2% at 5 years.

Conclusions of the study: Renal stenting is a safe procedure with a low rate of peri-operative complications and with an assisted primary patency rate close to 95% in our experience.

In this study, there was no immediate deterioration of renal function during follow-up but there was a 69.2% improvement in itself.

In our opinion, the poor results obtained for the improvement of blood pressure need to be investigated with controlled prospective trials.

In this experience, there is a good result concerning the recovery and / or improvement in renal function; while there is only a temporary benefit in blood pressure control.

Tratamiento endovascular en fístula aorto entérica secundaria: solución definitiva o puente a la resolución abierta

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INTRODUCCIÓN:

La fístula aortoentérica secundaria es una entidad poco frecuente, de gran morbilidad y mortalidad, y alto riesgo quirúrgico. El abordaje endovascular simplifica en tratamiento inicial, aunque existen dudas sobre su eficacia a largo plazo. Presentamos dos casos de tratamiento endovascular del FAE secundaria, uno como tratamiento único y otro como solución provisional

CASO 1:

Varón, 83 años. 24 años antes by-pass aorto-bifemoral, dos laparotomías posteriores (colitis isquémica, colostomía de descarga), eventración e implante de malla abdominal. Presenta hemorragias digestivas bajas, con importante anemización (Hb 6,6 g/dl) sin encontrarse punto hemorrágico en endoscopia digestiva alta ni colonoscopia.

En angio-TAC se evidencia reacción inflamatoria periprotésica alrededor del by-pass, en relación con cuarta porción duodenal, con alta sospecha de FAE secundaria. Se evidencia fuga de contraste desde el by-pass a tubo digestivo mediante arteriografía intraopertoria procediéndose a implantar endoprótesis aorto-monoilíaca derecha y by-pass fémoro-femoral derecha-izquierda.

En el postoperatorio inmediato se somete al paciente a reposo intestinal y nutrición parenteral durante 2 semanas evoluciona de forma favorable, sin nuevos episodios hemorrágicos. Es dado de alta con tratamiento antibiótico vía oral (ciprofloxacino 500 mg/12h y metronidazol 250 mg/8h) a largo plazo. Alta al mes del episodio y seguimiento a los 6 meses libre de nuevas hemorragias y TC con fibrosis en la zona de la FAE.

CASO 2:

Varón, 72 años. 10 años antes by-pass aorto-biferomal por patología aneurismática infrarrenal.

Debuta con hemorragia digestiva alta, sin hallazgos en la endoscopia. En angio-TAC se aprecian cambios inflamatorios periaórticos en relación con 3ª-4ª porción de duodeno y burbujas periprotésicas, llegando al diagnóstico de FAE.

En un primer tiempo quirúrgico se implanta endoprótesis aorto-monilíaca derecha con by-pass cruzado fémoro-femoral derecha-izquierda. Mediante laparotomía subcostal se localiza el orificio fistuloso en duodeno y se lleva a cabo reparación y epiplopastia. El paciente es mantenido con antibioterapia de amplio espectro (ertapenem 1g/24h y daptomicina 10 mg/kg/d).

Tras 2 meses de tratamiento antibiótico y ante la persistencia de infección demostrada mediante TAC y gammagrafía, en un segundo tiempo quirúrgico se realiza by-pass axilo-femoral derecho con anastomosis distal sobre el fémoro-femoral, y mediante abordaje retoperitoneal explante del material protésico aórtico previo, incluida la endoprótesis, y ligadura de aorta e ilíacas con refuerzo del muñón aórtico con fascia lata.

El paciente es dado de alta al mes sin tratamiento antibiótico

CONCLUSIONES:

El tratamiento endovascular mediante implante de endoprótesis es una opción a tener en cuenta en el tratamiento de la FAE, y según las características del paciente puede suponer la resolución definitiva del cuadro, o proporcionar una mejoría suficiente para estabilizar al paciente y llevar a cabo cirugía abierta exerética con posterioridad.

Cool excimer laser assisted angioplasty (CELA) vs tibial balloon angioplasty (TBA) in management of infragenicular tibial arterial occlusion in critical lower limb Ischaemia (CLI) TASC DE. A pivotal observational analogy congregate proportional analysis over 48 months "Six L Trial"

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Endovascular revascularisation (EvR) is the current gold standard and first line of therapy for Critical Limb Ischaemia (CLI). However, despite the advances of EvR, there is still concern about its capability for treating complex Tibial lesions. This study aims to compare outcomes with Cool Excimer Laser Assisted Angioplasty (CELA) Vs Tibial Balloon Angioplasty (TBA) in patients with CLI, TASC DE. The primary endpoints are Sustained Clinical Improvement and amputation-free survival (AFS). Secondary endpoints are binary restenosis, Target Lesion Revascularisation (TLR), Target Extremity Revascularisation (TER), all-cause survival and survival free from Major Adverse Events (MAE).

Pivotal Observational Analogy Congregate Proportional Analysis over 48 months.

From June05 - December08, 1406 patients were referred with PVD, 372 had CLI. 56 patients underwent 65 EvRs for tibial TASC DE; 35 using TBA and 30 using CELA. All intervention was done using Pre-operative Duplex Ultrasound. Patients were on a Statin, Aspirin, Clopidogrel and anti-hypertensive therapy. All patients were Rutherford Category 4-6 with mean age 69 years (48-96yrs) and all had comparable demographics, vascular-related risk factors and runoff grading.

Technical Success was 80% for CELA Vs 74% for TBA (p=0.278). Technical outcomes were independent of procedure, stent placement, multilevel interventions, and adjunctive procedures. Improvement to Rutherford Category ≤3 occurred in 80% of CELA Vs 66% of TBA (p=0.048) with hemodynamic Success in 90% of CELA Vs 71% of TBA (p=0.041).

At four years the rate of sustained clinical improvement was enhanced with CELA (73.3%) compared to TBA (65.7%), although this did not quite reach statistical significance. (P=0.409, Hazard ratio (HR) =0.67, 95% CI [0.27 – 1.72]). 4 year limb salvage rates (93.3% Vs 88.5%, P=0.482, HR=0.56, 95%CI [0.11-2.78]) were also improved with CELA

4-year freedom from TLR was significantly augmented with CELA (93.3%) in comparison to TBA (65.7%). (P=0.0053, HR= 0.219, 95% CI = [0.0752 – 0.637] (Figure 3) At four years freedom from binary restenosis was also substantially improved with CELA (76.6%) when compared with TBA (54.2%) but was just shy of statistical significance. (P=0.0699, HR=0.45, 95% CI [0.19 – 1.07]). Four-year freedom from TER remained superior with CELA (90% vs. 80%, P=0.256, HR= 0.49, 95% CI= [0.14 – 1.69]) Furthermore the rate of revascularisation performed due to progress of arteriosclerosis at 4 years. (Obtained by subtraction of TLR from TER rates) was significantly reduced with CELA (P= 0.005, HR= 0.132, 95% CI = [0.032 – 0.551]). 4 years freedom from MAE was significantly more likely with CELA. (P= 0.02, HR= 0.367, 95% CI= [0.157 – 0.859]).

CELA patients had a substantial improvement in quality of life at 4 years with a Q-TWiST of 9.72months compared to TBA patients (7.5 months, P=0.078). Mean cost per primary procedure; mean cost including follow-up; and mean total cost were all substantially reduced with CELA compared to TBA, with a incremental cost effectiveness ratio of €7,209.27 per QALY gained in favor of CELA.

Prospective Clinical Prelude showed that ostial lesions with poor distal run off have a reduced prospect of distal embolisation. Furthermore, CELA ameliorated PTA, if used primarily in instances where the wire can cross but not the Balloon. Initially compromised endeavors' at Crural PTA can be treated successfully with redo PTA without spoiling subsequent attempts at bypass grafting.

Tibial EvR bestows Exceptional Outcome in CLI TASC DE .Both CELA & TBA enhance Anatomical, Clinical and Technical Success Rates in Complex Tibial Vessel Lesions. However, CELA has superior freedom from binary restenosis, freedom from TLR and Survival free from MAE, with improved Q-TWiST better QALY and cost-effectiveness.

Fast track carotid surgery is the gold standard for high-risk (HRP) carotid artery intervention: five year cost-effectiveness and quality stroke free survival comparison between carotid endarterectomy (CEA), carotid angioplasty and stenting technique (CAST) and optimal medical therapy (OMT) in symptomatic patients at a university vascular centre with appraisal of the contemporary prose

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We aim to conciliate CAST, CEA and OMT in high-risk symptomatic patients. Primary endpoints were stroke, myocardial infarction or death. Secondary endpoints were cost per QALY, re-intervention rate, and patency.

From Oct01- Oct08, 847 patients were evaluated with carotid stenosis>60%. The Predicted Probability of receiving CEA, CAST, or OMT was tabulated for all patients using multiple logistic regressions, controlling for co-morbidity and anatomical factors.

Propensity scoring was used to adjust for baseline characteristics and selection bias by matching co-variables, creating a pseudo-randomized control design. From 306 CEA, 39 CAST and 275 OMT, we matched 55 CEA, 34 CAS and 67 OMT by propensity score. 19 (6.3%) had bilateral interventions. Co-morbidity Severity Score were similar between groups ($p>0.05$) All interventions were performed within 14 days of initial presentation. Mean age was similar between CEA and CAST (68.6years vs 70.6years, $p>0.05$) but OMT patients were older (75.4 years) than CEA ($p<0.01$) or CAST ($p<0.05$). Duplex ultrasound was the sole preoperative imaging modality used to quantify plaque-morphology and stenosis.
Following intervention, 5-year stroke-free rate was 99.1%(95%CI 99.6-99.9%), stroke-free survival was 90.6%(95%CI 85.9%-93.9%) and primary patency was 94.6%(95%CI 90.5%-97.0%). 5-year stroke-free survival was significantly improved with CEA (90.6%) compared to OMT (44.3%, $p<0.0001$).

Cox-proportional hazards ratio showed age >80years ($p<0.001$), female gender ($p<0.04$) and echolucent plaque material ($p<0.01$) were associated with reduced stroke-free survival.

Q-TWiST and cost per QALY were comparable but in favor of CEA over CAST ($p>0.05$) and were significantly improved with CEA compared to OMT ($p<0.0001$) and CAST ($p<0.001$).

OMT does not prevent future stroke in patients with severe carotid artery disease. Indications for CAST are limited; technology is immature and strict selection criteria should apply. CEA remains the gold standard in suitable patients with recently symptomatic carotid artery stenosis with superior 5-year stroke-free survival compared to CAST or OMT.

Degeneración aneurismática de aorta toraco-abdominal e ilíacas: ¿No reparable?

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INTRODUCCION

Presentamos el caso de un paciente con dos reintervenciones secundarias luego de 11 años de seguimiento de un primer implante de endoprotesis de aorta torácica

REPORTE DEL CASO

Varón de 75 años, hipertenso y dislipidemico. Por diagnóstico de aneurisma de aorta torácica descendente con trombo intrarterial se le realizó implante de dos endoprotesis aórtica solapadas Talent 42 x 120 y por evidencia de endofuga tipo 1 distal se procedió a cubrir con otra extensión Talent 44 x 90 mm al cabo de 1 semana. En el transcurso de 6 años se observó degeneración aneurismática del resto de la aorta torácica (9 cm) abdominal (57 mm) ambas iliacas (5 cm bilateral) e hipogastricas. El paciente rechazó la cirugía abierta y fue rechazado para tratamiento endovascular para prótesis con ramas por angulación de aorta torácica, angulación iliacas y aneurisma de ambas hipogastricas; sin embargo, por aparición de endofuga tipo III se procedió a implante de otra endoprotesis Bolton Relay 44 x 200. A los 11 años de seguimiento, asintomático, se evidenció aumento del saco aneurismático distal (98 mm) con fuga periprotésica distal con progresión de enfermedad aortica dado por aumento de los diámetros en la unión toracoabdominal (68 x 64 mm) con ulcera intramural estable y progresión del aneurisma infrarenal. Luego de 1 semana, ingresó a urgencias por dolor torácico de 3 horas de evolución asociado a disnea y nauseas con ECG y Troponinas normales y tomografía que mostró endofuga distal con crecimiento del saco hasta 105 mm sin evidencia de rotura. Se realizó de forma urgente tratamiento endovascular, con exclusión de endofuga distal con dos extensiones (Bolton Relay 44 x 44 y 46 x 46). A las 24 horas durante permanencia en UCI, luego de extubado y sin drogas vasoactivas presenta disnea súbita e hipotensión arterial con evidencia de derrame pleural izquierdo masivo. Luego de reintubación y múltiples transfusiones se realizó nueva tomografía que mostró aumento de saco aneurismático torácico con evidencia de sangrado reciente, efecto de masa importante sobre aurícula y pulmón izquierdo, con diámetro máximo de 136 x 111 y endofuga distal. Finalmente el paciente falleció 18 horas posteriores. La autopsia confirmó los hallazgos de aneurisma torácico de 12 cm y fuga periprotésica con material coagulado reciente y hemotórax, así como aneurisma aorta abdominal y de ambas iliacas con marcada trombosis intramural de todos los aneurismas

COMENTARIOS

La evolución degenerativa aneurismática de la aorta toracoabdominal representa un reto por la dificultad para su reparación tanto abierta como endovascular en ocasiones irreparables. Los estudios de necropsia son imprescindibles para avanzar en el conocimiento y tratamiento de la patología de la aorta

Pseudoaneurisma de arteria glútea superior

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Introducción: Los pseudoaneurismas de arteria glútea superior o inferior son excepcionales y la mayoría secundarios a un traumatismo pélvico, cirugía ortopédica o lesiones penetrantes en región glútea.

Material y Método.

Caso clínico: Varón de 73 años, con antecedente de absceso perianal con fascitis necrotizante, drenado quirúrgicamente 2 meses antes, que presenta dolor y masa púlsatil en región glútea izquierda. Se realiza TC abdominal urgente que evidencia pseudoaneurisma de arteria glútea superior izquierda de 9,3 * 4,7 cm diámetros máximos. Procedemos a la inyección de trombina ecoguiada en interior de saco, consiguiéndose la trombosis del mismo en control ecográfico inmediato.

Resultados: A los dos meses el paciente presenta de nuevo cuadro de dolor y tumoración a nivel de glúteo, observándose, por ecografía, reaparición de pseudoaneurisma arteria glútea superior izquierda.

Decidimos realizar tratamiento combinado endovascular, con embolización mediante liberación de coils, e inyección trombina ecoguiada. En arteriografía intraoperatoria y ecografía de control se observa trombosis completa de saco aneurismático.

Conclusiones: En este caso, al carecer de un antecedente traumático, es lógico pensar en un origen yatrogénico por el drenaje quirúrgico por la fascitis necrotizante. El diagnóstico lo confirma la ecografía aunque preferimos realizar TC abdominal para precisar diámetros y relación con estructuras vecinas. En cuanto al tratamiento, creemos que la embolización del aneurisma ó inyección de trombina son de elección frente al tratamiento quirúrgico aunque debe enfatizarse la necesidad de un control posterior periódico por la posibilidad de repermeabilización del mismo.

TEVAR with intentional coverage of the left subclavian artery for traumatic injuries of thoracic aorta: results of a prospective study

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INTRODUCTION:
To prospective analyze the sequelae of the intentional left subclavian artery (LSA) coverage during emergent thoracic endovascular aortic repair (TEVAR) for post-traumatic injuries.

METHODS:
To assess the functional status of the left arm the following tests were performed: clinical evaluation (temperature, presence or absence of radial pulse, motility), brachial pressure and duplex scan. At 1-3 and 6 months these examinations were repeated including a functional test and a questionnaire. During the follow-up an angio-CT was performed at 1-3-6-12 month and thereafter early.

RESULTS:
From January 2005 to June 2011 31 patients underwent TEVAR for traumatic rupture of the thoracic aorta. Mean age was 35 yrs. In 4 cases (12.9%) the LSA coverage was partial. Two patients (6.4%) died in the postoperative period for associated hepatic and cerebral trauma. No signs of left arm ischemia, vertebral insufficiency, strokes, or paraplegia were observed. The duplex scan examination revealed in 27 patients (87.1%) a reperfusion of the left arm through the vertebral artery. At follow-up (mean 30 months, range 4-66), only one patient (3.7%) showed an impairment of left arm function (ischemic pain after 2.5 minutes of arm exercise), without any impediment in his normal life activity at the questionnaire. No signs of endoleaks or graft migrations were observed at the angio-CT.

CONCLUSIONS:
LSA coverage during TEVAR for traumatic aortic injuries seems a feasible and safe solution to extend endograft landing zone, without an adjunctive risk of paraplegia, stroke or left arm ischemia. Further larger studies are required to confirm those results.

Ruptura de aneurisma de aorta toraco-abdominal tratada con inversión de endoprótesis por vía trans-axilar

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Paciente 77 años de edad del paciente, hipertensión arterial, dislipemia, cardiopatía isquémica, insuficiencia renal, enfermedad de Alzheimer y aneurisma de la aorta toraco-abdominal de 58 mm de diámetro diagnosticado en julio de 2008. En diciembre de 2008 debido a un aumento del diámetro de aorta torácica hasta 67mm, fue sugerido un tratamiento con una prótesis endovascular ramificada por compromiso de troncos viscerales.

En octubre de 2009, el paciente fue ingresado de urgencia por un dolor pleurítico de 4 días de duración, sin fiebre. En placa de tórax se observo un derrame pleural importante. Su oximetría basal fue de 91%. La sospecha de infección hizo comenzar el tratamiento antibiótico.

Posteriormente, en Angio-TC se obsevó un aneurisma de 86 mm toraco-abdominal con derrame pleural derecho de gran

densidad, que podría corresponder a un hemotórax debido a la ruptura del aneurisma.

A causa de la condición clínica del paciente decidimos tratar la ruptura por vía endovascular, con dos endoprótesis Relay® (Bolton) guiada por ecografía transesofágica y radioscopia. La primera endoprótesis (38 mm) fue implantada en la aorta torácica descendente a través de un abordaje femoral y la segunda (46 mm), por vía axilar. A causa de falta de cuello distal, la endoprótesis fue implantada justo por encima de la arteria mesentérica superior con oclusión intencional del tronco celiaco. Durante la arteriografía de control se observó una estenosis crítica de la arteria mesentérica superior, que se decidió tratar mediante angioplastia que se complicó con disección que se requirió un implante de stent.

Al día siguiente, se realizo un drenaje cerrado del tórax derecho con cánula de Yankauer y drenaje pleural. Se drena 2.500 cc de sangre. El paciente se mantuvo en la UCI durante 5 días con buena evolución. La función renal se mantuvo estable.

Thoraco-abdominal dissection with involvement of the Supra-Aortic Trunks

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Fifty-five-years old patient with high blood pressure, requiring 3 different drugs, sought medical attention due to oppressive thoracic pain, radiating to back. There was a widening of the mediastinum in plain x-ray. A dissection of thoraco-abdominal aorta was observed in Angio-CT besides a huge descending aorta aneurysm (80 mm of diameter). A big perforation of dissection in descending thoracic aorta was noted with a retrograde dissection till the aortic arch.

We decided to treat this dissection with implant of an endoprothesis in the descending thoracic aorta by femoral approach. The prothesis was a Relay (Bolton®) of 38 mm of diameter.

A retrograde flow till the aortic arch was observed during the post-surgery control Angio-CT although the correct management of the intimal lesion of the descending thoracic aorta with thrombosis of the aneurysm sac.

Doppler echocardiography and transesophageal Doppler diagnosed a proximal entry point of dissection. After the thorough revision of the Angio-CT, the entry point was localized in the origin of the brachiocephalic trunk. We decided to implant 2 covered stents by retrograde approach bilaterally.

The placement was performed under general anesthesia. The access of the left carotid artery was made by punction and a placement of 7F introductor, on the right side it was made by open access. A stent Atrium 8 x 40 mm was implanted by the left side and a stent graf Viaban (Gore®) 12 x 8 mm was implanted in the right side.

The patient recovered in a very favorable way without any kind of neurological deficit. In the post-surgery Angio-CT a very good result was observed of the procedure, with total thrombosis of the aneurysm sac.

Técnica mixta (láser endovenoso y esclerosis con espuma) para el tratamiento de las varices C2 dependientes de la vena safena interna incompetente.

Descripción de la técnica, análisis de los resultados y del grado de satisfacción de los pacientes

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INTRODUCCION: En la literatura (Min, Anastasio, Proebstle) existen referencias de series de pacientes tratados con láser endovenoso para corregir el reflujo de la vena safena interna y cierre permanente del eje, con un éxito cercano al 99%. El cierre del eje safeno interno con esclerosis con espuma ecoguiada, técnica novel por evitar el uso de un quirófano, ha

demostrado que el eje safeno tiene un porcentaje de reapertura de entre el 30 y 40% (meta-análisis de Van den Enden L, y otras publicaciones), además de los efectos sistémicos no despreciables de la espuma, que distan de hacerla la técnica ideal. Sin embargo múltiples publicaciones afirman que la escleroterapia con espuma de venas C2 se constituye cada día como técnica perfecta para reemplazar las flebectomías que se realizan complementarias al stripping o tratamiento con endoláser de la vena safena interna.

OBJETIVOS: Describir los detalles técnicos de la técnica (tratamiento en quirófano de la vena safena interna con láser endovenoso y sesiones semanales de escleroterapia con espuma de colaterales C2, empezando a la semana postoperatoria) Analizar los resultados de aceptación por parte del paciente (CIVIQ 2 pre-operaotorio y post-operatorio, cuestionario de satisfacción del paciente, que incluye la necesidad de técnicas anestésicas menos cruentas) y tabular el seguimiento clínico en el tiempo y con ecodoppler de la evolución.

MATERIAL Y MÉTODOS: Entre noviembre de 2009 y diciembre de 2010, en el Hospital Rúber Internacional de Madrid, se ha realizado el tratamiento con la técnica descrita a 79 pacientes, recogiendo la información mediante varios formularios (VCSS, CIVIQ 2 pre- y post-operatorio, encuesta de satisfacción del paciente a los 14 días siguientes al post-operatorio y revisiones periódicas tanto clínicas como por ecodoppler: 7, 14, 30, 90 y180 días). Los resultados se tabularon en una base de datos para obtener resultados estadísticos aplicables a la muestra.

RESULTADOS: Los pacientes no experimentaron complicaciones graves como trombosis venosa profunda o embolia pulmonar. Existió muy baja incidencia de complicaciones menores como hematomas, equimosis, trombosis, induración de la trayectoria de la safena, parestesias y dolor. La tabulación de datos demuestra una muy buena aceptación de la técnica por parte de los pacientes y un eficiente tratamiento que se mantiene en el tiempo en el cierre de la safena tratada con láser y de las varices C2 tratadas con esclerosis con espuma y por último, una positiva mejoría en su calidad de vida con buen resultado estético como valor añadido.

CONCLUSIONES: En la serie descrita, se comprueba que es una técnica mínimamente invasiva, que aprovecha las fortalezas del láser endovenoso y de la esclerosis con espuma, con muy baja morbilidad postoperatoria y que permite un rápido regreso de los pacientes a la vida normal, mejorando positivamente su calidad de vida. Los resultados se mantienen a través de su seguimiento en el tiempo.

Doble disección aórtica en paciente con síndrome de Marfan: Abordaje endovascular

Flores, C.; Cruz, L.; Navarro, J.; Riambau, V. (1); Rodriguez, R.

Hospital Clinic i Provincial de Barcelona España

Introducción: El manejo endovascular de las complicaciones localizadas en el territorio aórtico en pacientes portadores de síndrome de Marfan aún es controvertido. El presente caso muestra la posibilidad de reparar disecciones aórticas endovascularmente en este tipo de patología compleja.

Caso. Mujer de 38 años, diagnosticada de Síndrome de Marfan, con disección aórtica tipo B de Stanford. Con dos niveles de disección, el proximal limitado a la aorta descendente. El distal de aorta infrarenal hasta arteria iliaca común izquierda, con re-entrada en esta zona. Con asociación de aneurismas en aorta torácica e infrarenal. Se procedió a la colocación de endoprótesis torácica Bolton Relay NBS 28x204 con despliegue distal desde el origen de arteria subclavia hasta la aorta a nivel diafragmático. En angiografía de control hubo adecuado resultado final, colapsando la luz falsa. Tres meses después, se trató el segmento de aorta abdominal mediante la colocación de endoprótesis Gore Excluder de 23x14x12. En arteriografía de control aún se observó persistencia de reentrada en bifurcación de arteria iliaca común izquierda. Al segundo año se encontró por AngioTC nueva entrada y dilatación de 6mm en el extremo distal de la endoprótesis torácica. Además de permeabilidad de la reentrada en arteria iliaca común izquierda. Se trató con extensión del componente torácico con una endoprótesis Bolton 28x24 hasta el nivel supra-celiaco y una endoprótesis multicapa 6x60 a nivel de bifurcación de iliaca común izquierda.

Comentario. Paciente con Síndrome de Marfan que presentó una doble disección de aorta tipo B tratada endovascularmente en diferentes niveles. Las indicaciones para la terapia endovascular aún no se han definido completamente para la disección aórtica. En el subgrupo de pacientes con síndrome de Marfan aún son mas inciertas. Sin embargo ante los resultados que ofrece el tratamiento farmacológico, con tasas de mortalidad de 30-50 % a 5 años y una expansión del falso lumen de 20-50 % a 4 años, la opción de terapia endovascular ha ido superando las expectativas iniciales. Sus resultados a corto y mediano plazo como la mortalidad tardía de 1.5% en fase aguda y de 4.8% en fase crónica la ha hecho una opción viable. A pesar de esto, las complicaciones tras una reparación endovascular como la que se presentó en este caso continúan originando temas a resolver. Tal complicación en la aorta torácica ha sido considerada un fenómeno de nueva entrada en la zona de anclaje distal secundaria. Debida a una mayor fuerza radial del extremo distal de la endoprótesis torácica aplicada sobre un flap mas frágil en comparación a la zona proximal.

Conclusión. El tratamiento endovascular en pacientes con Síndrome de Marfan y disección aórtica es aplicable. Puede retrasar la cirugía abierta y requiere un seguimiento muy estrecho para tratar sus complicaciones.

Si tuviera que tratar un caso similar usted que terapia aplicaría?

Preservación de la arteria subclavia izquierda mediante el implante de una endoprótesis torácica con Scallop proximal por aneurisma yuxta subclavio

Jiménez Olivera, M. A.; López de la Franca Beltran, B.; Esteban Gracia, C.; Martorell Lossius, A.; Lisbona Sabater, C.; Lerma Roig, R.; Callejas Pérez, J.M.

Hospital Universitario Germans Trias i Pujol.

INTRODUCCIÓN

El tratamiento endovascular habitual de los aneurismas aórticos torácicos que implican a la arteria subclavia izquierda, conllevan la obliteración de la misma por el implante de la endoprótesis en su ostium, asegurando así el correcto sellado del aneurisma.

OBJETIVOS

Presentamos la técnica quirúrgica endovascular de tratamiento de los aneurismas de aorta torácica yuxta subclavios, preservando la permeabilidad de la arteria subclavia izquierda.

CASO CLÍNICO

Varón de 63 años, con antecedente único de hipercolesterolemia. Diagnosticado mediante TC tóraco-abdominal, en el contexto de estudio de disfonía de meses de evolución, de un aneurisma sacular a nivel del cayado de la aorta y un AAA infrarenal.

A la exploración física se objetiva masa abdominal pulsátil, sin otros hallazgos a destacar.

Ante el diagnóstico de pseudoaneurisma del cayado de la aorta por úlcera penetrante aórtica, se decide el implante de una endoprótesis de aorta torácica. Al tratarse de un caso sin cuello proximal, y para así evitar la realización de un bypass carótido-subclavio que aumenta la morbi-mortalidad, se decide el implante de la endoprótesis de aorta torácica "custom made" tipo Relay® de 36 mm de diámetro. Se introduce la prótesis a través de arteriotomía en arteria femoral izquierda. Se comprueba al finalizar la intervención la correcta exclusión del aneurisma y permeabilidad completa de la arteria subclavia izquierda.

Realizamos un TC torácico de control tras el primer mes que confirma la permeabilidad de los troncos supraaórticos, sin objetivar fugas de contraste y con una reducción del saco aneurismático de 14 mm.

RESULTADOS DEL ESTUDIO

Actualmente las guías clínicas indican, de modo obligatorio, la revascularización de la subclavia, teniendo como opciones el bypass carótido-subclavio con el aumento de la morbi-mortalidad que esto supone, o el implante de una endoprótesis de aorta torácica con "scallop" proximal. Esta técnica permite la preservación del flujo de la arteria subclavia sin necesidad de otras técnicas adicionales.

ev3 lanza el Nuevo stent de Femoral superficial EVERFLEX+

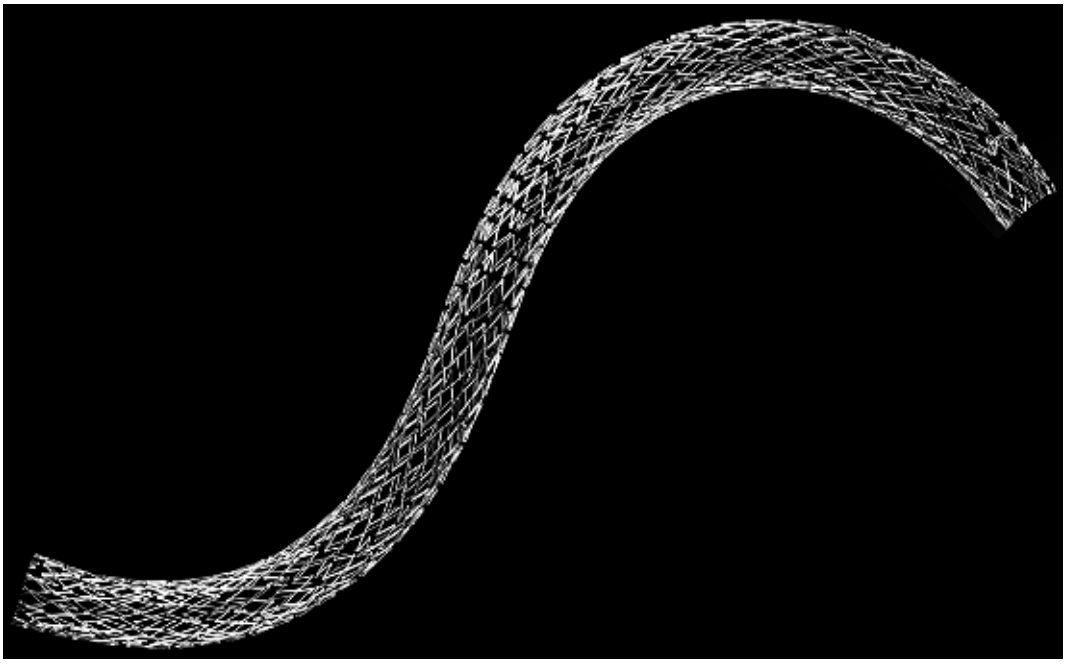
Como resultado de la integración de los datos de los estudios clínicos, ev3, con su historia en el diseño de stents innovadores, lanza al mercado una nueva malla mejorada para el Stent de Femoral Superficial, llamado EverFlex+.

La mejora fundamental radica en que este stent posee una mayor resistencia a la fractura, hasta catorce veces mayor. Esto se ha conseguido mediante un nuevo diseño, que ahora es mecánicamente más equilibrado y hace que el stent reparta su fatiga axial (cuando el stent sufre elongación); por ello, se disminuyen los "puntos calientes" que contribuyen a la fractura, y así, de esta manera, se reducen las restenosis asociadas a fracturas.

Durante los ensayos con stents elongados, el stent Everflex+ de 6 mm, resistió 9 ciclos más sin romperse (la media para todos los diámteros es de 5,5 ciclos más de resistencia frente a la fractura). Y todo esto, unido a que mantiene la misma fuerza radial y flexibilidad que su predecesor, hacen del stent Everflex+ el primer stent de 3ª generación para la femoral superficial.

El nuevo Stent EverFlex+ conserva el sistema EX.P.R.T exclusivo de toda la familia PROTÉGÉ. Gracias a este sistema, se evita el salto o liberación prematura del stent, lo cual le confiere una liberación precisa.

El stent Everflex +, al igual que el anterior "EverFlex", dispone de una amplia gama de medidas; longitudes de 20 a 200 mm, y diámetros de 5 a 8 mm, todas ellas compatibles con introductor de 6F.



CALENDARIO DE CONGRESOS

4-7 May, 2011

Barcelona, Spain
IX INTERNATIONAL SYMPOSIUM ON ENDOVASCULAR THERAPEUTICS

Web site: site2011.atlantacongress.org

7-11 May, 2011

Philadelphia, PA
91ST ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR THORACIC SURGERY

www.aats.org/annualmeeting
Phone: (978) 927-8330

11-14 May, 2011

Noordwijkerhout, The Netherlands
6TH INTERNATIONAL SYMPOSIUM ON THE DIABETIC FOOT

www.diabeticfoot.nl
Phone: +31 (0)88 0898100
Fax: +31 (0)88 0898109
Email: diabeticfoot@mccm.nl

12-13 May, 2011

New York, NY
INNOVATIONS AND PRACTICAL APPLICATIONS IN VASCULAR SURGERY 2011

www.nyp.org/vascular
Contact: Jessica Scully
Phone: (201) 346-7007
Fax: (201) 346-7011
Email: jas2134@columbia.edu

CALENDARIO DE CONGRESOS

12-14 May 2011

Miami Beach, FL
9TH INTERVENTIONAL VEIN CONGRESS (IVC)

www.ivcmiami.com
Phone: (888) 334-7495
Email: questions@ccmcme.com

17-20 May 2011

Paris, France
EUROPCR

www.europcr.com
Fax: +33 5 34 45 26 46
Email: europcr@europa-organisation.com

1-4 June 2011

New Orleans, LA
12TH ANNUAL NEW CARDIOVASCULAR HORIZONS

www.newcvhorizons.com
Contact: Dana Rigdon, CMP
Phone: (337) 993-7977 begin_of_the_skype_highlighting (337) 993-7977 end_of_the_skype_highlighting
Fax: (337) 993-7922
Email: dana.rigdon@slcrf.org

2-4 June 2011

Boston, MA
SVM 22ND ANNUAL SCIENTIFIC SESSIONS

www.vascularmed.org
Phone: (847) 480-2961 begin_of_the_skype_highlighting (847) 480-2961 end_of_the_skype_highlighting

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CALENDARIO DE CONGRESOS

15-18 June, 2011

New York, NY
LIVE SYMPOSIUM OF COMPLEX CORONARY & VASCULAR CASES 2011

www.cccsymposium.org
Phone: (425) 788-9060 begin_of_the_skype_highlighting (425) 788-9060 end_of_the_skype_highlighting

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16-19 June, 2011

Chicago, IL
2011 VASCULAR ANNUAL MEETING

www.vascularweb.org
Phone: (312) 541-0567 begin_of_the_skype_highlighting (312) 541-0567 end_of_the_skype_highlighting

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26-30 June, 2011

Orlando, FL
COMPLEX CARDIOVASCULAR CATHETER THERAPEUTICS (C3)

www.c3conference.net

3-5 August, 2011

Santiago, Chile
SOLACI'11

www.solacicongress.com
Email: congreso@solaci.org

CALENDARIO DE CONGRESOS

12-13 August 2011

Chicago, IL
AMPUTATION MANAGEMENT & PREVENTION SYMPOSIUM

Phone: (305) 279-2263 begin_of_the_skype_highlighting
(305) 279-2263 end_of_the_skype_highlighting
Email: questions@ccmcme.com

25-26 August 2011

Tokyo, Japan
JAPAN ENDOVASCULAR SYMPOSIUM

www.japanendovascular.com
Email: jes-info@n-practice.co.jp

8-30 September 2011

Portoroz, Croatia
ESVS VENOUS WORKSHOP

This workshop will be open for
registration on 1 May 2011

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11 September 2011

Hungary
ESVS VASCULAR ACCESS WORKSHOP

This workshop will be open for
registration on 1 May 2011

22-25 September 2011

Athens, Greece
EUROPEAN SOCIETY FOR VASCULAR SURGERY 25TH ANNUAL MEETING

Megaron Conference Centre

NORMAS DE PUBLICACIÓN

La redacción de **TÉCNICAS ENDOVASCULARES (TE)** considerará para su publicación aquellos trabajos relacionados con la terapéutica endovascular. Las secciones que compone la revista son:

- **Editorial**
- **Trabajos originales**
- **Revisiones**
- **Casos clínicos**
- **Imágenes endovasculares**
- **Notas técnicas**
- **Zona catastrófica**
- **Novedades desde la industria**
- **Cartas al Director**
- **Bolsa de Trabajo e intercambio profesional**
- **Congresos**

EDITORIAL

Se asignará por invitación desde la redacción de **TE**.

TRABAJOS ORIGINALES

Se consideran trabajos originales aquellos que no hayan sido publicados en otros medios de comunicación escrita médica. Deberán constar de la estructura siguiente:

- Resumen en Español y Abstract en Inglés (máximo 250 palabras)
- Introducción
- Material y Métodos
- Resultados
- Discusión y conclusiones
- Referencias Bibliográficas

Importante:

Cada uno de los apartados anteriores iniciará página. En la primera página deberá figurar el título completo, los autores, el centro de trabajo, la persona de contacto para la correspondencia con su dirección postal y e-mail, la sección a la que va dirigida y la fecha de envío. Asimismo deberá confeccionar un título corto y facilitar palabras clave (mínimo de 3 y máximo de 6).

El manuscrito se redactará con letras de tamaño 12 (preferiblemente tipo Times, Arial o Courier), con interlineado doble y con las páginas numeradas. El idioma deberá ser Español o Inglés.

Referencias Bibliográficas: Se numerarán según aparición correlativa en el texto. Para la citación de los trabajos se utilizarán las normas que aparecen detalladas en 'Uniform Requeriments for Manuscripts Submitted to Biomedical Journals', NEJM 1997; 336:309-316.

A modo de ejemplo:
Artículo: Kioka Y, Tanabe A, Kotani Y, Yamada N, Nakahama M, Ueda T, et al. Review of coronary artery disease in patients with infrarenal abdominal aortic aneurysm. Circ J 2002;66(12):1110-2

Capítulo de Libro: Coselli JS, Buket S, Crawford ES. Thoracic Aortic Aneurysms. En: Haimovici H, Ascer E, Hollier LH, Strandness DE, Towne JB, eds. Vascular Surgery. Cambridge (USA), Blackwell Science, 1996; 759-785

Figuras: Las figuras irán numeradas (números árabes) correlativamente según aparición en el texto. Se aceptará un máximo de 5. Las imágenes deberán indicar su orientación. Las figuras en color se reproducirán del mismo modo si su interés lo hace imprescindible. De modo contrario, se reproducirán en escala de grises. Se adjuntará en página aparte los pies de figura. Si las figuras van digitalizadas deberán presentarse en formato jpg a 300 ppp, a 10 x 15 cms.

Tablas: Las Tablas se numerarán con números romanos correlativos según su orden de aparición en el texto. Se aceptará hasta un máximo de 5 tablas por trabajo. Cada tabla deberá identificarse con un breve texto explicativo.

REVISIONES

Se aceptarán para su valoración aquellos trabajos de revisión que por su actualidad o controversia susciten la atención de los especialistas relacionados con las terapéuticas endovasculares. Se podrán solicitar explícitamente desde la redacción o bien someter libremente según iniciativa de sus autores. Deberán seguir las mismas normas de redacción y presentación que aparecen para los trabajos originales. No obstante, su estructuración deberá contemplar:

- Resumen (Español) y abstract (Inglés)
- Introducción
- Desarrollo
- Conclusiones
- Referencias Bibliográficas

NORMAS DE PUBLICACIÓN

CASOS CLÍNICOS

Se aceptarán para su valoración los casos clínicos singulares y originales. Seguirán las normas de redacción ya mencionadas en apartados anteriores. Si bien su estructuración deberá ser:

- Resumen (Español) y Abstract (Inglés) máximo de 150 palabras
- Caso
- Referencias Bibliográficas (máximo de 5)
- Las Figuras estarán limitadas a tres como máximo.

IMÁGENES ENDOVASCULARES

Se aceptarán para su valoración aquellas imágenes relacionadas con las terapéuticas endovasculares que por su singularidad sean merecedoras de su publicación. Se acompañarán de texto (máximo 100 palabras) y referencias bibliográficas si se considera necesario en un máximo de dos. Sólo se aceptarán dos figuras.

NOTAS TÉCNICAS

Se aceptarán para su valoración aquellas modificaciones o innovaciones técnicas que se consideren de interés para los profesionales relacionados con las terapéuticas endovasculares. Se ilustrarán con un máximo de tres figuras y un texto máximo de 500 palabras. Se podrá acompañar de 5 referencias bibliográficas.

ZONA CATASTRÓFICA

Se aceptará para su valoración aquellas situaciones o procedimientos que condujeron a complicaciones singulares, resueltas o no satisfactoriamente, pero que de la experiencia se pueda derivar una enseñanza de interés para los profesionales relacionados con las terapéuticas endovasculares. Se seguirán las recomendaciones reflejadas en el apartado de 'casos clínicos'.

NOVEDADES DESDE LA INDUSTRIA

Los profesionales de la industria podrán disponer de un espacio que permitirá dar a conocer nuevos proyectos o productos a través de esta sección. Se aceptarán para su valoración textos (máximo 500 palabras) y figuras (máximo de tres) para este cometido. Se dará preferencia a las publicaciones procedentes de las industrias colaboradoras habituales de **TE**.

CARTAS AL DIRECTOR

En esta sección se dará cabida a todas las cartas que en la redacción se reciban a modo de sugerencia, crítica o comentario del fondo y forma de **TE**.

BOLSA DE TRABAJO E INTERCAMBIO PROFESIONAL

Este espacio se reservará para anunciar oportunidades de trabajo o de formación en el campo de la terapéutica endovascular. El Departamento Comercial de **TE** convendrá con el anunciante, el coste de su anuncio.

CONGRESOS

Se incluirán todos aquellos acontecimientos científicos, congresos, reuniones, jornadas, simposios, etc,, que por su interés merezcan ser anunciados a los profesionales relacionados con terapéuticas endovasculares. Su anuncio estará libre de cargo.

Todos los manuscritos, **copia impresa y en soporte informático**, deberán ser dirigidos a:

TÉCNICAS ENDOVASCULARES
Aribau, 237. Escalera B 3º-1ª, 08021 Barcelona

O directamente por correo electrónico
e-mail: **riambau@meditex.es**

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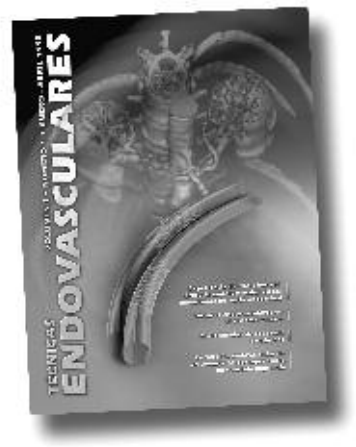

¡Revise su manuscrito y confirme su adecuación a las normas que aquí figuran antes de enviarlo a la redacción de TE!

INSTRUCTIONS FOR THE AUTHORS

'TÉCNICAS ENDOVASCULARES' (TE) will consider for publication original articles related to endovascular therapy. The appropriate sections in the journal are:

- **Editorial**
- **Original articles**
- **Reviews**
- **Case Reports**
- **Endovascular Images**
- **Technical Notes**
- **Complications/Catastrophies**
- **News from Industry**
- **Letters to the Editor**
- **Bag of Work and Professional Exchange**
- **Congress' Agenda**

CONDITIONS OF PUBLICATION

A covering letter must accompany all articles and should be signed by all authors. The first named author will be responsible for ensuring that all authors have seen and approved the manuscript. Each author should have participated sufficiently in the article to take public responsibility for the content.

Articles will be accepted on the understanding that the work has not been submitted for publication elsewhere. Exclusive copyright in the paper and illustrations shall be assigned to the publisher.

Articles involving human or animal investigations will be accepted on the understanding that the work has been approved by local ethical committees.

The articles should conform to the "Uniform Requirements for Manuscripts submitted to Biomedical Journals" NEJM 1997:336(4); 309-315.

EDITORIALS

These will be by invitation from the Editorial Board.

ORIGINAL ARTICLES

Language can be Spanish or English and should conform to the following structure:

- Title Page
- Abstract and key words
- Introduction
- Material and Methods (including a description of the statistics)
- Results
- Discussion and Conclusions
- Acknowledgements
- References
- Tables
- Legends for Illustration

Each of the above sections should begin on a new page. The title page should include the title of the article, the authors and affiliations, the name, address and e-mail contact of the author responsible for correspondence and requests for reprints, the category for which the manuscript is being submitted, the source of any support or funding and a short title (running head). The second page should contain the abstract, which should not exceed 200 words and should accurately reflect the content of the body of the article. 3 to 6 key words are required. Each table should be on a separate page. Illustrations should be no larger than 203 x 254mm.

The manuscript should preferably be typed on A4 paper with 25mm margins in Times New Roman, Ariel or Courier New fonts, size 12, lines should be double spaced with numbered pages. Language may be Spanish or English.

References should be cited in the Vancouver Style and should be numbered in the text consecutively by Superscript. References should be listed in numerical order at the end of the article. The first 6 authors should be listed followed by et al. Examples of a perfect style of reference are:

Article: Kioka AND, Tanabe TO, Kotani AND, Yamade N, Nakahama M, Ueda T, et al. Review of coronary artery disease in patients with infrarenal abdominal aortic aneurysm. Circ J 2002;66(12):1110-2.

Book Chapter: Coselli JS, Buket S, Crawford is. Thoracic Aortic Aneurysms. In : Haimovici H, Ascer AND, Hollier LH, Strandness OF, Towne JB, eds. Vascular Surgery. Cambridge, Blackwell Science, 1996; 759-785.

Figures should be consecutively numbered as they appear in the text, each on a separate page. A maximum of 5 will be accepted. The reverse side of any illustration should indicate its orientation. Colour figures will only be accepted if they are indispensable, otherwise they will be reproduced in black and white.

INSTRUCTIONS FOR THE AUTHORS

Tables should be consecutively numbered as they appear in the text. Up to 5 will be accepted.

Both figures and tables should have appropriate legends.

REVIEWS

The submission of review articles that address topics of current interest or controversy are encouraged. The structure of the article will be dependent upon the subject that they review, but a possible format would be:

- Abstract in English or Spanish
- Introduction
- Main text
- Conclusions
- References

CASE REPORTS

These should be brief (not exceeding 500 words) and follow the following structure:

- Abstract
- Case Report
- Discussion
- References (maximum of five)
- Figures and tables (minimum of three)

ENDOVASCULAR IMAGES

Striking endovascular images will be accepted for publication, they should be short with text limited to 100 words and up to 2 references. Only 2 figures will be accepted.

TECHNICAL NOTES

Therapeutic innovations or interesting technical modifications will be considered for publication. They should be short with a maximum of 500 words, 3 figures and up to 5 references.

COMPLICATIONS/CATASTROPHIES

The Journal will accept for publication short cases that involve complications that have a well-focused learning point for the readers. The case should be structured as "case reports".

NEWS FROM INDUSTRY

Industry will have space to focus on new products or projects. The articles should have a maximum of 3 figures and 500 words. Preference will be given to those companies collaborating with Técnicas Endovasculares.

LETTERS TO THE EDITOR

Correspondence that focuses upon subjects of interests to the readership will be considered for publication.

BAG OF WORK AND PROFESSIONAL EXCHANGE

There will be an opportunity to advertise work opportunities and teaching programmes relating to the field of endovascular therapy. There will be a financial charge for this facility.

CONGRESS AGENDA

This section will be available to advertise congresses, meetings, workshops etc that have relevance to the field of endovascular therapy. There will be no charge.

CORRESPONDENCE

All manuscripts should be formatted as detailed above, and presented on A4 paper (210 x 297mm) on one side of the paper only with double spacing and 3cm margins. If possible the entire manuscript can be sent on a disk to:

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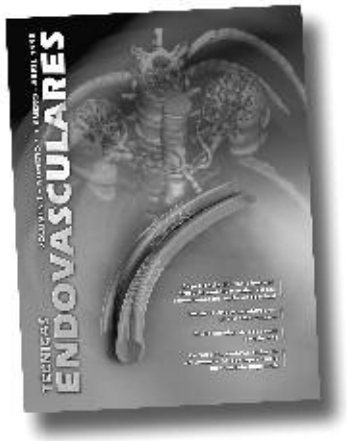
Aribau, 237. Stairway B 3o-1a, 08021 Barcelona
or e-mailed to:
riambau@meditex.es
tecnicas@a2multimedia.com

If electronic submission is not possible please forward 3 copies by post.



TÉCNICAS
ENDOVASCULARES

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