

VASCULAR SURGERY AT CROSSROADS:

HOW ENDOVASCULAR INNOVATION HAS CHANGED THE MANAGEMENT OF AORTIC DISEASE



ICVL / HLTDL

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IX Congresso
Novas Fronteiras
em Medicina
Cardiovascular

22 a 24 de Fevereiro 2019

The Village Praia D'El Rey - Óbidos

INNOVATION IN SURGERY

ADVANTAGES FOR THE PATIENT:

Improved Survival

Reduced morbidity

Durability of the new procedure

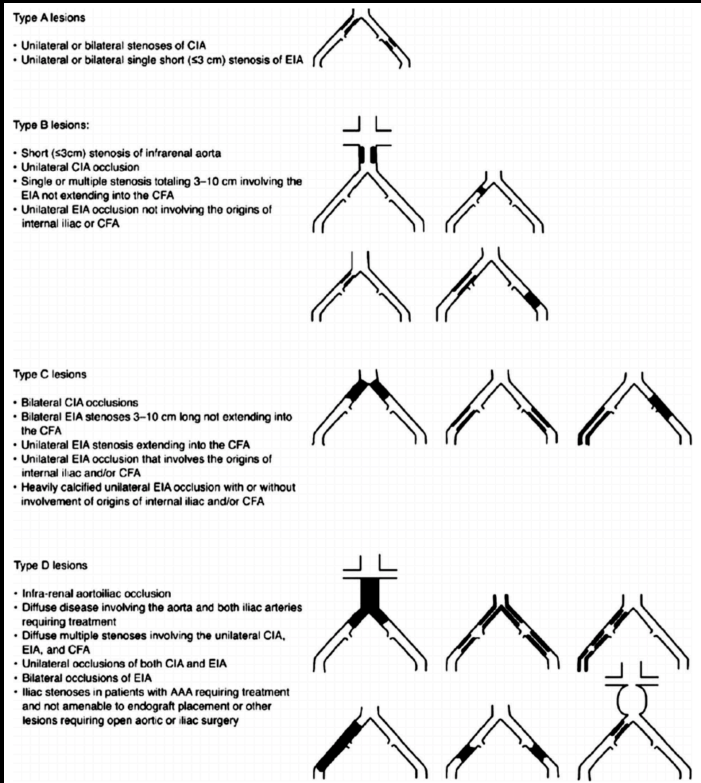
IMPROVEMENT ON LONG-TERM REINTERVENTION – FREE SURVIVAL

COST – BENEFIT RELATIONSHIP

ENDOVASCULAR REVOLUTION

PROXIMAL OCCLUSIVE DISEASE

TASC – II CLASSIFICATION

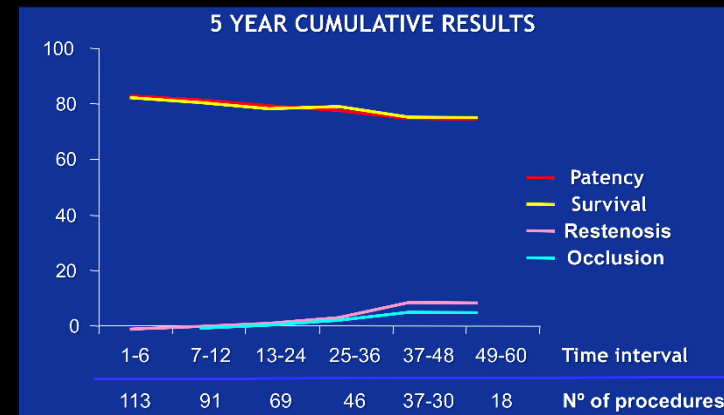


TASC A / B / C LESIONS

PTA / STENTING AS FIRST OPTION

REDUCED MORBIDITY AND MORTALITY

EXCELLENT LONG - TERM PATENCY AND DURABILITY



TASC D LESIONS

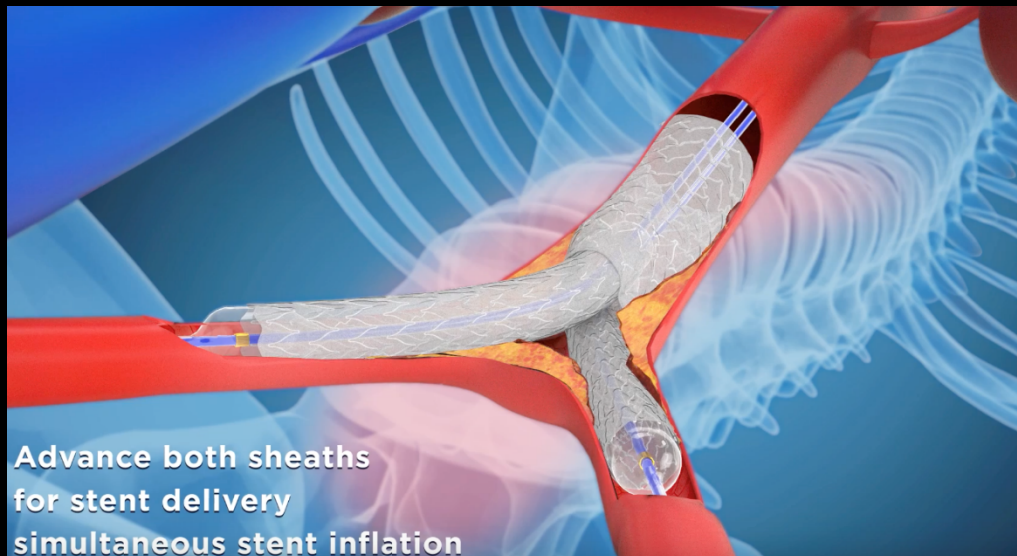
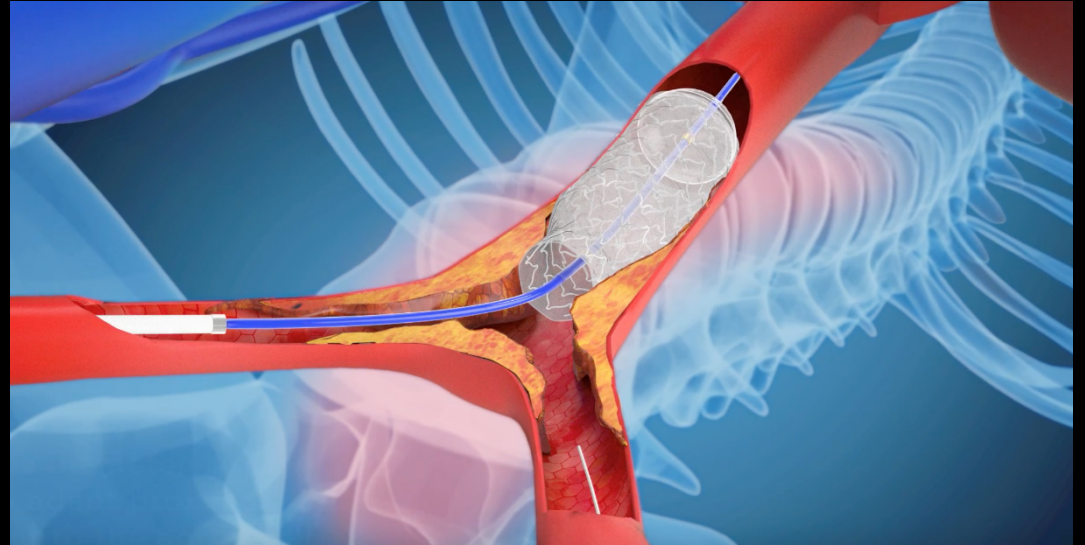
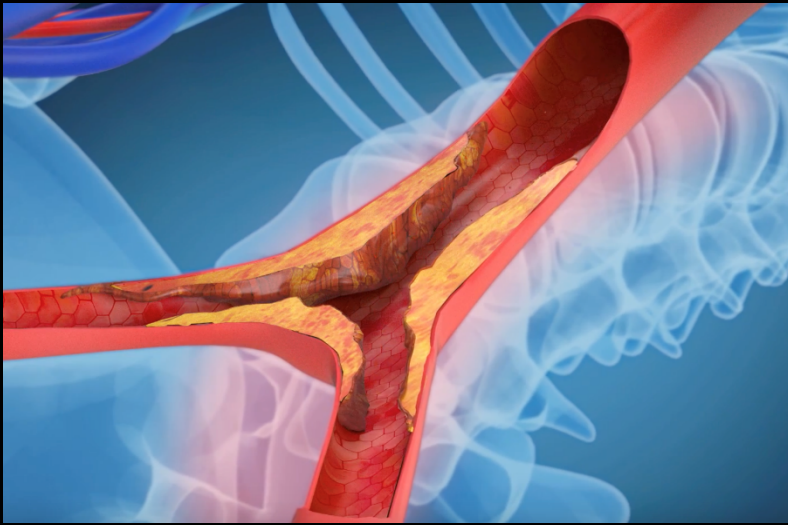
CONTROVERSY WITH OPEN SURGERY

(Aorto-femoral bifurcation graft)

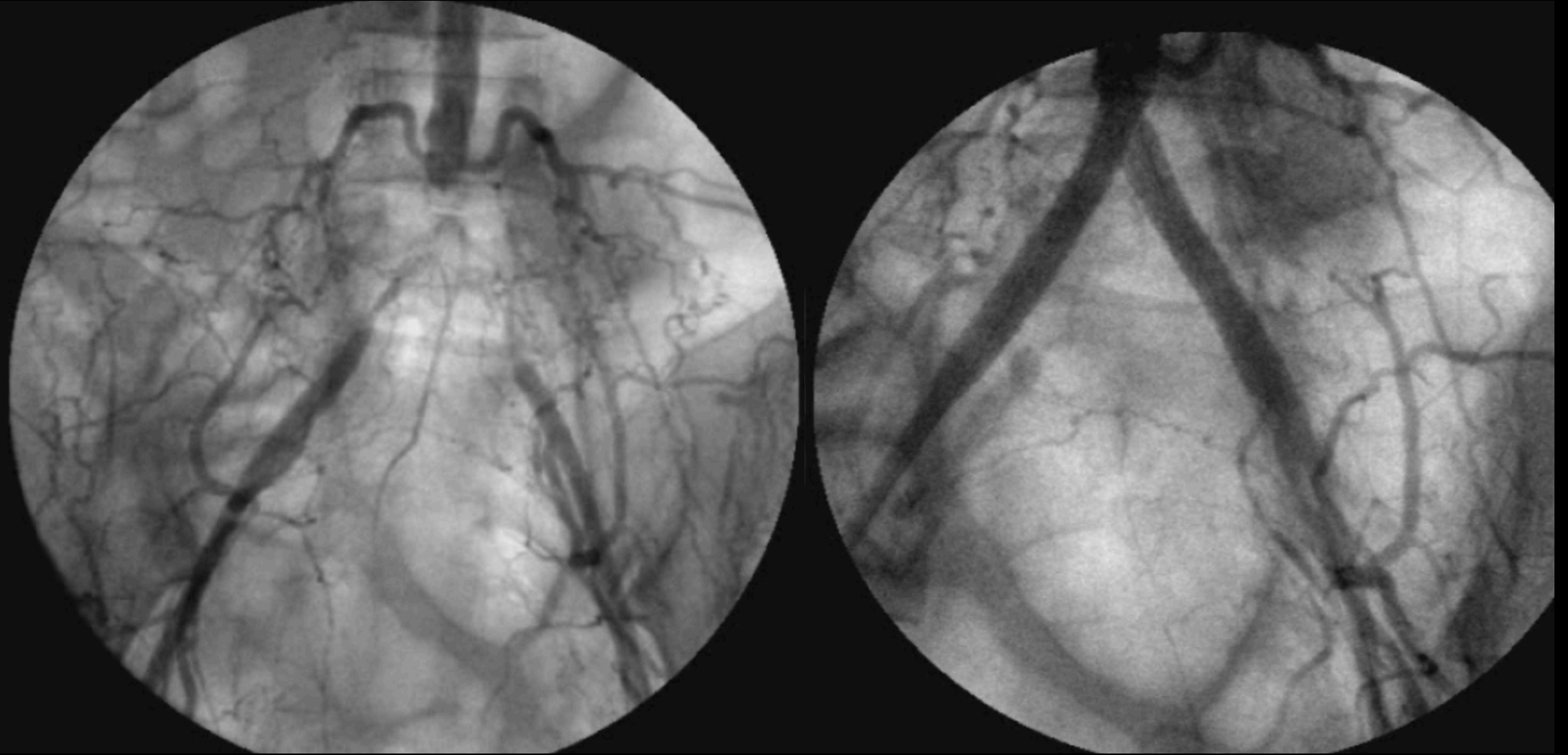
■ Survival		91%
■ Patency (primary)		90.4%
■ Restenosis		12%
■ Occlusions		7.9%

CERAB:

COVERED ENDOVASCULAR RECONSTRUCTION OF AORTIC BIFURCATION



A.T.V., 52 yrs , Female

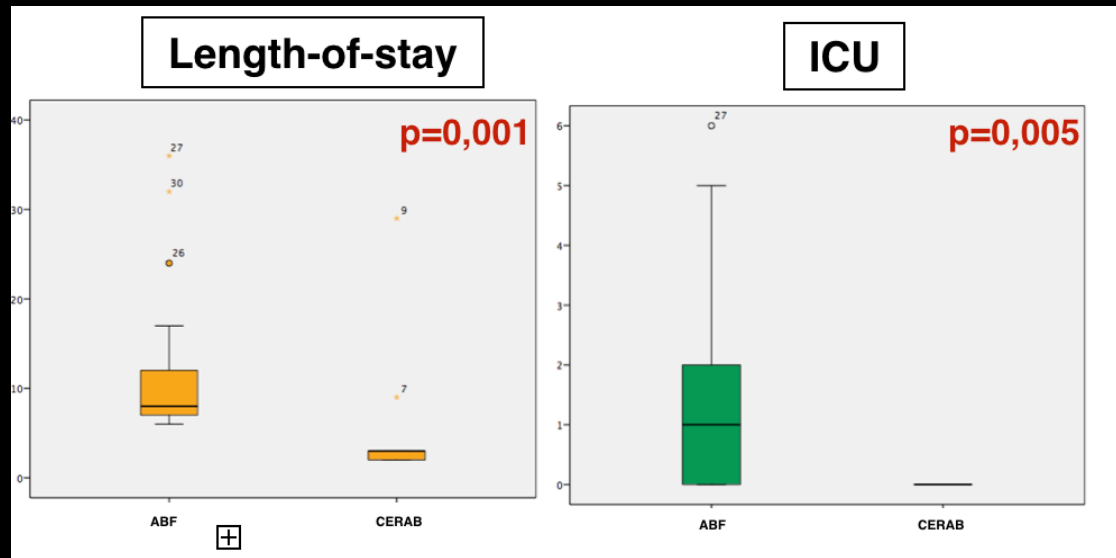


CERAB: Covered Endovascular Reconstruction of Aortic Bifurcation

MORTALITY:
(< 30 days)

CERAB 0

ABF 3.3% (1/30)

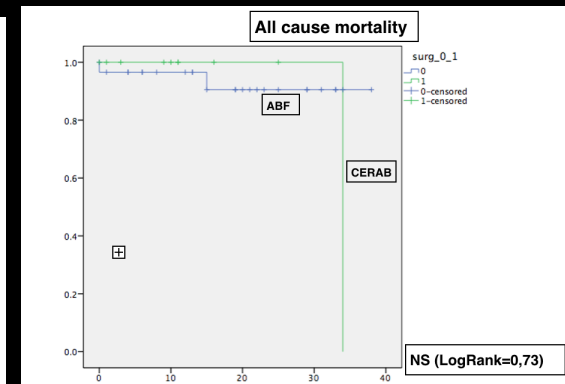
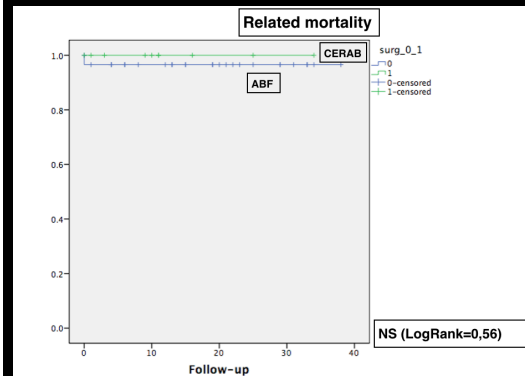
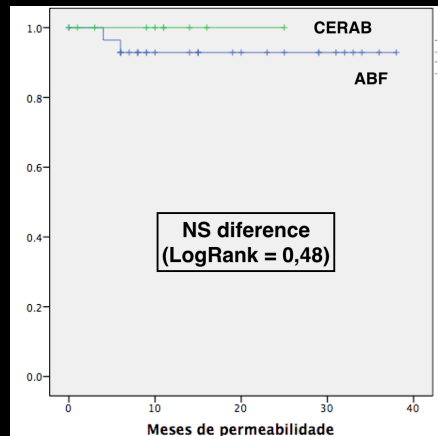


Late outcomes:

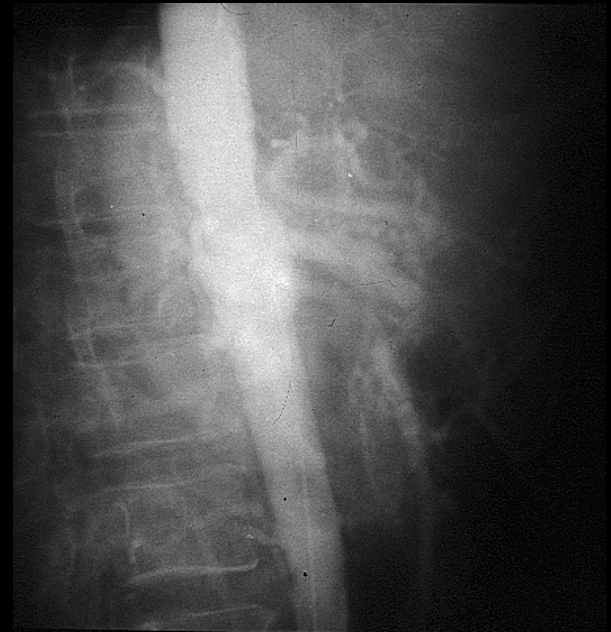
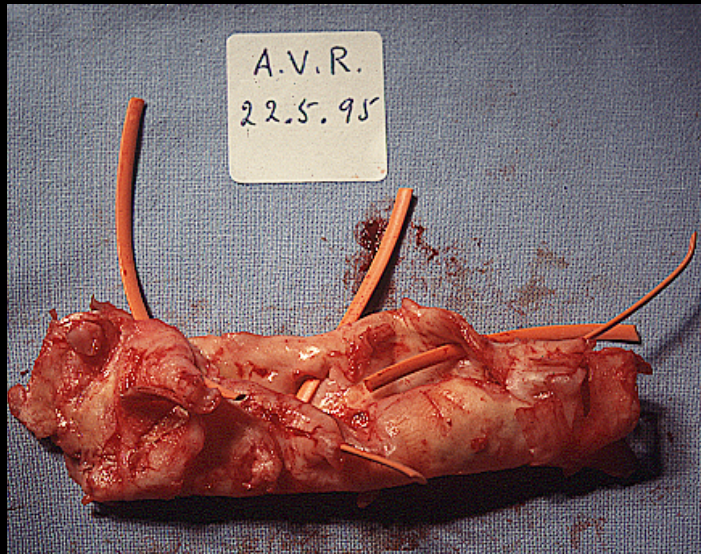
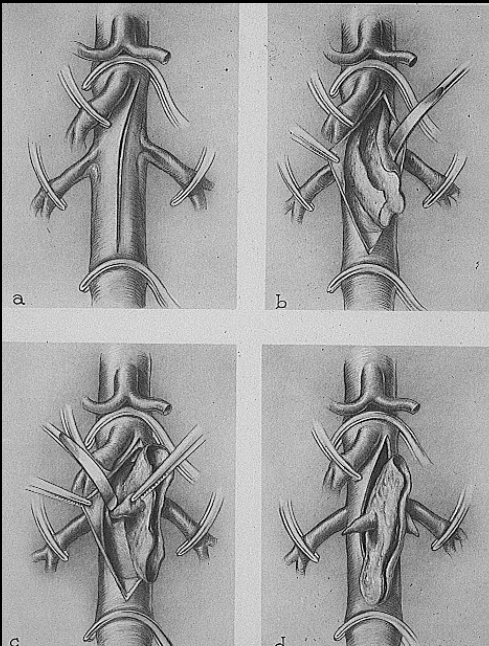
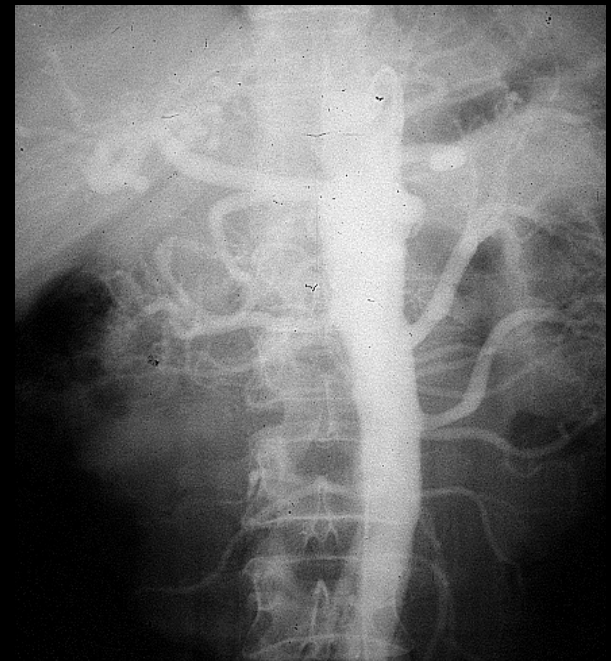
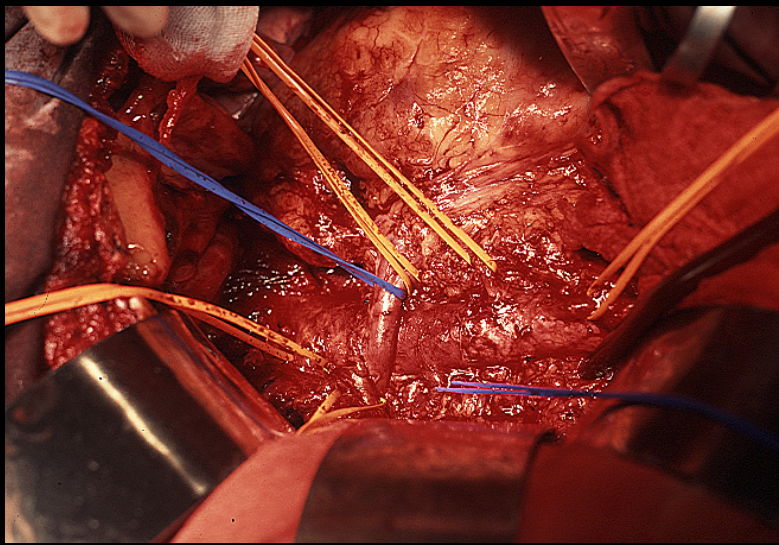
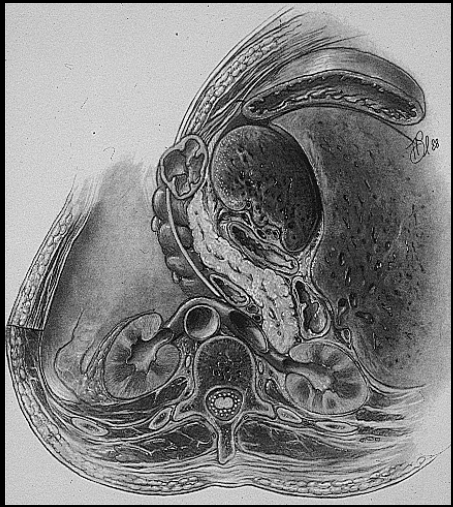
Clinical improvement (Rutherford):

- ABF: median 3 (0-6)
- CERAB: median 3 (0-5)

Improvement **was significant in both groups** ($p < 0.001$)



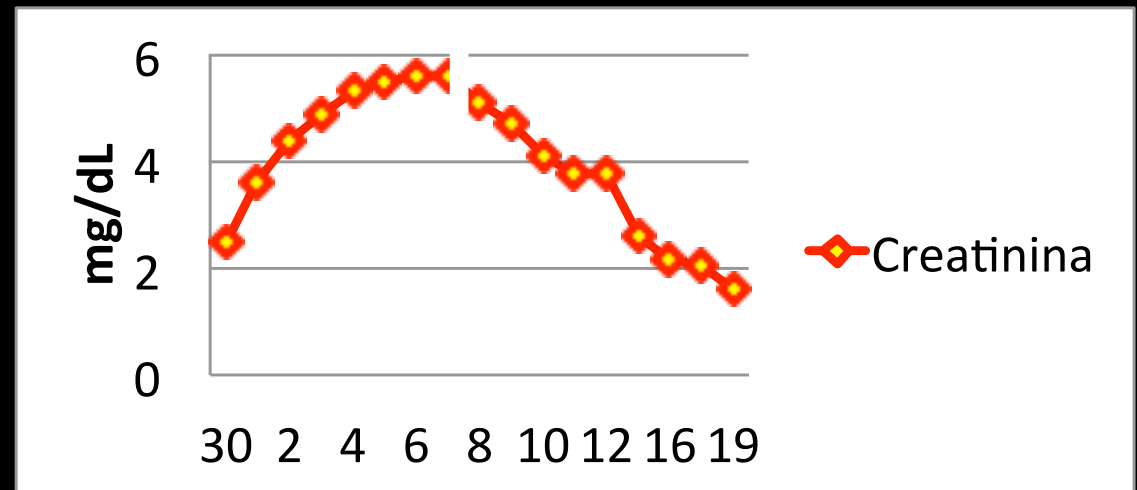
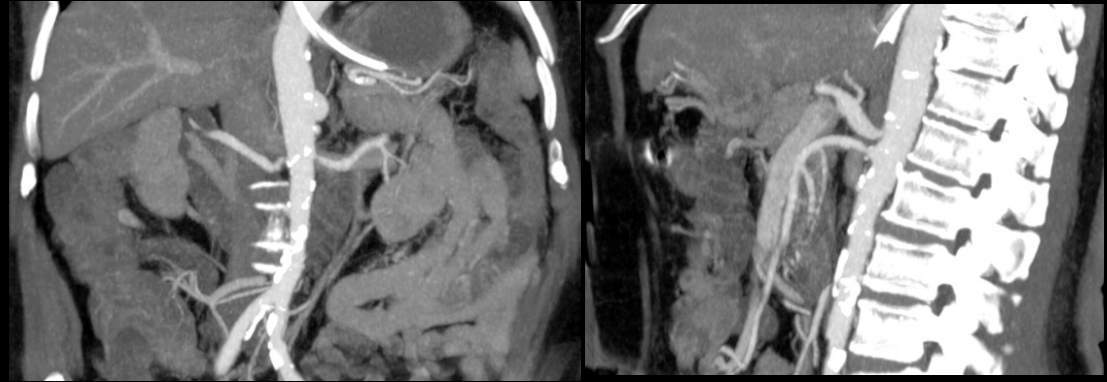
- CERAB seems to be safe and feasible in patients with aortoiliac TASC-II D disease when compared to the gold standard (ABF):



2014: CEA for minor stroke
BP controlled
Renal function preserved
Patency of the reconstruction

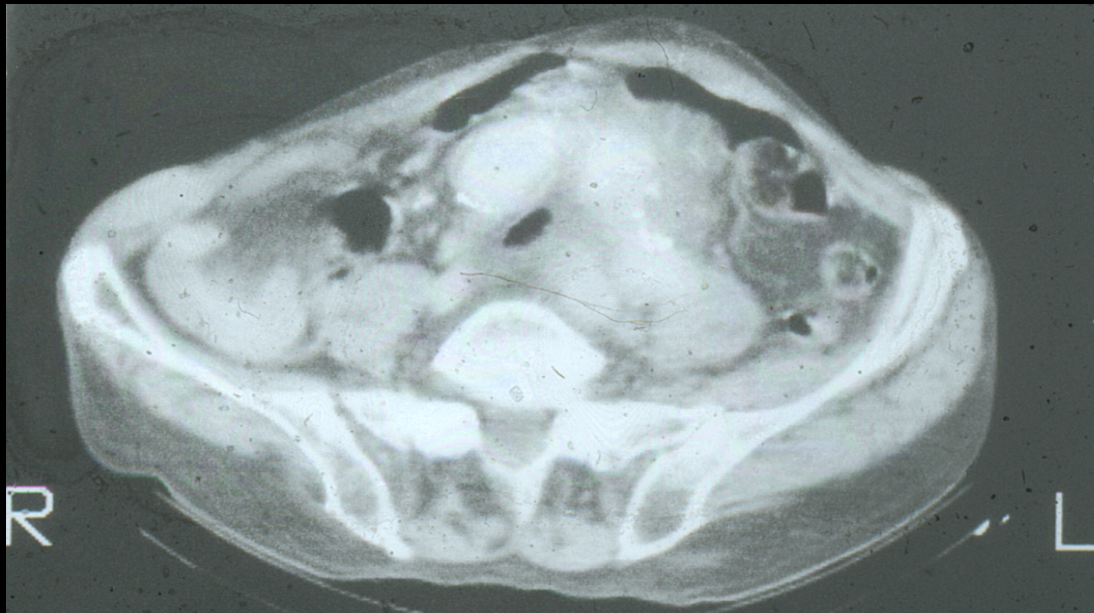
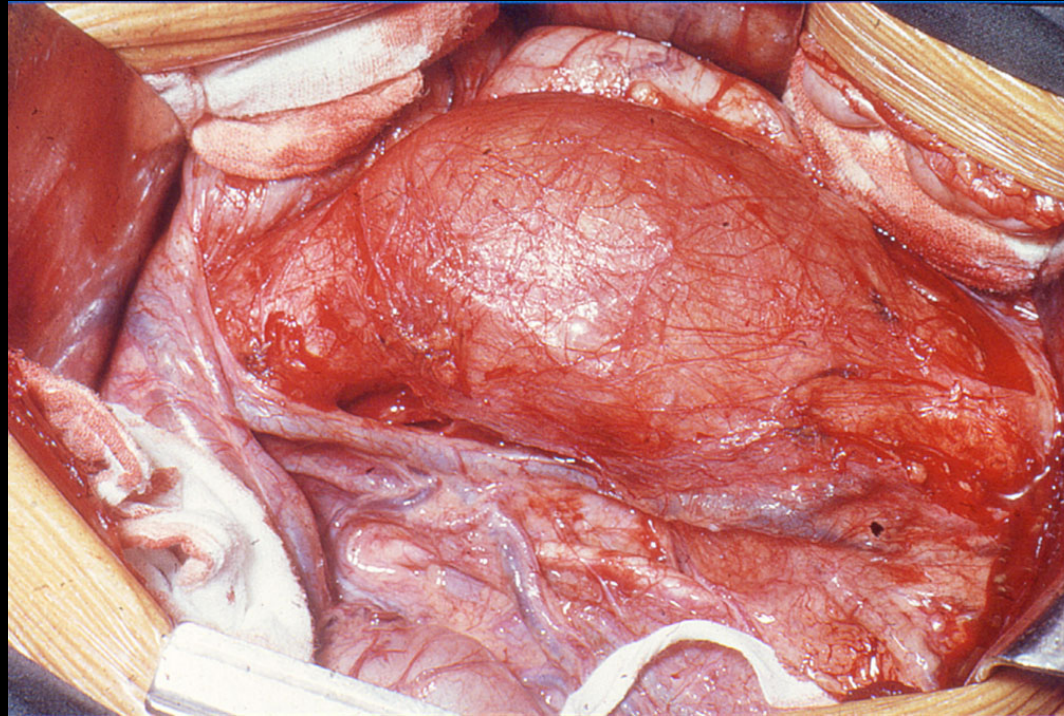
A.M., MALE, 76 yrs

- ▶ Hypertension with heart failure
- ▶ Rectal bleeding
- ▶ Diabetes
- ▶ Previous stroke



Discharge at 19th day after admission:
Well
BP controlled w/ 2 medications
No further episode of rectal bleeding

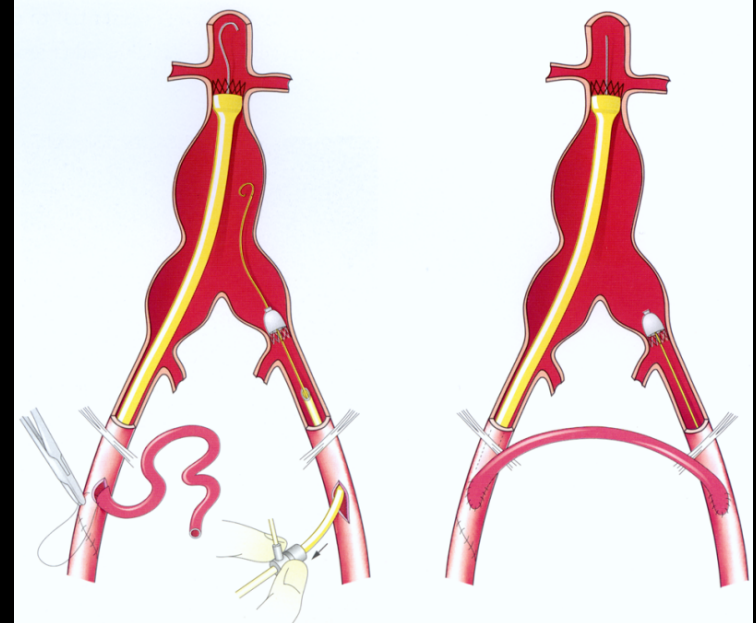
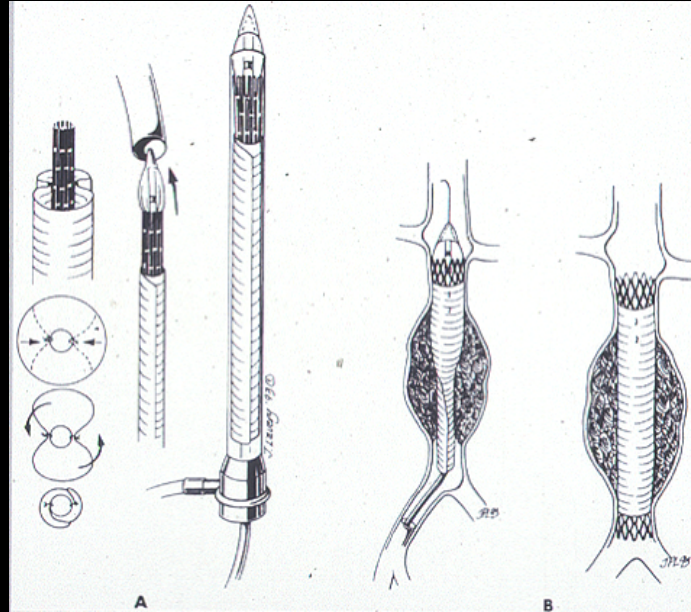
AORTIC ANEURYSMS





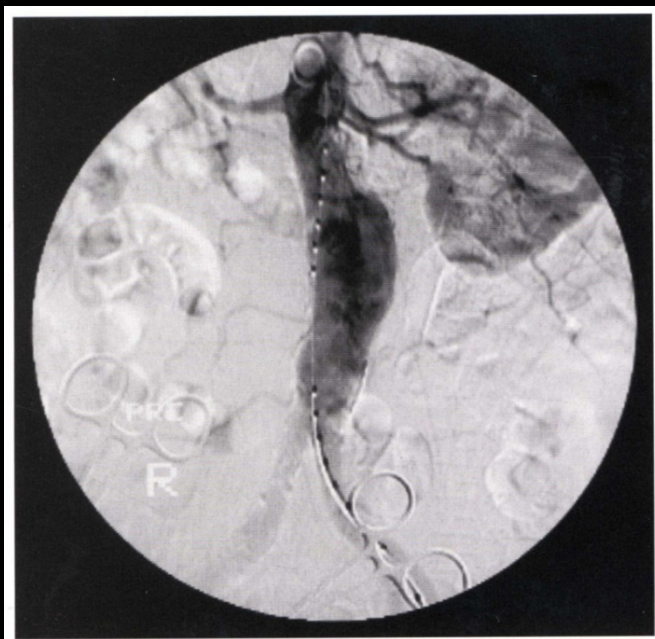
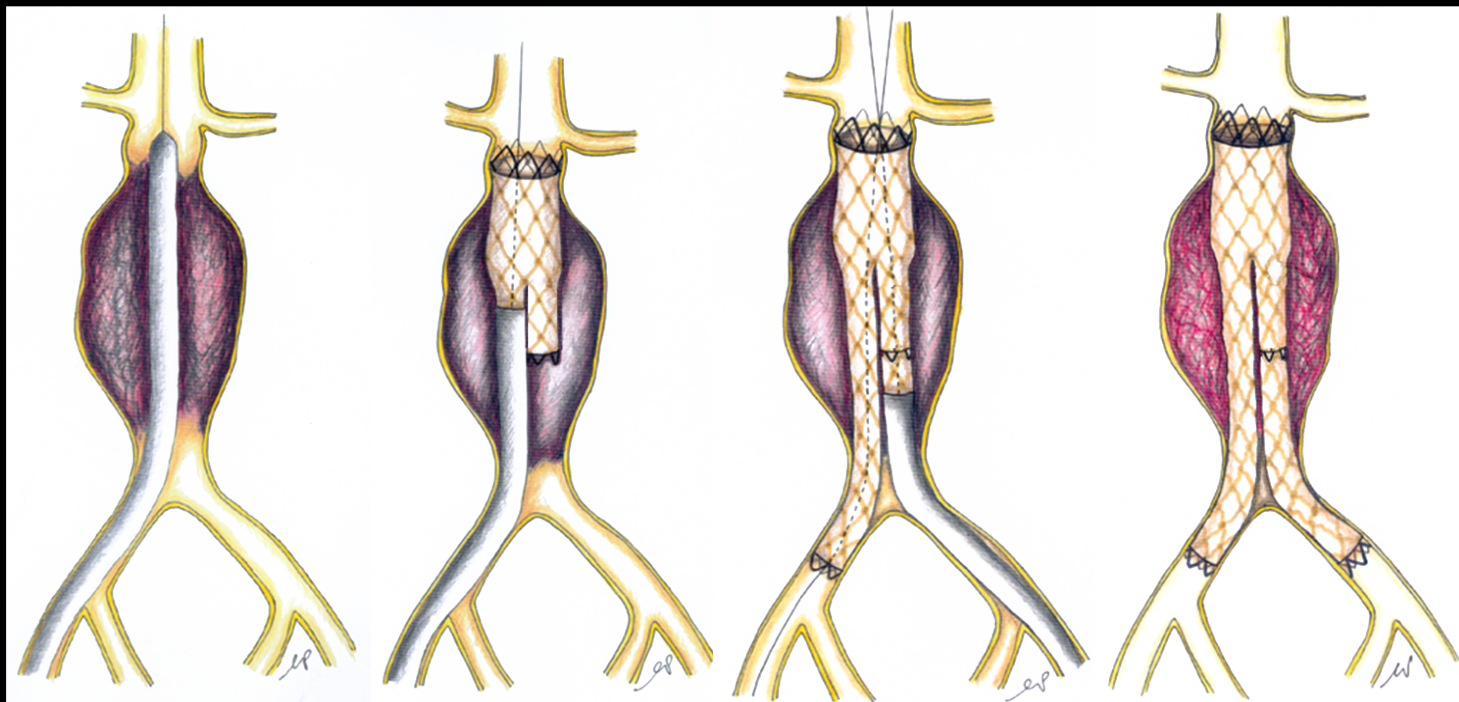
MARÇO 1987

HONORARY MEMBER



Annals of Vascular Surgery, 5: 491-497, 1991

**A SUCCESSFUL STORY THAT
CHANGED MANAGEMENT OF
ANEURYSMAL DISEASE**



EVAR IN AORTIC ANEURYSMS

ANATOMIC REQUIREMENTS FOR EVAR

Rules of OR – Bridging between *normal* segments (landing zones)

NEW IMAGING REQUIREMENTS AND STANDARDS

High-Resolution CTA / Anatomy of the disease

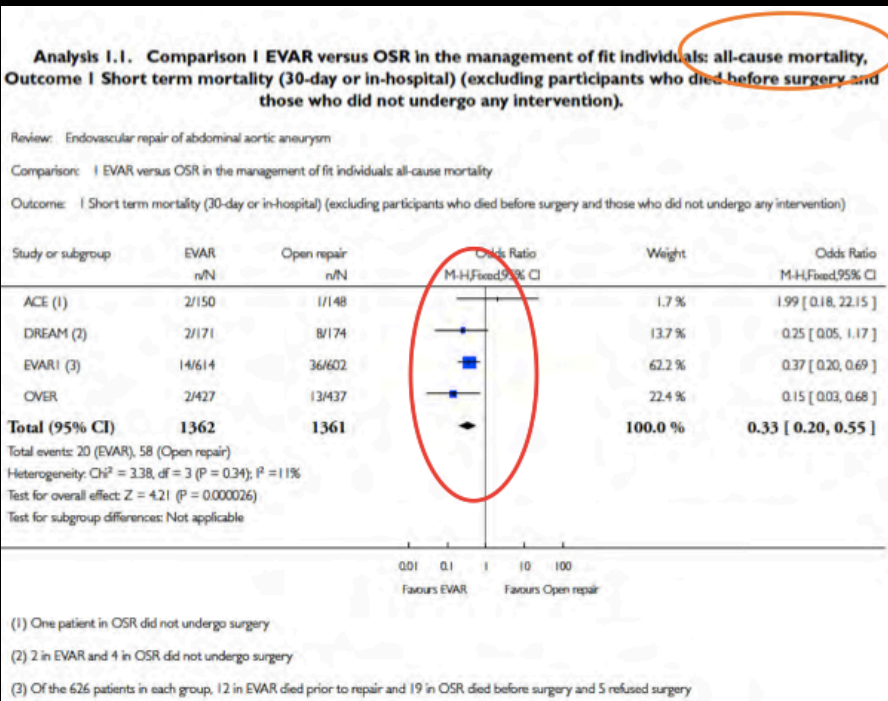
IMPROVEMENT IN THE UNDERSTANDING OF THE DISEASE

Improved Selection of Patients

NEW ENDOPROSTHESIS

Safer and more durable

EVAR vs OPEN REPAIR



Analysis II.1. Comparison II EVAR versus OSR in the management of fit individuals: length of hospital stay, Outcome I Length of hospital stay.

Length of hospital stay

Study	EVAR	OSR	P value
ACE	5.8 ± 5.5 days (mean ± SD)	10.4 ± 8.3 days (mean ± SD)	< 0.0001
DREAM	6 days (mean)	13 days (mean)	< 0.001
EVARI	10.3 ± 17.8 days (mean ± SD)	15.7 ± 16.9 days (mean ± SD)	< 0.001
OVER	3.0 days (2.0 to 5.0) (mean/range)	7.0 days (6.0 - 10.0) (mean/range)	< 0.001

ADVANTAGES OF EVAR

Reduction of early mortality and morbidity

Treatment of higher risk patients (not suitable for OR)

Shorter ICU and hospital stays

Affordable early costs (?)

ABDOMINAL AORTIC ANEURYSMS

- **Elective Abdominal Aortic Aneurysms: 247 patients**

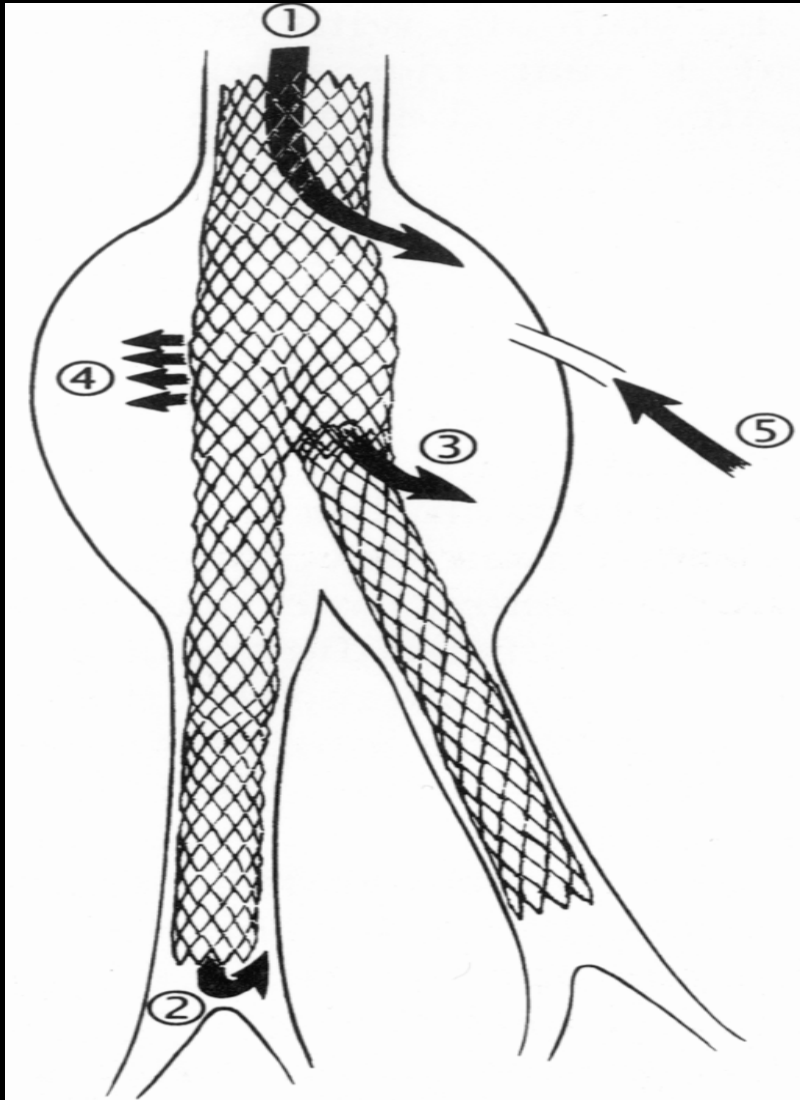
Open repair - 175 patients

Mortality < 30 days: 4 (2.3%)

Endovascular repair - 130 patients

Mortality < 30 days: 1 (0.8%)

FAILURES AFTER EVAR



Endoleaks

Migration

Structural Failure of the Endoprosthesis

Modular Disconnection

**Persistent flow from patent vessel
IMA / Lumbar arteries**

REPERFUSION OF THE ANEURYSM

SAC GROWTH

RUPTURE

FAILURES AFTER EVAR

- **Unfavorable Anatomy** 
 - **Aortic wall irregularities / Calcification / Thrombus / Tortuosity**
 - **Occlusions**
- **Inadequate Surveillance**
 - Late Diagnosis
 - Delayed Intervention
 - Late Ruptures
- **Progression of Disease**
 - Failure of pharmacological intervention

LATE FAILURES AFTER EVAR

- **EVAR permits treatment of AAAs with low peri-operative mortality, but concerns persist over long-term durability with specific regard to sac expansion and aortic rupture**

EVAR

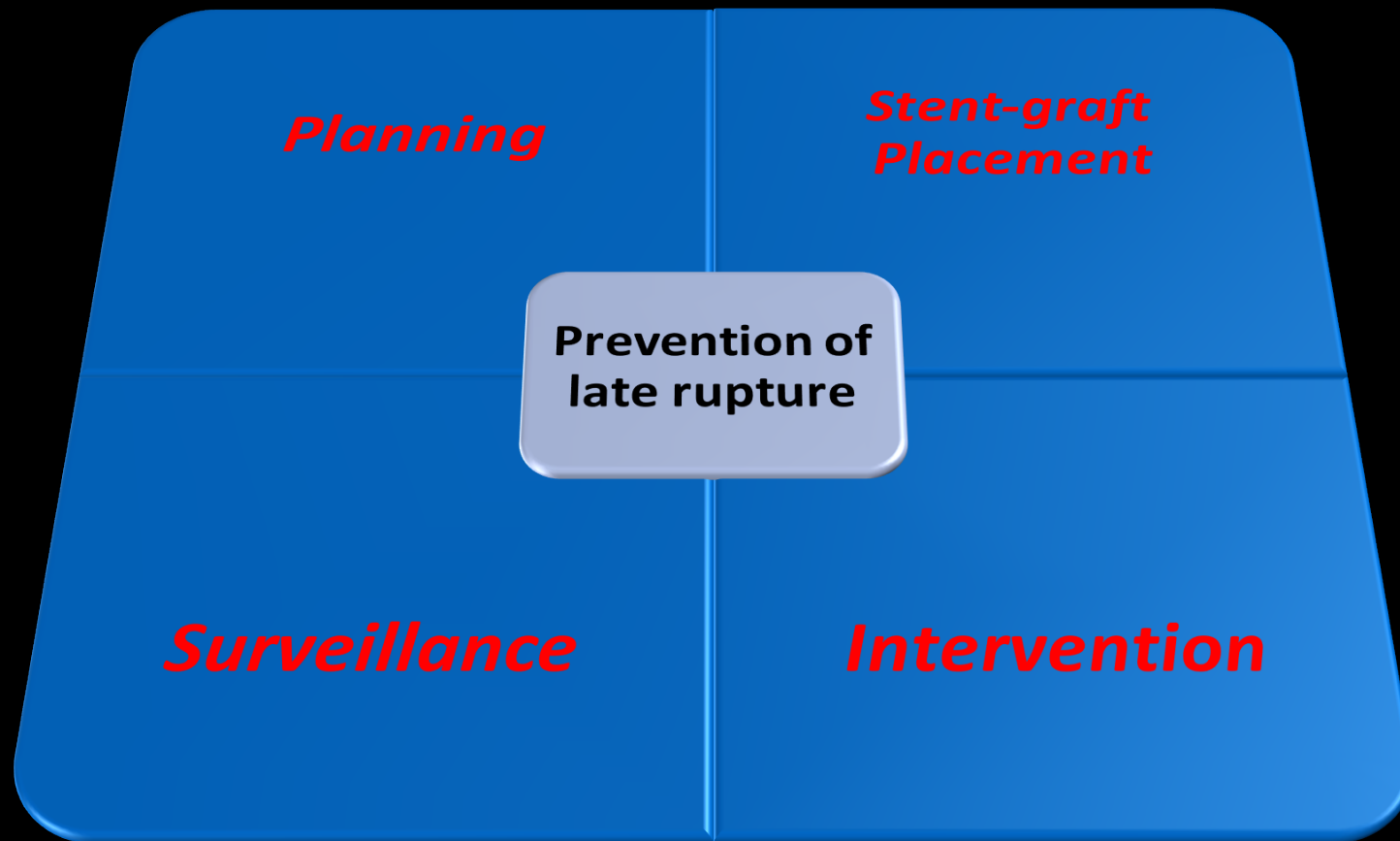
**endoleak
sac expansion**

**late
rupture**

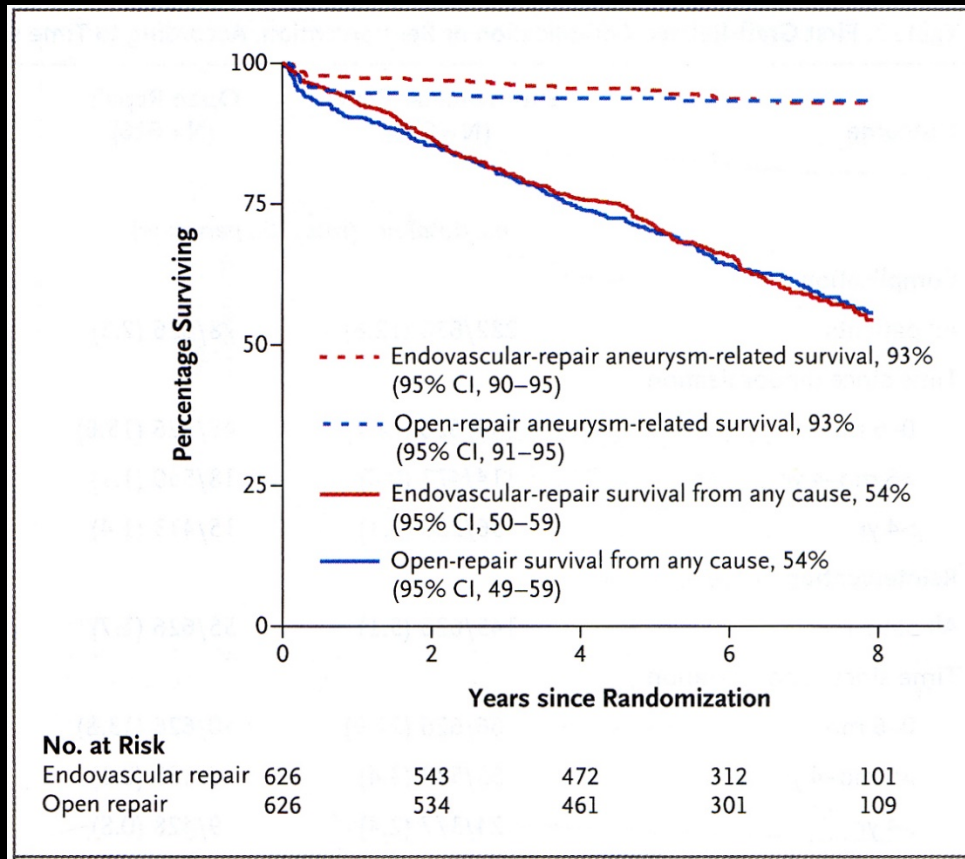
ACHILES' HEEL

EVAR FOR AORTIC ANEURYSMS

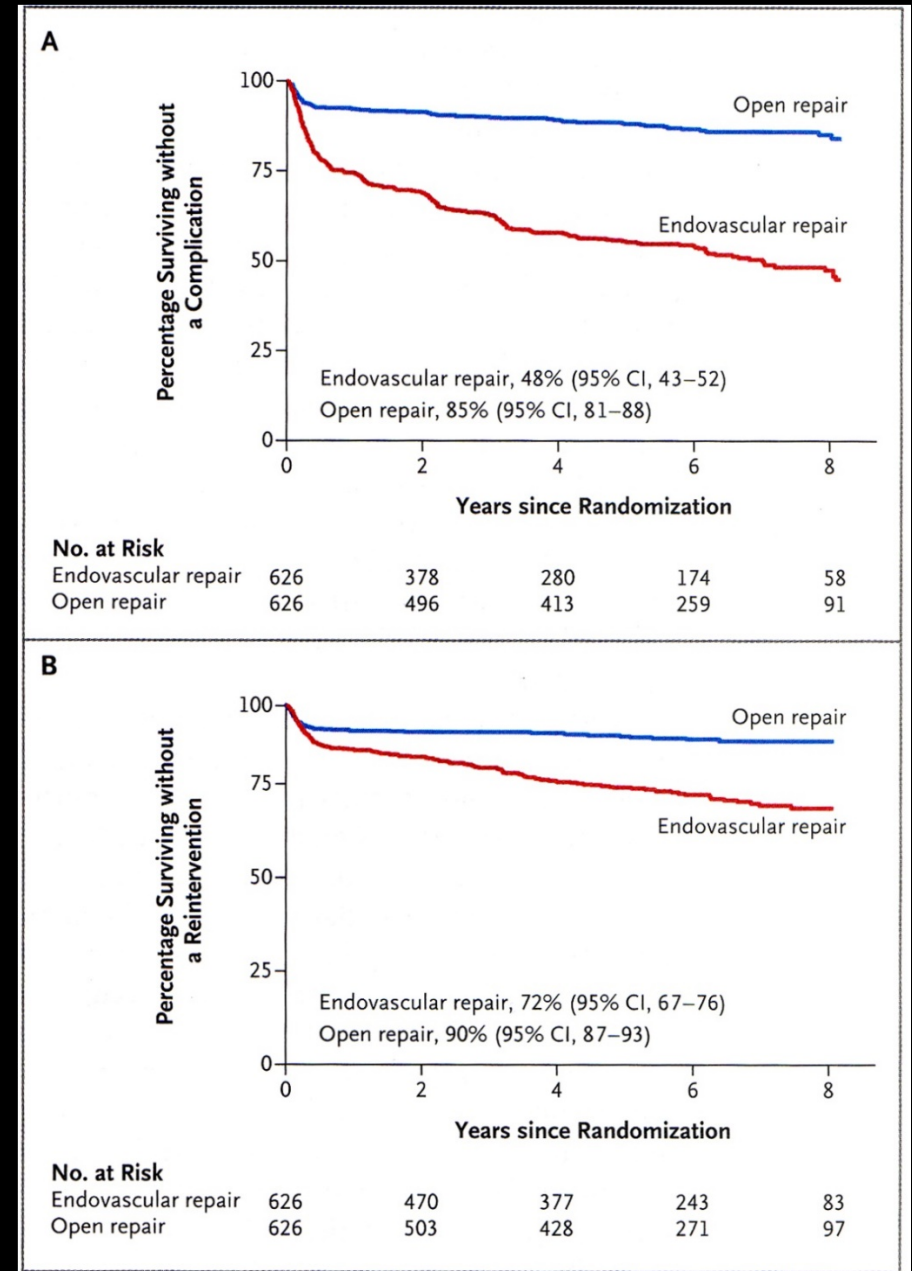
Requirements for Success



EVAR I TRIAL – 8 YRS FOLLOW - UP



N Engl J Med, 362, 20, 1863 – 187, 2010



MANAGEMENT OF AORTIC ANEURYSMS

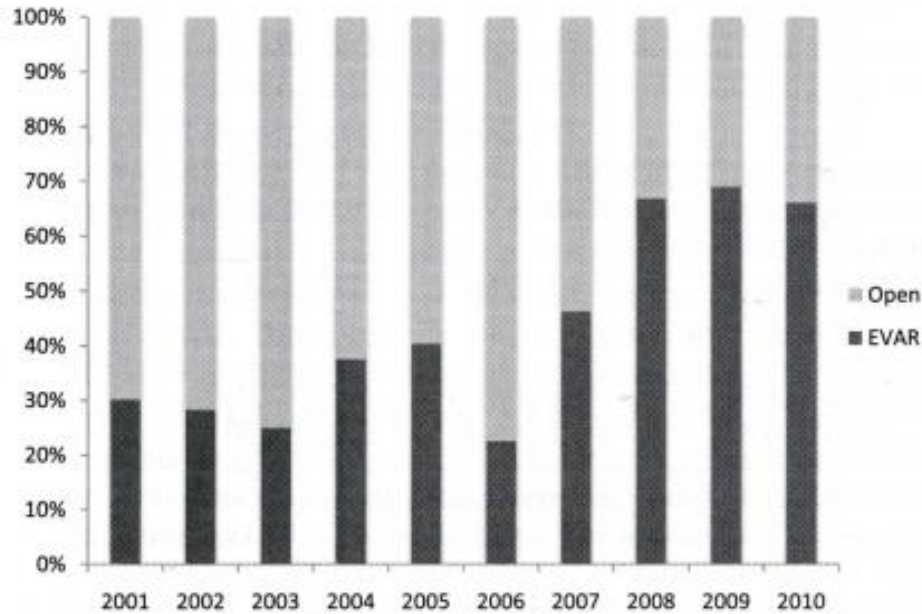


Fig 1. Percentage of total procedures performed annually via endovascular aneurysm repair (EVAR) or open techniques over the 2000 to 2010 time period.

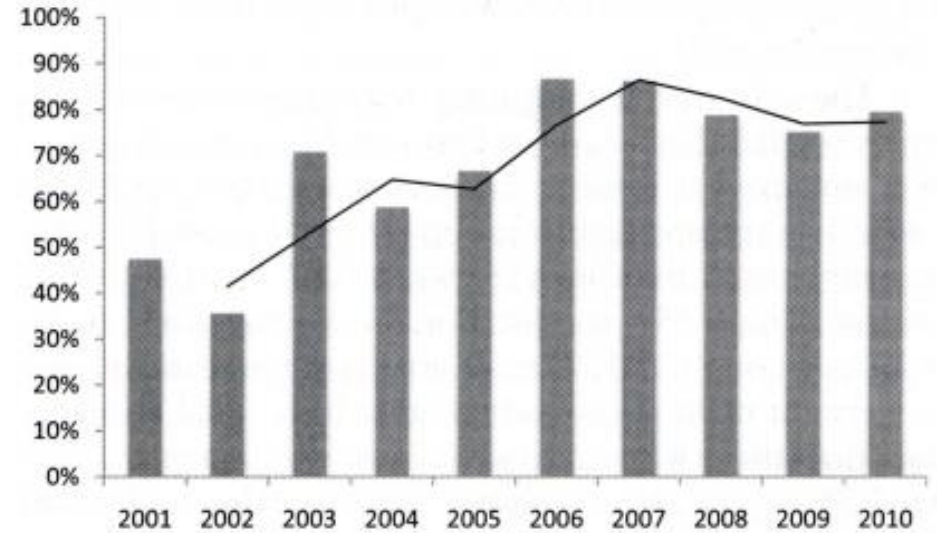


Fig 2. Percentage of patients classified as American Society of Anesthesiologists IV (ASA IV) receiving endovascular aneurysm repair (EVAR) over the 2000 to 2010 time period. The trend line represents the averages between each individual time period.

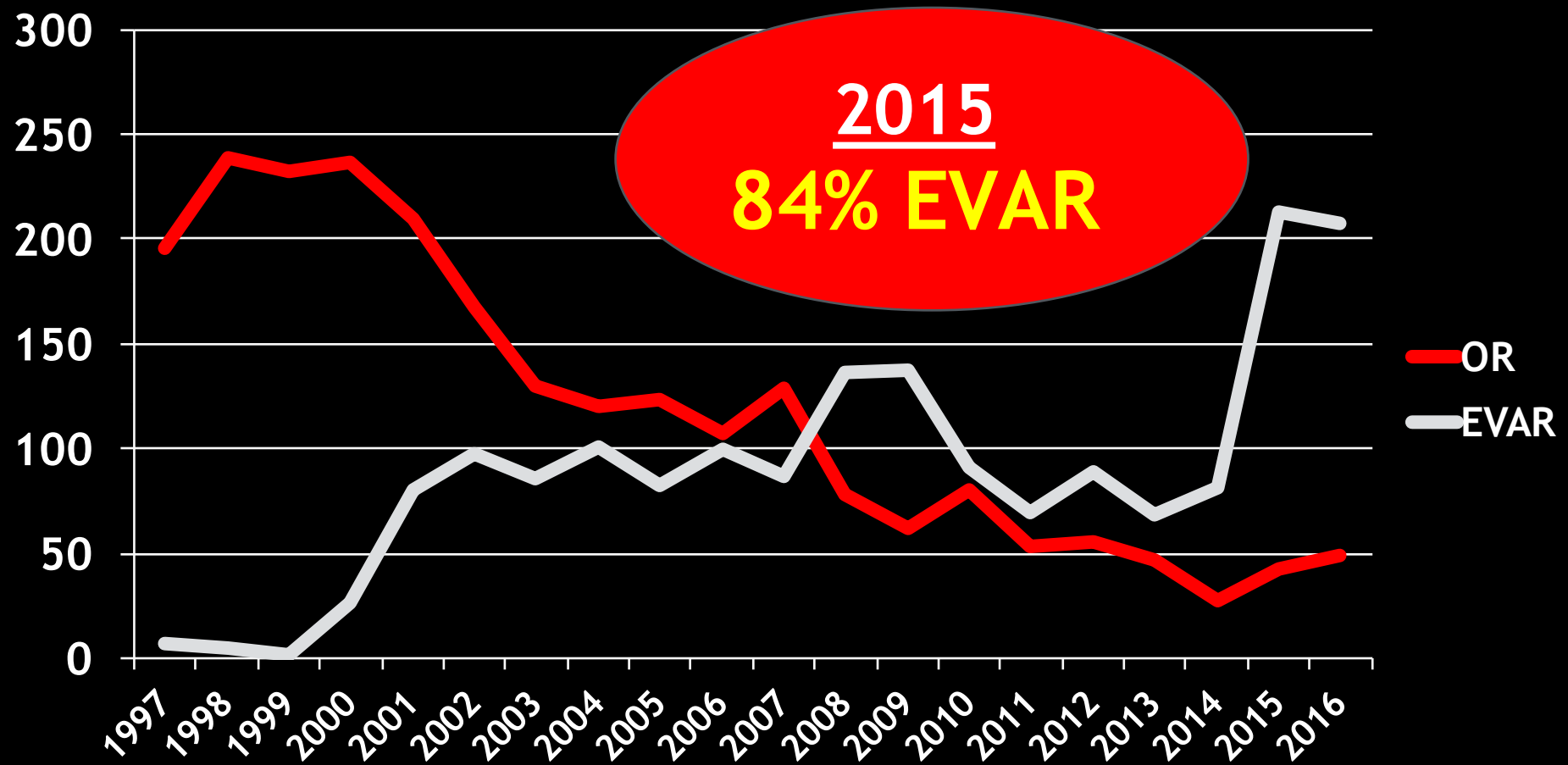
in S A Chadi et al, JVS, 55,4,924-8, 2012

EVAR > GAME CHANGER

Repair of AAA

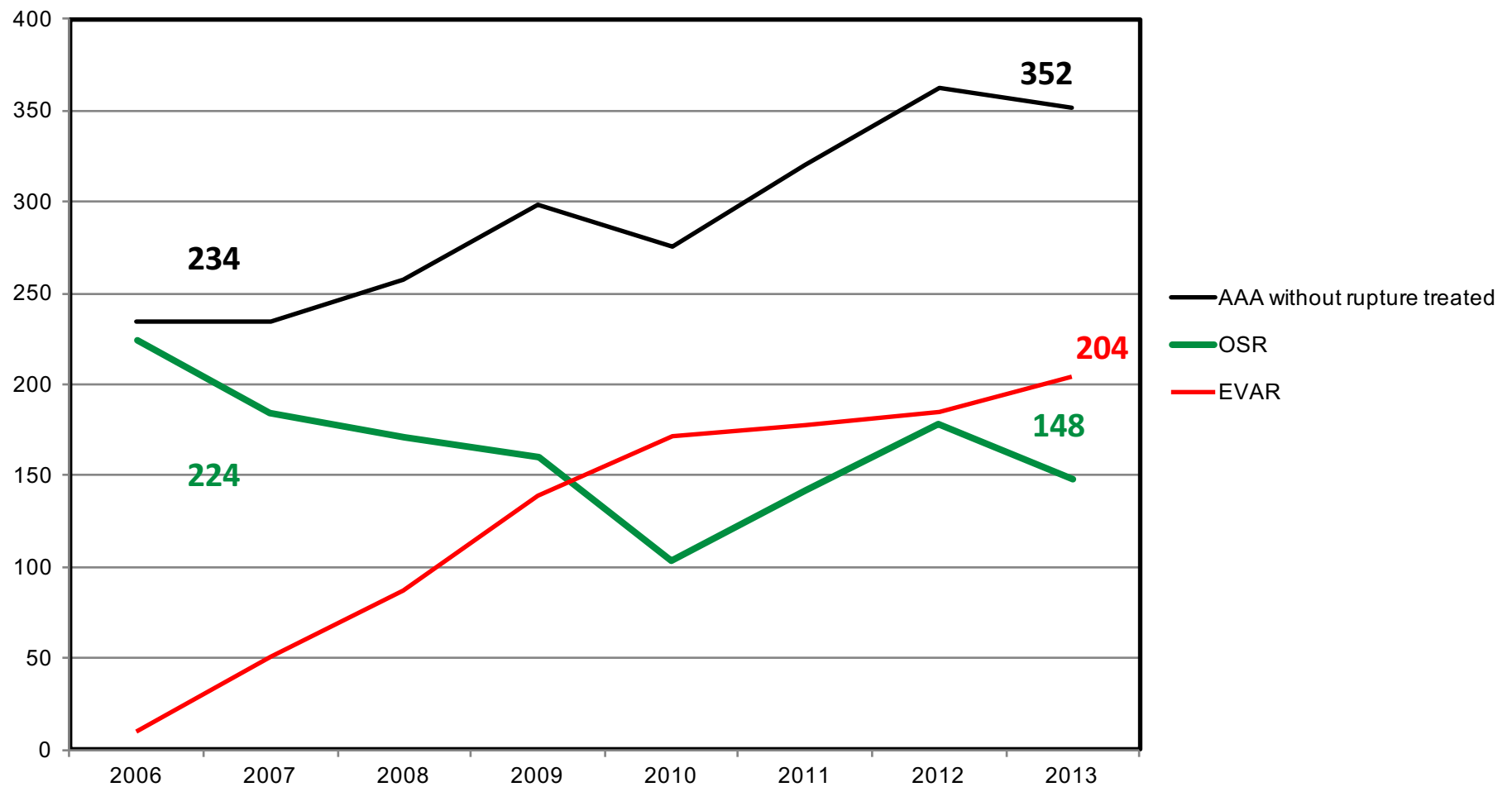
Mayo Clinic, Rochester, MN

1997 – 2016: 4149 patients



Courtesy from Peter Gloviczki, 7th LVF, December 2016

TREND ON AAA MANAGEMENT



Courtesy Prof. Paulo Sousa (ENSP)

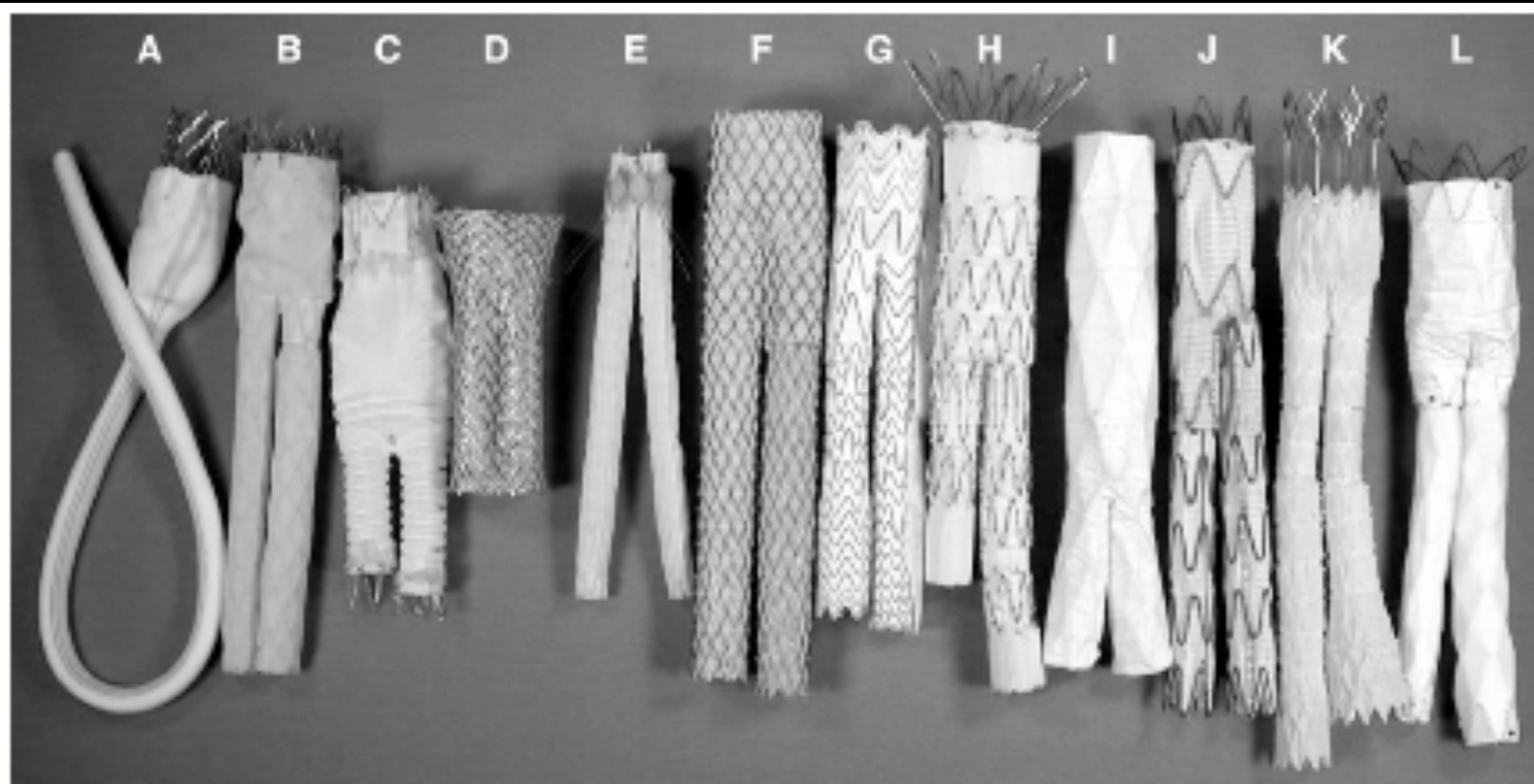
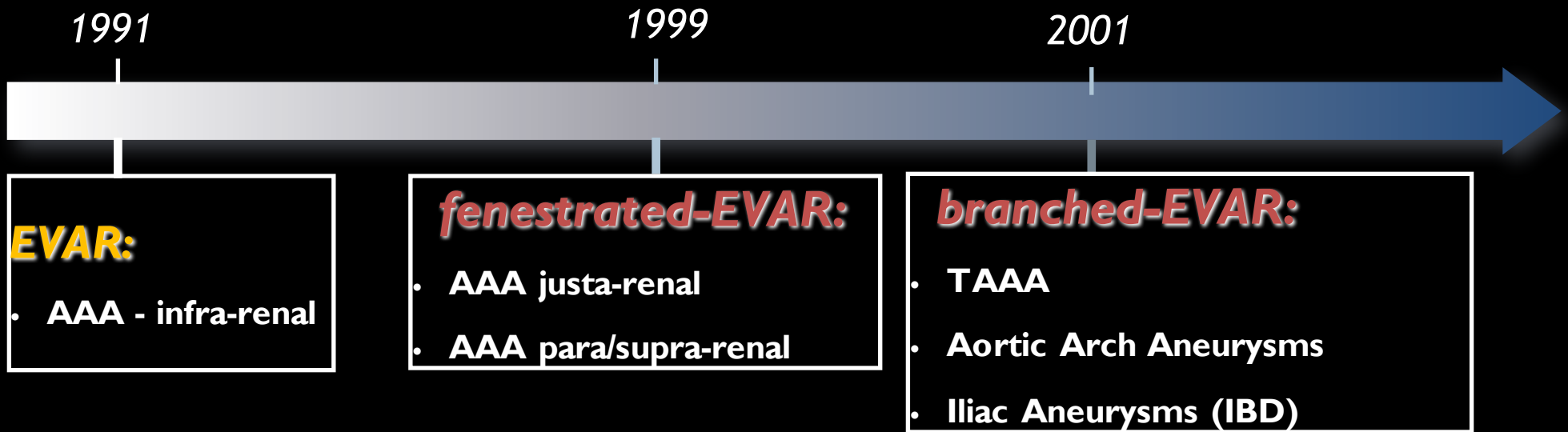


Figure ♦ Exhibits from the Ohki collection of endovascular prostheses. (A) Montefiore Endovascular Grafting System, (B) Vanguard, (C) Ancure, (D) Corvita, (E) Cordis Percutaneous Endograft, (F) AneuRx, (G) Excluder, (H) Zenith, (I) PowerLink, (J) Talent, (K) Fortran, and (L) Appolo.

Management of Abdominal Aortic Aneurysm: A Decade of Progress

Timothy A.M. Chuter, MD¹; Juan C. Parodi, MD²; and
Michael Lawrence-Brown, FRACS³

AORTIC ENDOVASCULAR REPAIR



❖ Tim Chuter (2001): 1st TAAA

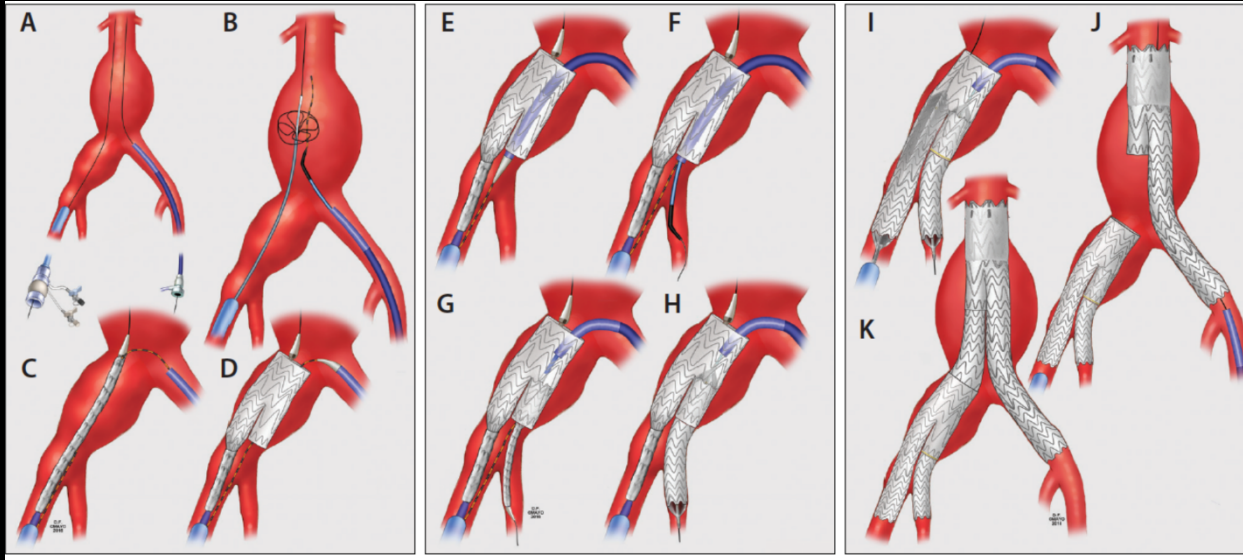
❖ Initially for high-risk patients

❖ *f-EVAR* e *b-EVAR*:

- endoprosthesis *custom-made* (Cook Inc., plataforma Zenith).
- Aortic component with fenestrations and/or branches.
- Covered stents for the visceral arteries



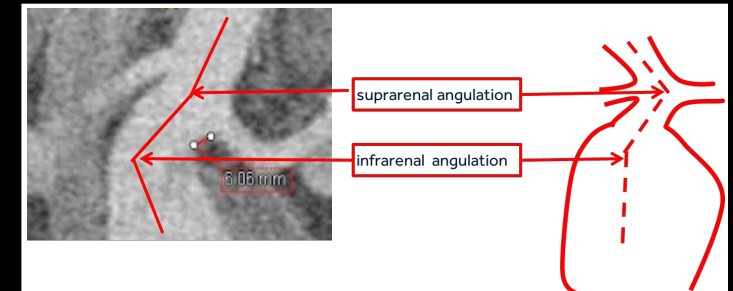
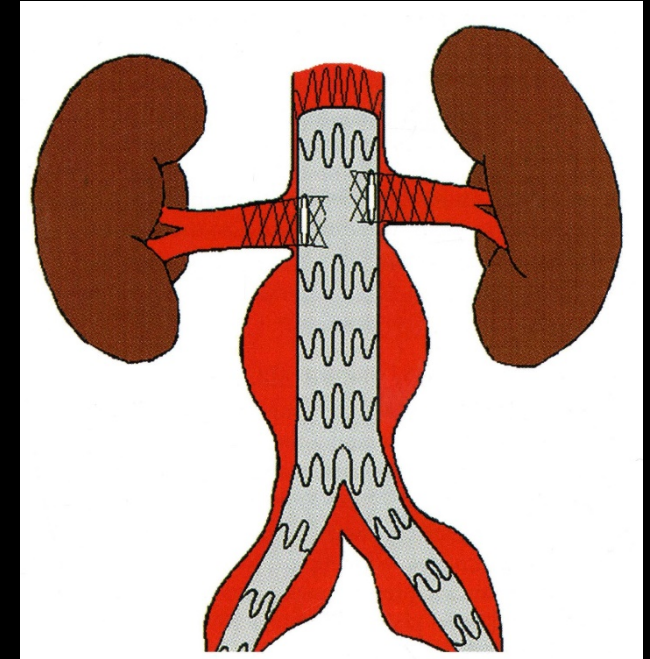
OVERCOMING UNFAVORABLE ANATOMY



IBD will provide adequate distal landing zone and preservation of hypogastric circulation (uni/bilateral)

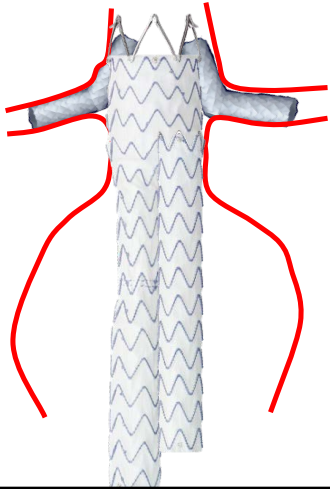
FEVAR in patients with challenging aneurysm necks may further improve the results of EVAR

Standard infrarenal stent-grafts will be limited to patients with a favorable anatomy



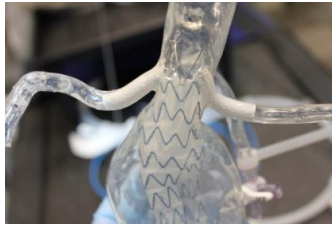
ALTERNATIVES FOR UNFAVORABLE ANATOMY

WHAT IS A CHEVAR PROCEDURE?



ChEVAR = Chimney-EVAR

Placement of single or multiple stents parallel to main aortic stentgraft to extend the sealing zone over one or multiple side branches while maintaining patency to those branches



INDICATION SUMMARY

JUXTARENAL AAA

Insignificant calcification and thrombus at the level of proximal neck
Adequate axillary or brachial artery access
Limited Thrombus or calcification in the arch and DTA

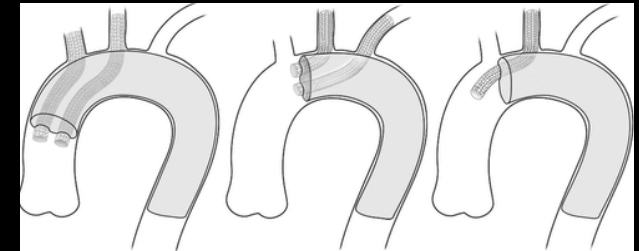
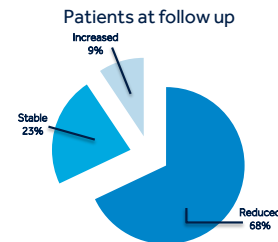
Short neck	Angulated neck	Renal
- New neck length 15 mm - Infrarenal neck length ≥ 2 mm up to 9 mm - New neck diameter from 19 to 30 mm - Possibly 1 or 2 Chimneys	- Supra SMA angulation of $0^\circ - 45^\circ$ - Suprarenal neck angulation $0^\circ - 45^\circ$ - Infrarenal neck angulation $0^\circ - 60^\circ$	- Maximum Renal Angulation $0^\circ - 90^\circ$ (based on Renal Aortic Centre line) - Renal sealing zone of 15 mm

THE PROTAGORAS STUDY

STUDY RESULTS

- Primary Endpoints: sac diameter regression and Chimney graft patency
- Sac regression: 64.8 ± 14.6 mm $\rightarrow$ 60.1 ± 16.3 mm, $p < 0.001$
- New onset of type IA endoleak needed secondary procedure: 1.6 %

90,6 % patients reduced or stable AAA diameter



Courtesy from MEDTRONIC

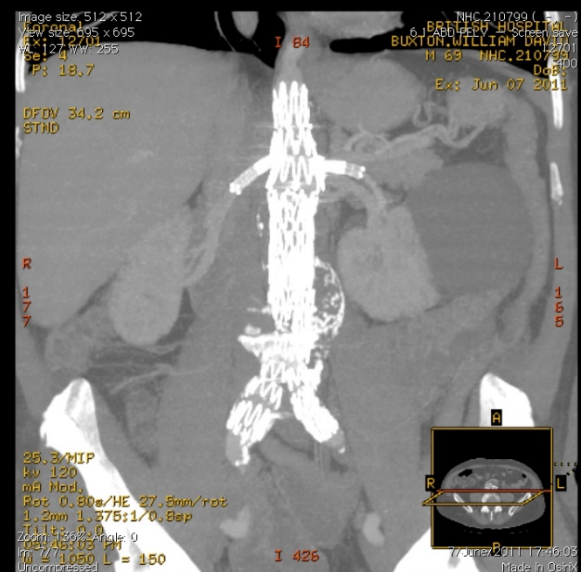
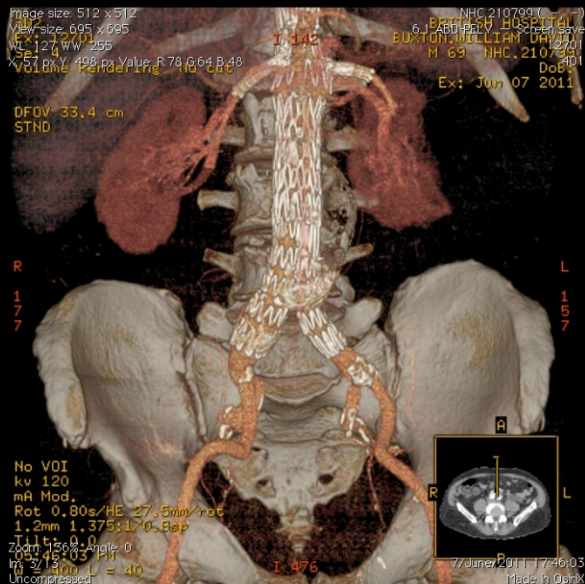
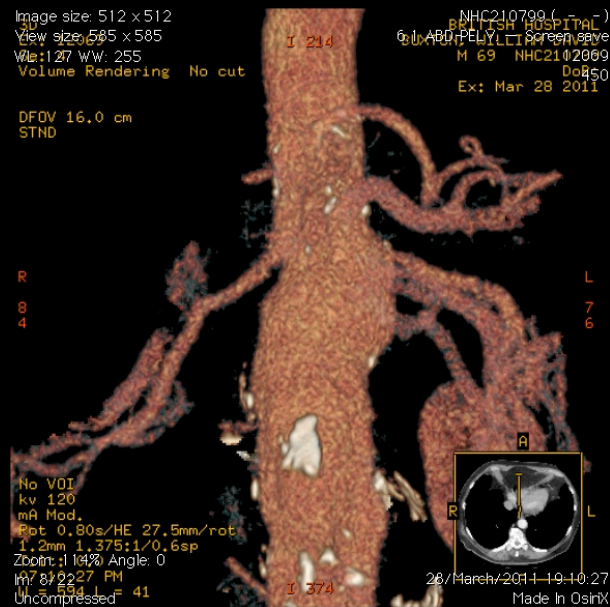
CHIMPS – PARALLEL GRAFTS

- CHIMNEY
- SNORKEL
- SANDWICH TECHNIQUES

BAIL-OUT PROCEDURES

EMEGENCY SITUATIONS

W. B., 69 yrs, male



8 yrs follow-up:

no endoleaks
no sac reperfusion

J.S.A., ♂, 81 yrs

✓ Back pain medicated with
etoricoxib

✓ 48h later: Emergency unit:
intra-oral hemorrhage,
hematuria / melenas

Ecchymosis dorsum /
abdominal wall

**DISSEMINATED
INTRAVASCULAR
COAGULATION**

Due to AAA
Hepatic insufficiency excluded -
Child Pugh A
Low levels of Factor VIII



**Aorta – 71 mm
Left iliac artery – 94 mm**

J.S.A., ♂, 81 yrs

Post-op.

- ❖ No pelvic ischemia.
- ❖ Improvement of coagulation abnormalities.
- ❖ No new hemorrhagic event.



Image size: 714 x 934
View size: 522 x 684
WL: 127 WW: 255

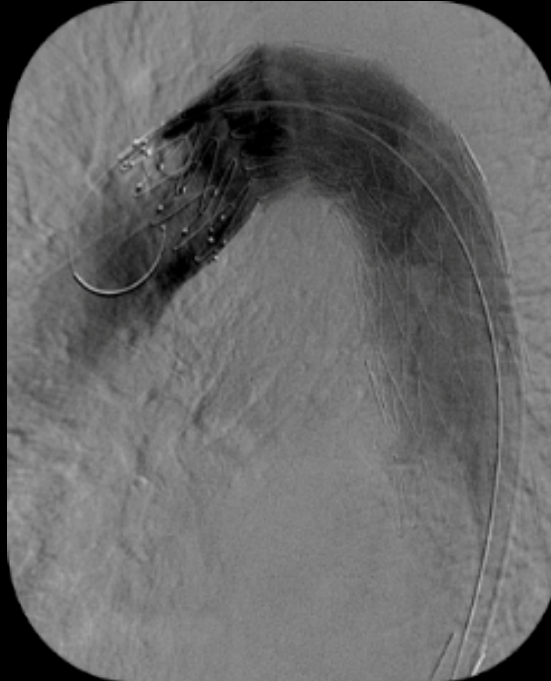
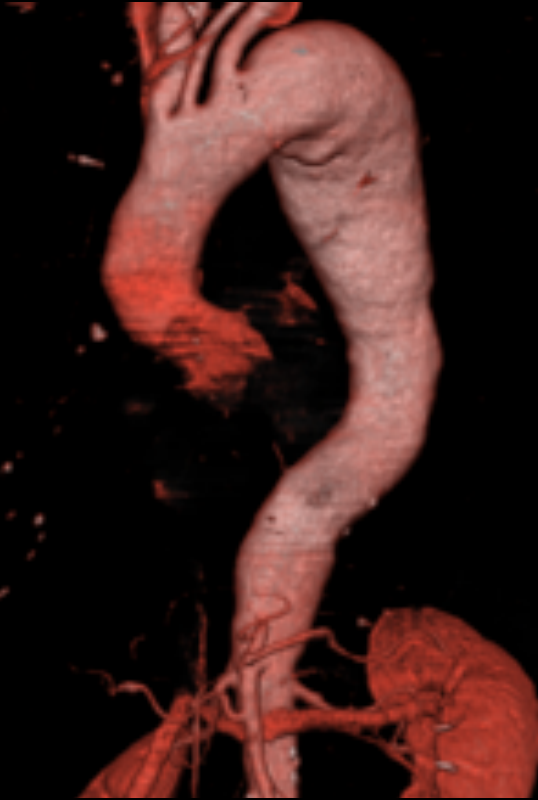
2234084 (81 y , 81 y)
Angio Tc (Contraste Não Iônico)
604



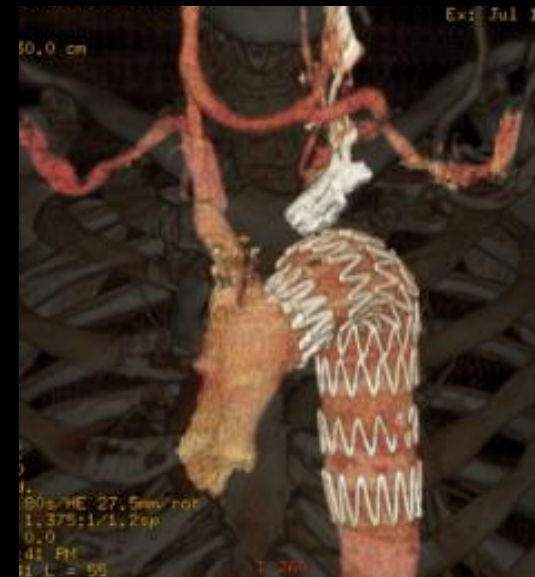
4 yr follow-up: no reinterventions

M.V.A., ♂, 63 yrs

HYBRID REPAIR



Follow-up: 8yrs
No complications



J.F.R. , MALE, 86 yrs



2006: Aortic Valve Replacement

2012: EVAR for AAA

2015: RUPTURED TAA

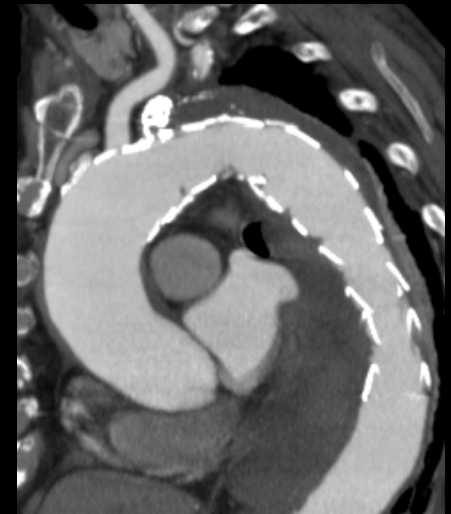
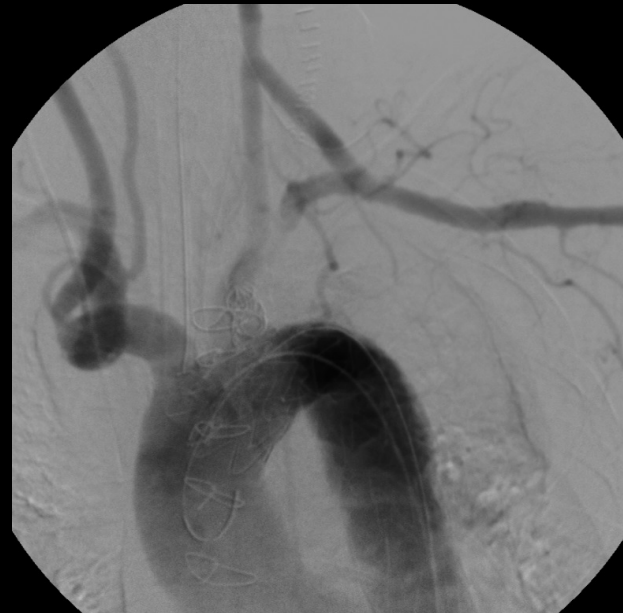
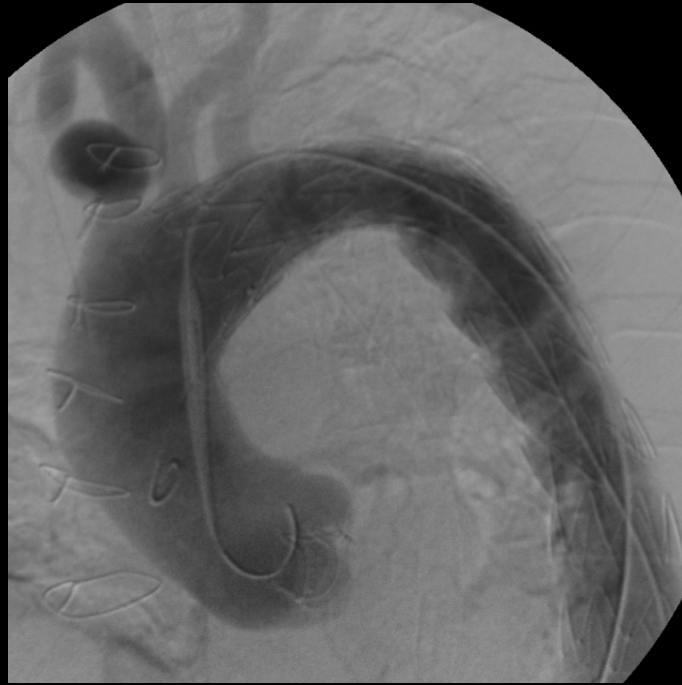
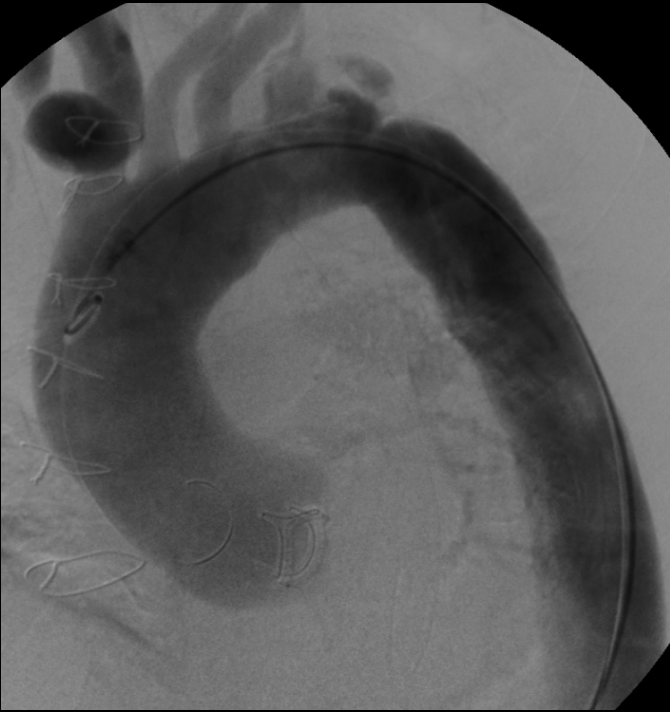
On Admission:

Conscious and stable

Cr: 2.2 mg%

Previously autonomous

J. F. R. , MALE, 86 yrs



1 week control CTA

Follow-up: 2 ½ yrs

TEVAR – DESCENDING AORTA ANEURYSMS

	TEVAR	OR
Mortality	7.6%	15.1%
Spinal Cord Ischemia	1.3%	5.7%
Stroke	2.5%	8.6%
Reinterventions	4.4%	5.7%

Reduced manipulation in the arch

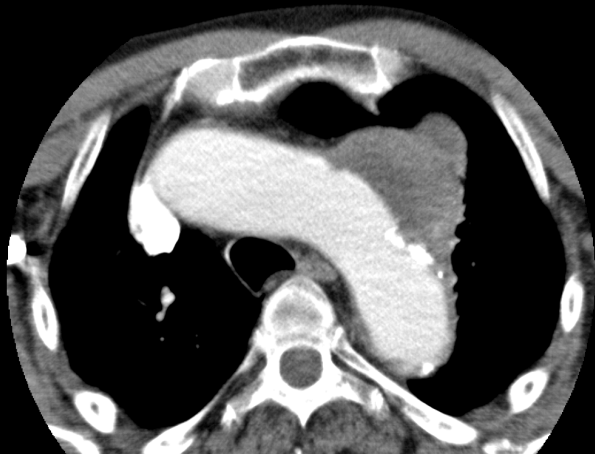
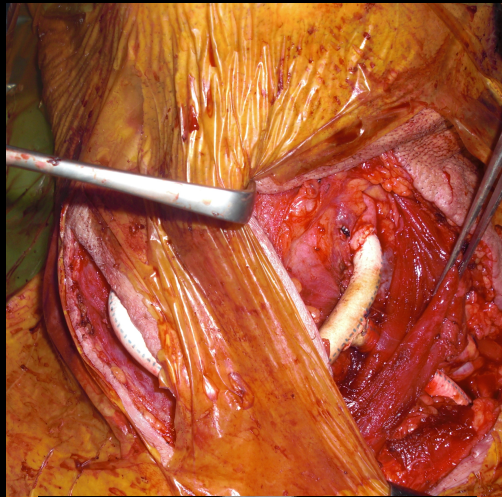
Patency of L subclavian artery

Protocol for spinal cord protection

AORTIC ARCH ANEURYSMS



Debranching Zone I + TEVAR



AORTIC ARCH ANEURYSMS

31 patients

n	stroke	mortality	paraplegia
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Elective

23	3 (13%)	2 (9%)	0
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Degenerative: 18

Penetrating ulcer: 1

Kommerell diverticulum: 1

Chronic post-trauma: 3

Rupture

8	0	2 (25%)	0
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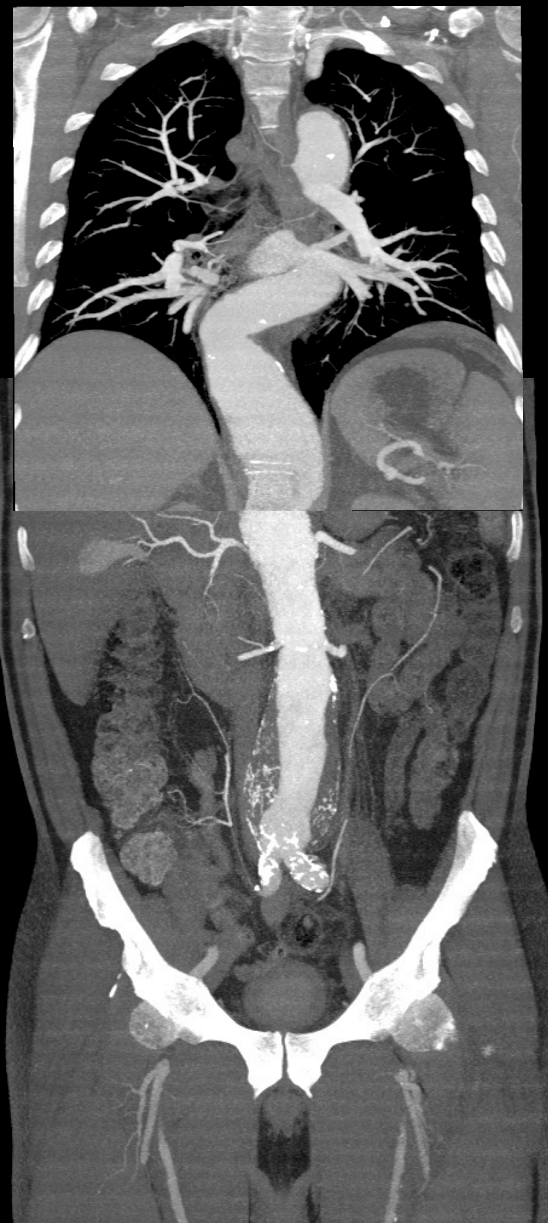
Degenerative: 6

Penetrating ulcer + ruptured pseudoaneurysm: 1

Post-dissection: 1

HIGH RISK PATIENTS

J.A.M., Male, 77 yrs



2011

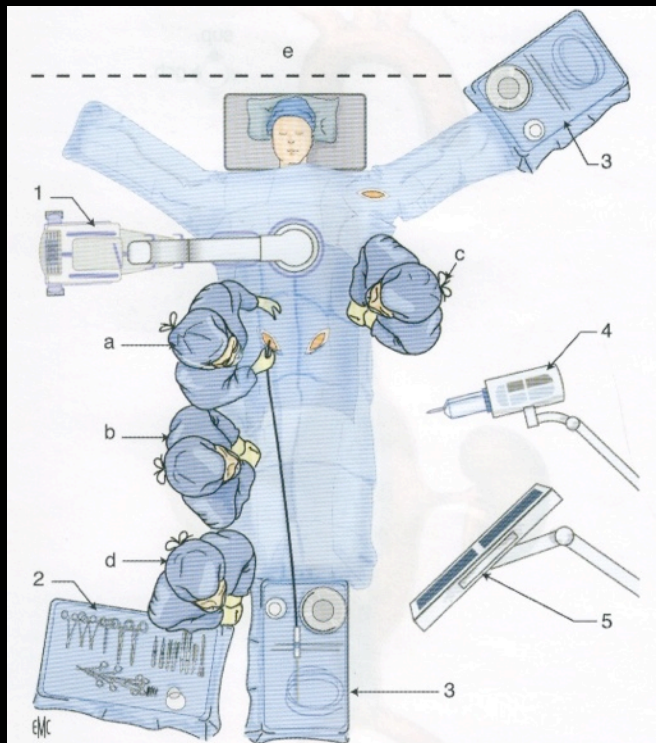
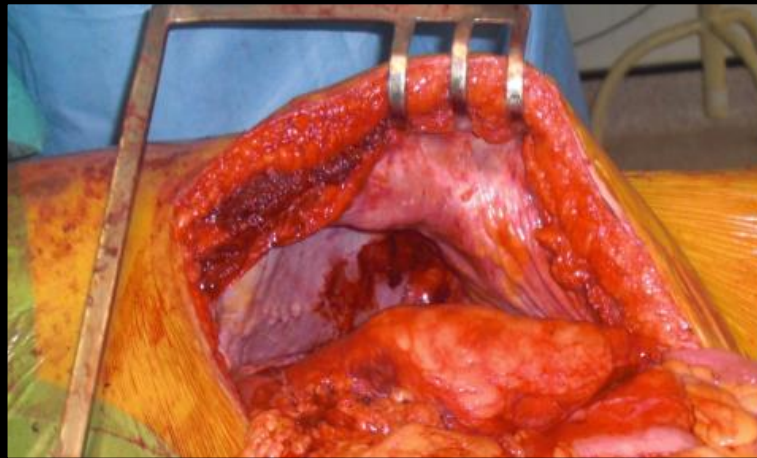


2012



2013

2018: well, no reperfusion of aneurysm sac



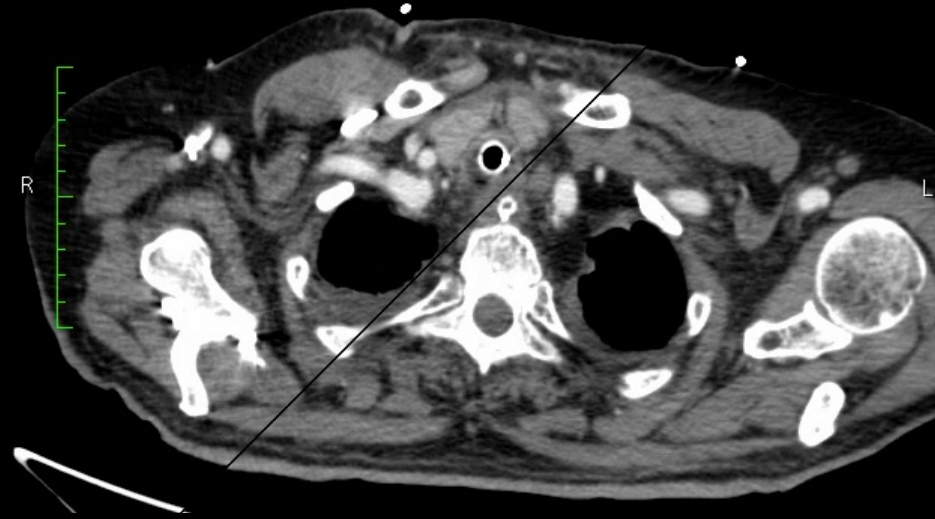
- **Adequate angiographic equipment**
- **General anesthesia**
- **3 access ports to the aorta: bilateral femoral and left axillary artery (surgical exposure)**
- **CSF pressure monitoring and fluid drainage**

A.A.C.J., Male, 78 yrs

Type II TAAA Post-dissection

Progressive enlargement of TAAA 9 cm

High risk for open surgery



Supra aortic debranching:

Bypass RCC-LCC + bypass Graft – LSCA (*Dacron* 8mm)

Abdominal debranching:

Bypass SMA – Common hepatic artery (*Dacron* 8mm)

First Post-op. day

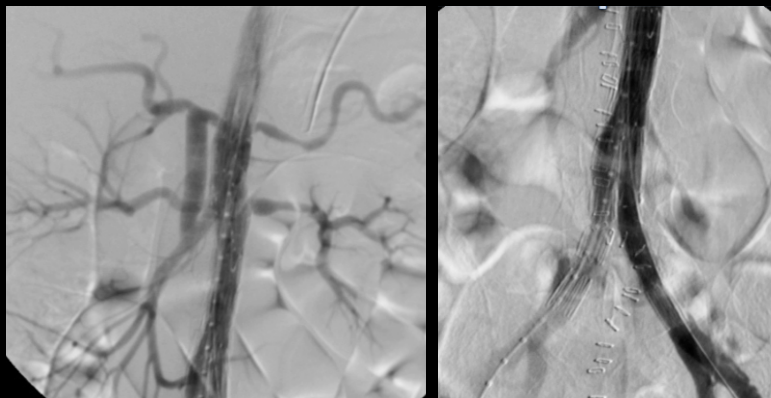
Respiratory arrest - glottis oedema

Placed on ventilatory support + methylprednisolone

Kept orotracheal tube until the 2nd surgery



A.A.C.J., Male, 78 yrs



Complex endovascular procedure

2 Thoracic endografts

Fen. Thoracoabdominal graft (SMA + LRA + RRA)

AAA bifurcated graft

Placement of CSF drainage catheter before the surgery

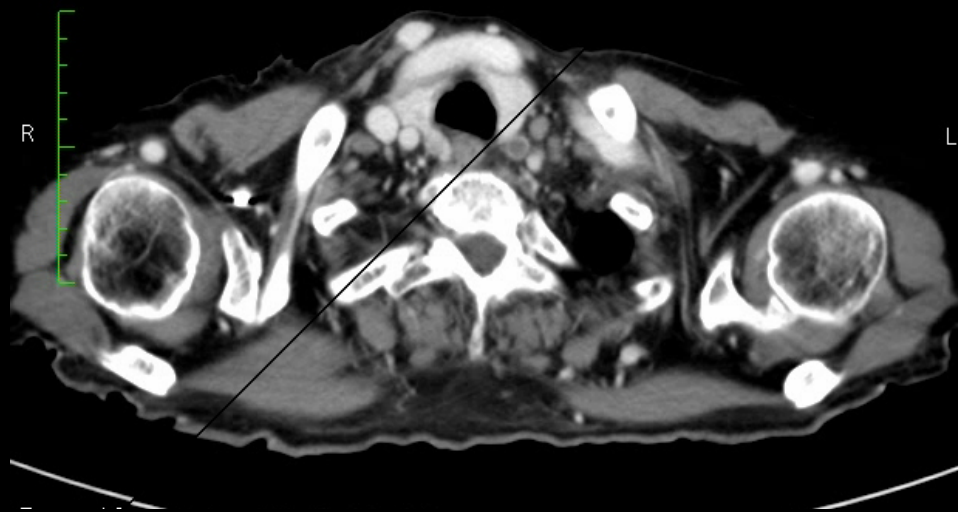
ICU for 48h First post-op.day

Extubation

CSF drain occlusion – Left lower limb weakness

Drain replacement – active drainage

Complete reversal of neurological deficits



Control CT Scan

RESULTS

Global experience **107 patients**

	ENDOVASCULAR		OPEN SURGERY (%)	
	N	(%)	N	(%)
TAAA (n=40)	15	(36.6)	25	(37.9)
<i>type II</i>	4	(26.7)	10	(40.0)
<i>type III</i>	6	(40.0)	5	(20.0)
<i>type IV</i>	3	(20.0)	10	(40.0)
<i>type V</i>	2	(13.3)	-	-
AAA SR/PR/JR (n=67)	26	(63.4)	41	(62.1)
TOTAL (n=107)	41		66	

HOSPITAL MORTALITY 2.43% 1/41

10.6% 7/88

SPINAL CORD ISCHEMIA

Reversible 13.3% 2/15
Permanent 0

0
12% 3/25

HEMODIALYSIS 2.5% 1/41

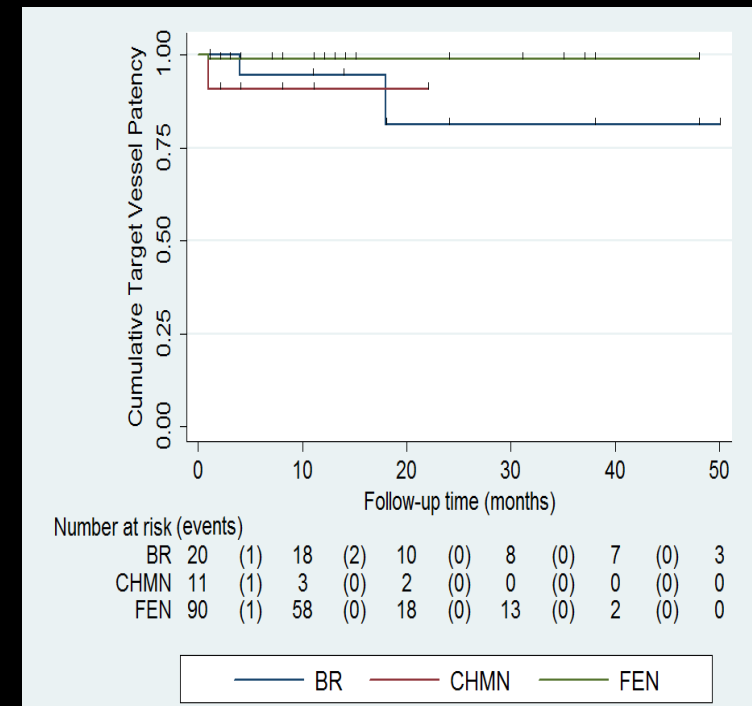
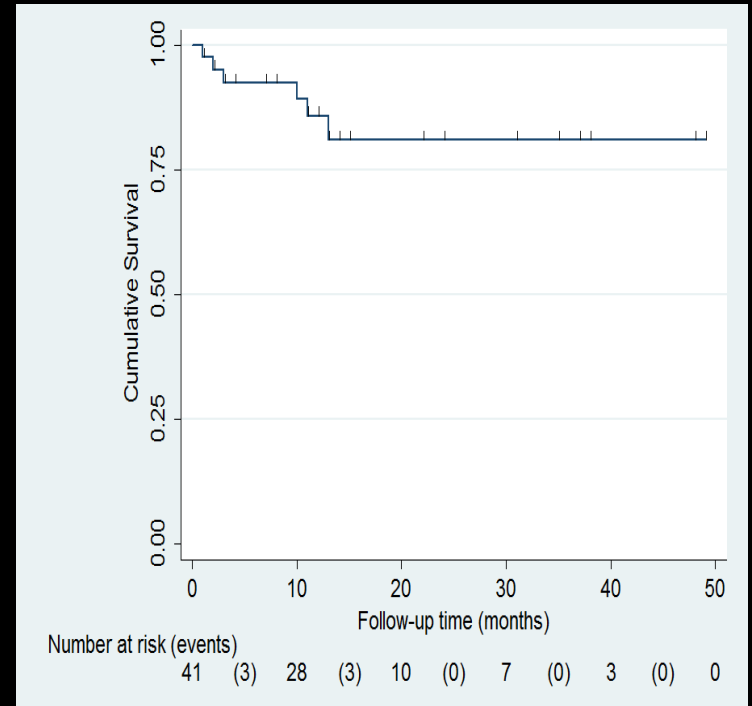
4.5% 3/66

RESULTS

Follow-up

15.4 months (1-66)

- ❖ **Five cases of unrelated mortality.**
- ❖ **Target Vessel patency = 115/120 (95.8%)**
 - **1 SMA fenestration intra-op**
 - **1 renal chimney 3M**
 - **1 CT branch 4M**
 - **2 Renal branches (same patient) 14M**



Endovascular versus open repair of abdominal aortic aneurysm in 15-years' follow-up of the UK endovascular aneurysm repair trial 1 (EVAR trial 1): a randomised controlled trial

Rajesh Patel, Michael J Sweeting, Janet T Powell, Roger M Greenhalgh, for the EVAR trial investigators*

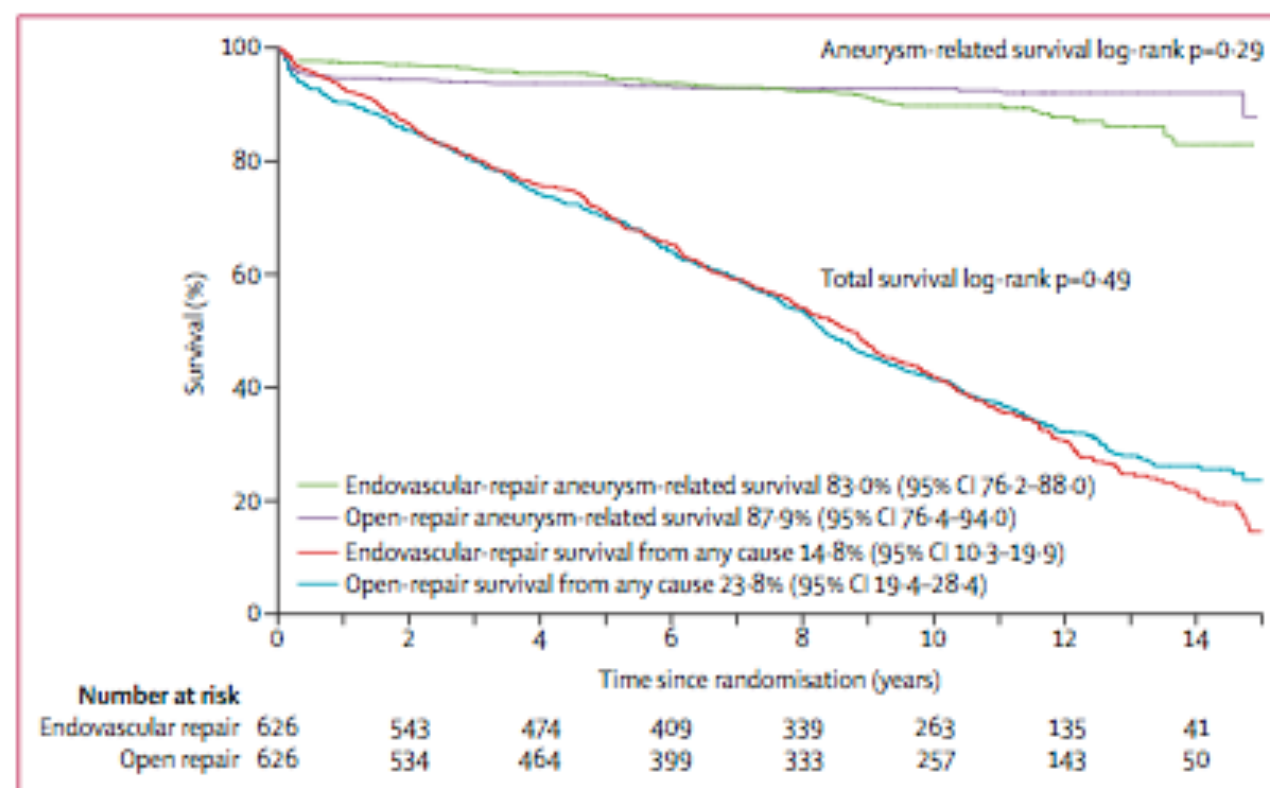


Figure 2: Kaplan-Meier estimates for total survival and aneurysm-related survival up to 15 years of follow-up. The hazard ratio is 1.05 (95% CI 0.92–1.19) for total mortality, and is 1.24 (0.84–1.83) for aneurysm-related mortality.

Lancet 2016;388:2366-74

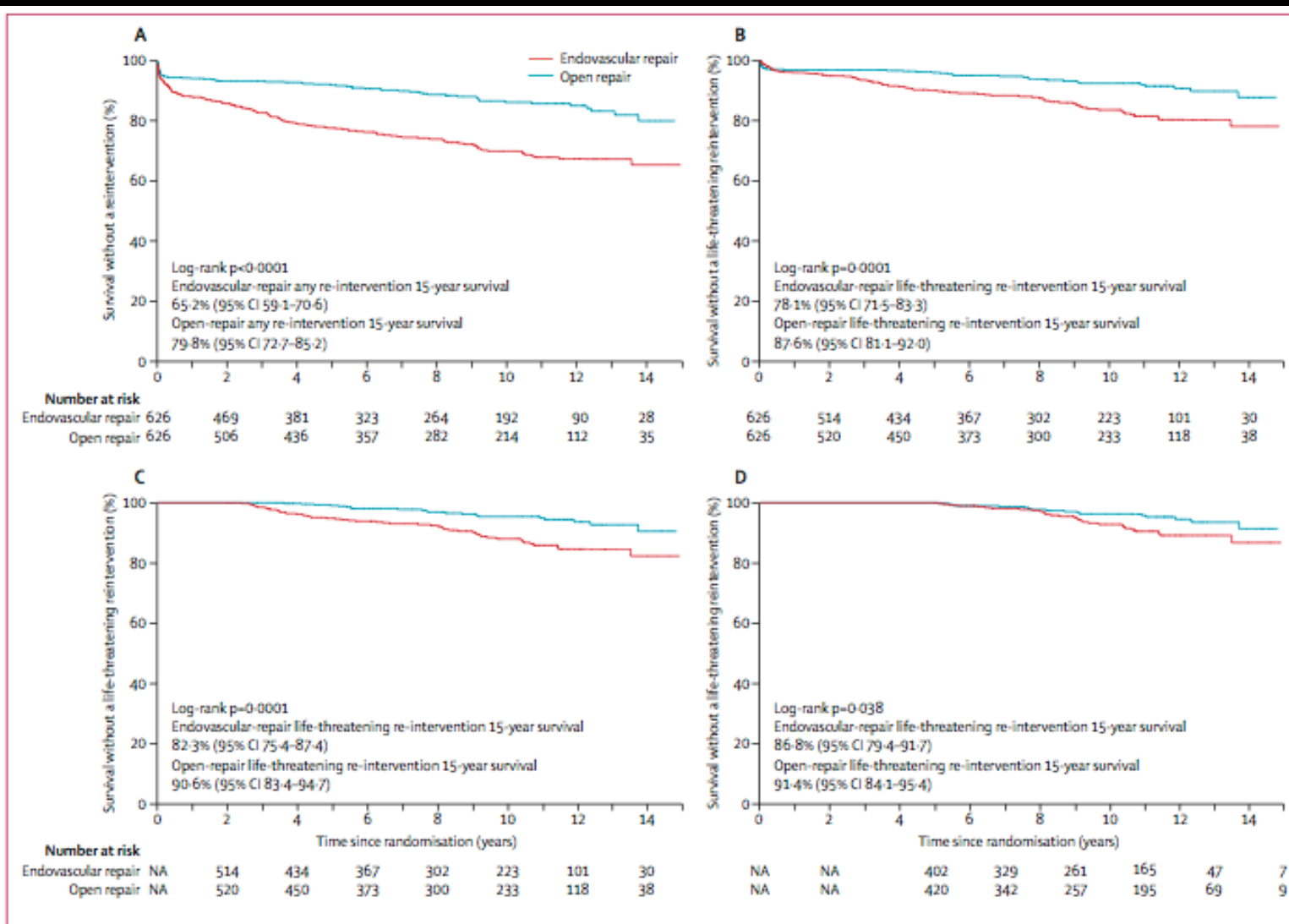


Figure 3: Kaplan-Meier estimates of time to first re-intervention in the EVAR and open repair groups during 15 years of follow-up

The time to first re-intervention (A), to first life-threatening re-intervention (B), to first life-threatening re-intervention for individuals who have survived 2 years free of a life-threatening re-intervention (C), and the time to first life-threatening re-intervention for individuals who have survived 5 years free of a life-threatening re-intervention (D). EVAR=endovascular aneurysm repair. NA=not applicable.

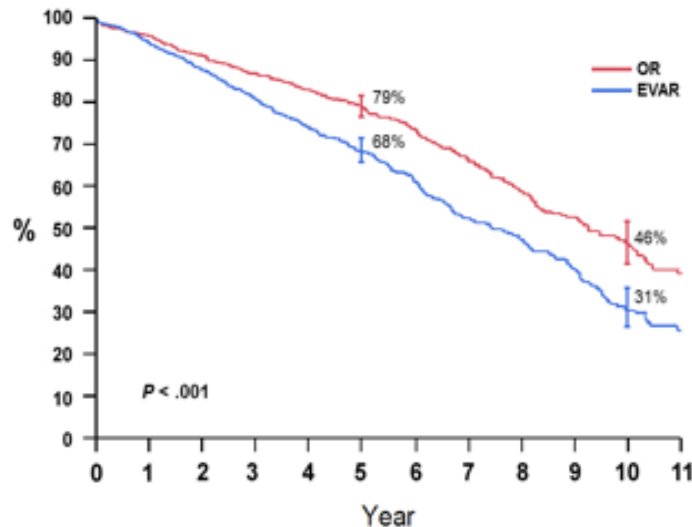
Lancet 2016;388:2366-74

INSUFFICIENT FOLLOW-UP IN 10 TO 40% OF THE PATIENTS

EVAR – LONG-TERM RESULTS

PREDICTORS OF ALL-CAUSE MORTALITY:

High clinical risk
Advanced age
Cancer history
AAA size



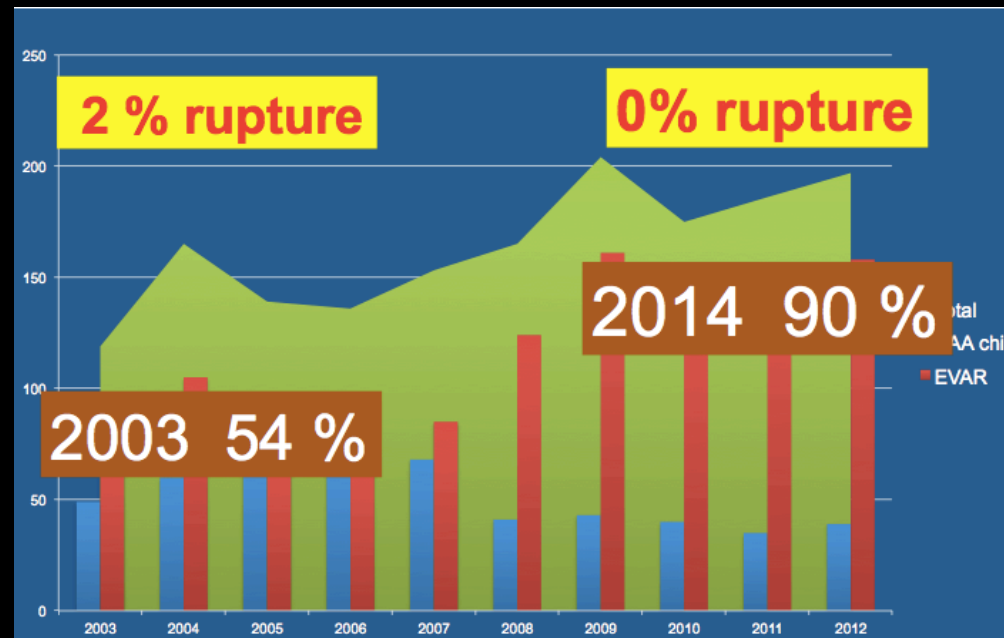
**POST - 6-yr INCREASE ON EVAR MORTALITY
NO LONGER OBSERVED AFTER 2005**

Courtesy from Peter Gloviczki, 7th LVF, December 2016

EVAR – 3rd DECADE

	Lenght	Diameter	Angulation	Others
Endurant (Medtronic)	15 mm	18-32	15 mm	
Excluder C3			18-32 mm	< 25% thrombus calcification cone shaped > 2 mm
Zenith		18-32	< 60 °	circular thrombus calcification cone -shaped
Anaconda (Vascutek)	15	17.5-31	no limit	
(Endologix)	mm			or calcification

Anatomically unsuitable for EVAR 40%



Courtesy, J.P.Becquemin, 2015

EVAR – 3rd DECADE

IS EVIDENCE FROM THE RCT'S STILL VALID TODAY?

- Technological Developments**
- New Endoprosthesis with better durability**
- Reduction in Complications associated with EVAR**

IMPROVEMENT ON DIAGNOSTIC STRATEGIES AND TREATMENT OF EVAR COMPLICATIONS

RATIONALIZATION OF SURVEILLANCE PROTOCOLS (SAC SIZE)

- Reduction on radiation exposure and costs**

SELECTION OF PATIENTS – NOT PUSHING THE LIMITS!

UK NICE GUIDELI NES FOR AAA REPAIR

- **Open surgical repair (OR) – if suitable – preferable to endovascular repair (EVAR) for unruptured infrarenal AAA**
- **EVAR preferable to OR in patients with ruptured AAA**
- **Endovascular Repair recommended for Complex Aortic Aneurysms within RCT's**
- **Endovascular or Open Repair not recommended in high risk patients: anesthetic risk and/or severe medical comorbidities**
- **Reductions in EVAR use and EVAR-related reinterventions will lead to cost savings within the NHS**

Abdominal aortic aneurysm: diagnosis and management

NICE guideline

Draft for consultation, May 2018

European vascular community continues to dispute draft NICE AAA guidelines amidst publication delays

10th February 2019  472

Aortic aneurysms

Products

A list of all our products on aortic aneurysms

Filter

Product type

1 selected

☒ Guidance

☐ Quality standards

Guidance programme

Status

1 selected

☐ Published

☒ In development

☐ Proposed

New and updated

Showing 1 product

Product type: Guidance ✕ Status: In development ✕

Abdominal aortic aneurysm: diagnosis and management

In development NICE guideline Expected publication date: TBC

Webpage visit 19/2/2019

we went too far. ... We have already made some changes to the draft recommendations—whether those recommendations remain as modified or whether we modify them further, I do not know.”

CACVS, Paris, 7-9 / February /2019

European Society for Vascular Surgery (ESVS) 2019 Clinical Practice Guidelines on the Management of Abdominal Aorto-iliac Artery Aneurysms

Anders Wanhainen ^{a,†,*}, Fabio Verzini ^{a,†}, Isabelle Van Herzeele ^a, Eric Allaire ^a, Matthew Bown ^a, Tina Cohnert ^a, Florian Dick ^a, Joost van Herwaarden ^a, Christos Karkos ^a, Mark Koelemay ^a, Tilo Kölbel ^a, Ian Loftus ^a, Kevin Mani ^a, Germano Melissano ^a, Janet Powell ^a, Zoltán Szeberin ^a

ESVS Guidelines Committee ^b, Gert J. de Borst, Nabil Chakfe, Sebastian Debus, Rob Hinchliffe, Stavros Kakkos, Igor Koncar, Philippe Kolh, Jes Lindholdt, Melina de Vega, Frank Vermassen

Document reviewers ^c, Martin Björck, Stephen Cheng, Ronald Dalman, Lazar Davidovic, Konstantinos Donas, Jonathan Earnshaw, Hans-Henning Eckstein, Jonathan Golledge, Stephan Haulon, Tara Mastracci, Ross Naylor, Jean-Baptiste Ricco, Hence Verhagen

Classes of recommendations	Definition
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.
Class II	Conflicting evidence and/ or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.
Class IIa	<i>Weight of evidence/opinion is in favour of usefulness/efficacy.</i>
Class IIb	<i>Usefulness/efficacy is less well established by evidence/opinion.</i>
Class III	Evidence or general agreement that the given treatment or procedure is not useful/ effective, and in some cases may be harmful.

Level of evidence A	Data derived from multiple randomised clinical trials or meta-analyses.
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomised studies.
Level of evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

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Recommendation 2	Class	Level	References
It is recommended that centres or networks of collaborating centres treating patients with abdominal aortic aneurysms can offer both endovascular and open aortic surgery at all times.	I	B	[50,70,237,287–289,378,386,541,558,606]

Recommendation 4	Class	Level	References
Abdominal aortic aneurysm repair should not be performed in centres with a yearly caseload <20.	III	B	[124,160,174,277,329,378,435,526,531]

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Recommendation 60	Class	Level	References
In most patients with suitable anatomy and reasonable life expectancy, endovascular abdominal aortic aneurysm repair should be considered as the preferred treatment modality.	Ila	B	[48,70,71,78,100,192,193,194,237,270,385,386,387,401,447,541,545,558,563,577,698,709,710,779]

Recommendation 61	Class	Level	References
In patients with long life expectancy, open abdominal aortic aneurysm repair should be considered as the preferred treatment modality.	Ila	B	[50,70,71,237,385,386,387,541,545,558,563]

Recommendation 57	Class	Level	References
For newer generations of stent grafts based on existing platforms, such as low profile devices, long-term follow up and evaluation of the durability in prospective registries is recommended.	I	C	[460,638,107]

Recommendation 58	Class	Level	References
New techniques/concepts (such as endovascular aneurysm sealing with endobags) are not recommended in clinical practice and should only be used with caution, preferably within the framework of studies approved by research ethics committees, until adequately evaluated.	III	C	[75,313,460,638,687]

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Table 5.1. Comparison of peri-operative mortality figures between endovascular and open repair in administrative databases of patients with ruptured abdominal aortic aneurysm.

Author	Publication year	Country	Study period	n of pts (EVAR/OSR)	Mortality	
					EVAR	OSR
Greco	2006	USA	2000–2003	5798 (290/5508)	39%	48%
Wanhainen	2008	Sweden	1994–2005	3516 (92/3424)	15%	36%
Giles	2009	USA	2005–2007	567 (121/446)	24%	36%
Holt	2010	UK	2003–2008	4414 (335/4079)	32%	47%
Mani	2011	International	2005–2009	7040 (824/6216)	20%	33%
Chen	2013	Taiwan	1998–2009	537 (39/498)	44%	38%
Mohan	2013	USA	2001–2010	42,126 (8140/33,986)	26%	39%
Trenner	2013	Germany	1999–2010	4859 (575/4284)	23%	41%
Edwards	2014	USA	2001–2008	10,998 (1126/9872)	34%*	48% ^a
1099 propensity score matched patient pairs						
Karthikesalingam	2014	England	2005–2010	6897 (569/6328)	32%	43%
		USA	2005–2010	19,174 (4003/15,171)	27%	46%
Karthikesalingam	2015	England	2003–2012	12,467 (1184/11,283)	28%	41%
		Sweden	2003–2012	2829 (464/2365)	21%	31%
Taylor	2016	New Zealand	2010–2014	285 (28/257)	18%	36%
Summary data				120,075	26.8%	39.6%

n = number; pts = patients; EVAR = endovascular aneurysm repair; OSR = open surgical repair.

^a After propensity score matching. Result not included in summary data.

Table 5.2. Peri-operative mortality figures in the four randomised controlled trials comparing endovascular and open repair of ruptured abdominal aortic aneurysm.

RCT	Country	Recruitment period	n of pts	30 day mortality	
				Randomised to EVAR	Randomised to OSR
Nottingham 2006	UK	2002–2004	32	53%	53%
AJAX 2013	The Netherlands	2004–2011	116	28%	29%
IMPROVE 2014	UK	2009–2013	613	35%	37%
ECAR 2015	France	2008–2013	107	18%	24%

Recommendation 74	Class	Level	References
In patients with ruptured abdominal aortic aneurysm and suitable anatomy, endovascular repair is recommended as a first option.	I	B	[288,289,669]
Recommendation 70	Class	Level	References
Selection of patients with ruptured abdominal aortic aneurysm for palliation based entirely on scoring systems or solely on advanced age is not recommended.	III	B	[4,59,128,147,322,367,436,586,621,625,671,675,689,715,747,748]

European Society for Vascular Surgery (ESVS) 2019 Clinical Practice Guidelines on the Management of Abdominal Aorto-iliac Artery Aneurysms

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Recommendation 95

In patients with juxtarenal abdominal aortic aneurysm, open repair or complex endovascular repair should be considered based on patient status, anatomy, local routines, team experience, and patient preference

Class	Level	References
Ila	C	[524,570]

Recommendation 96

In complex endovascular repair of juxtarenal abdominal aortic aneurysm, endovascular repair with fenestrated stent grafts should be considered the preferred treatment option when feasible

Class	Level	References
Ila	C	[568]

Recommendation 97

In complex endovascular repair for juxtarenal abdominal aortic aneurysm, using parallel graft techniques may be considered as an alternative in the emergency setting or when fenestrated stent grafts are not indicated or available, or as a bailout, ideally restricted to ≤2 chimneys

Class	Level	References
Iib	C	[165]

MANAGEMENT OF AORTIC DISEASE

ENDOVASCULAR INNOVATION CHANGED TREATMENT

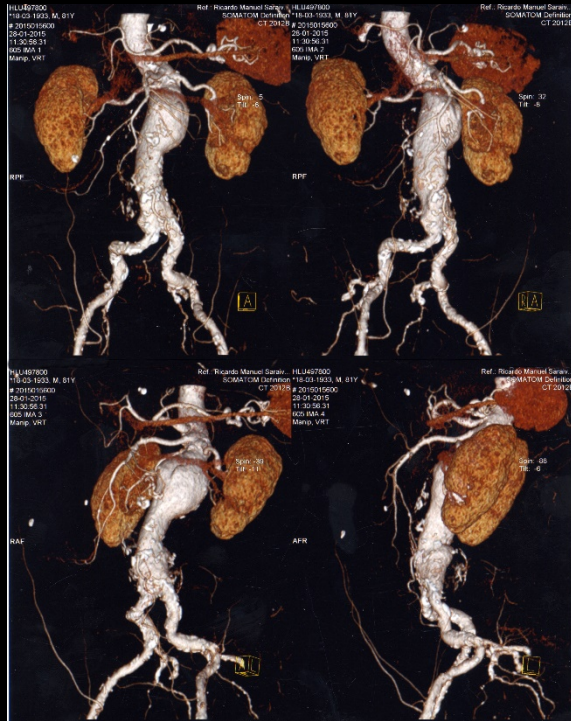
PTA / STENTING 1st alternative for aorto-iliac occlusive disease
EVAR / TEVAR / F / B - EVAR *game changers* world wide
Technology: better and more durable devices
Increments in early survival tend to persist beyond 6-yr interval
Critical appraisal of EVAR trials

COST – AWARENESS / AFFORDABILITY BY HEALTH SYSTEMS

REDUCTION ON COSTS: DEVICES / SURVEILLANCE / REINTERVENTIONS

PUBLIC HEALTH ISSUE

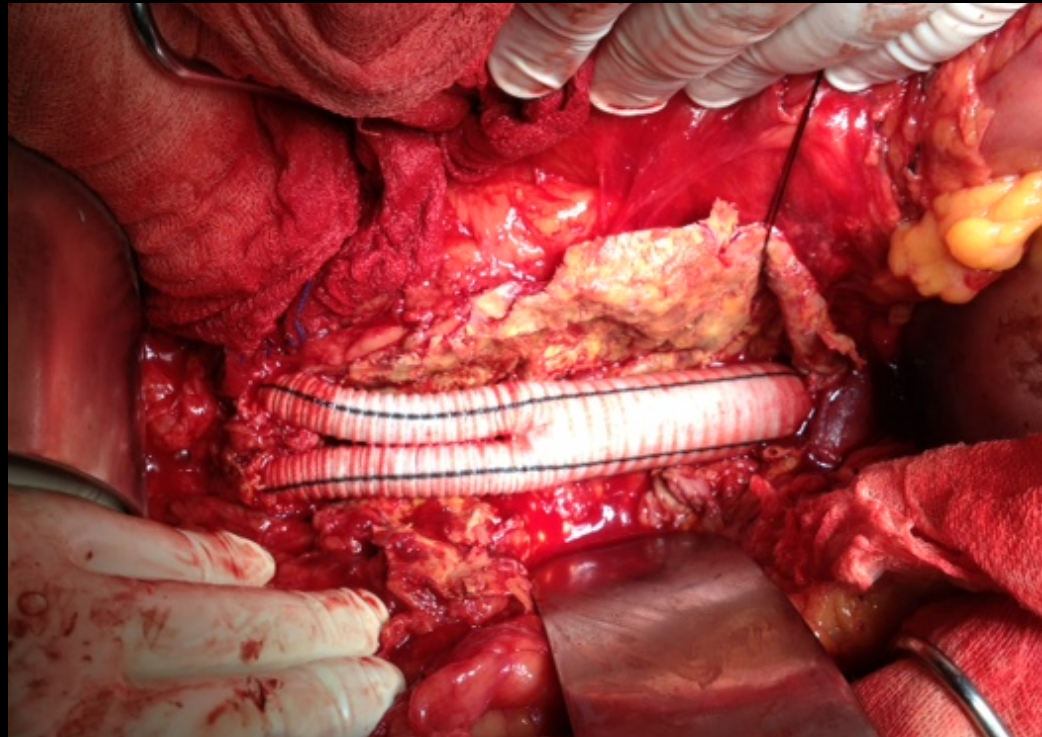
M.M.M. , MALE, 81 YRS



Juxta - renal AAA: 6.0 cm

Fit male / Cr: 1.8 mg%

Previous abdominal surgery

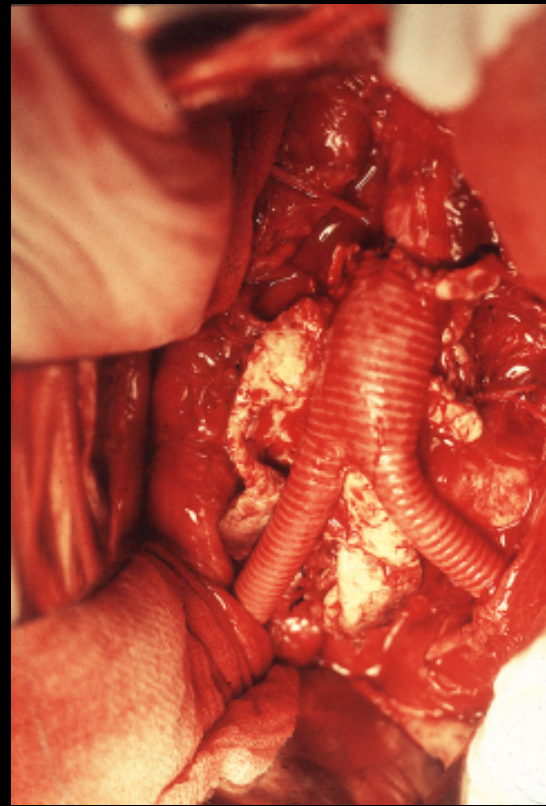
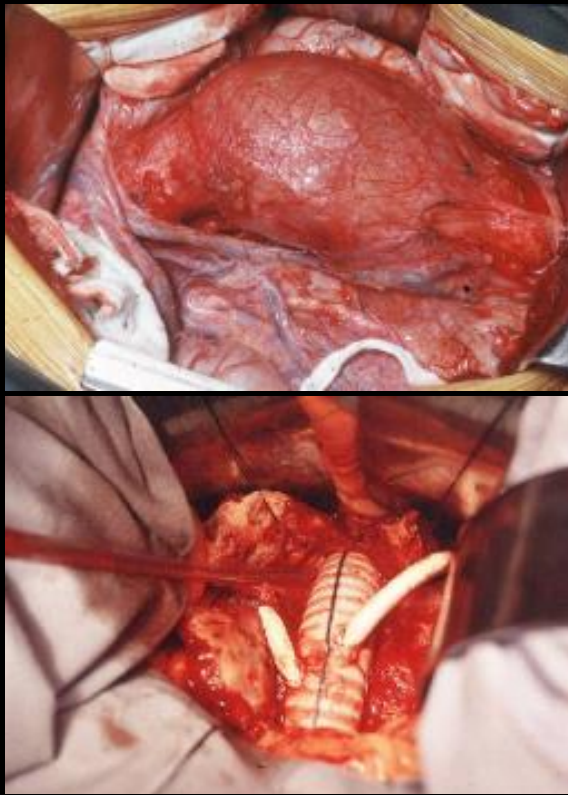


Suprarenal clamping / A – I Bifurcation graft

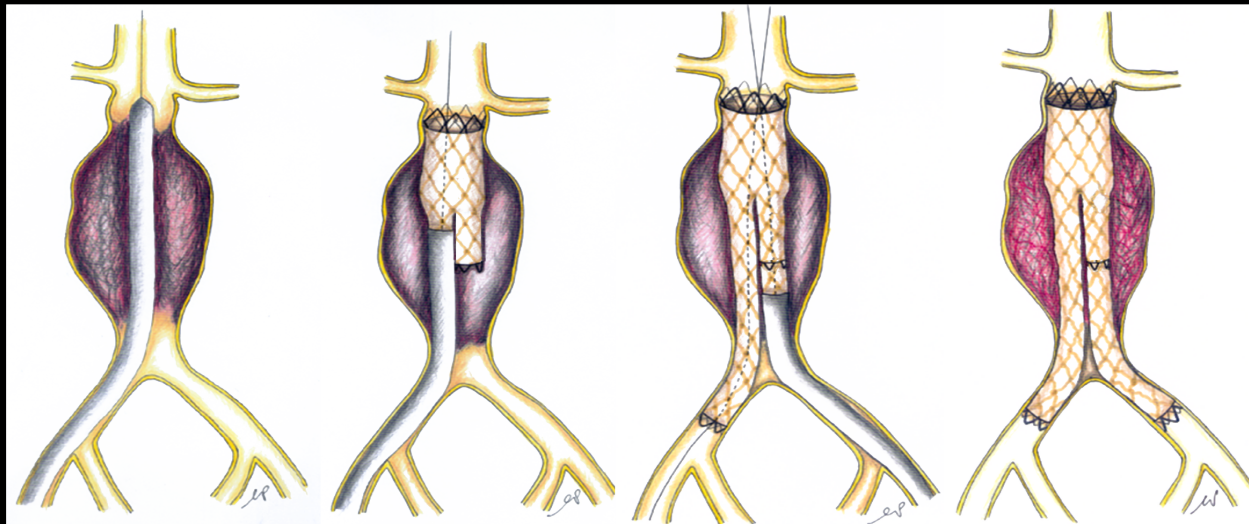
No deterioration of renal function

Uneventful recovery / Discharge at 7th day p – op.

Patient well at 2 ½ yrs follow-up visit



30%



70%

2012 - 2016

MANAGEMENT OF AORTIC DISEASE

Patient Selection:

Age / Expected Survival / Surgical Risk

Anatomy of the Disease

Experience (Surgeon / Institution)

Prevention of Complications of Aortic Repair

Planning and adequacy of reintervention

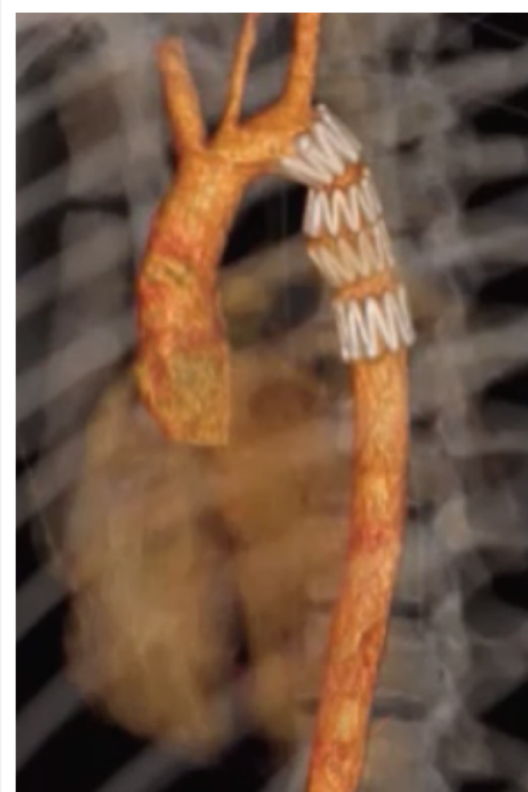
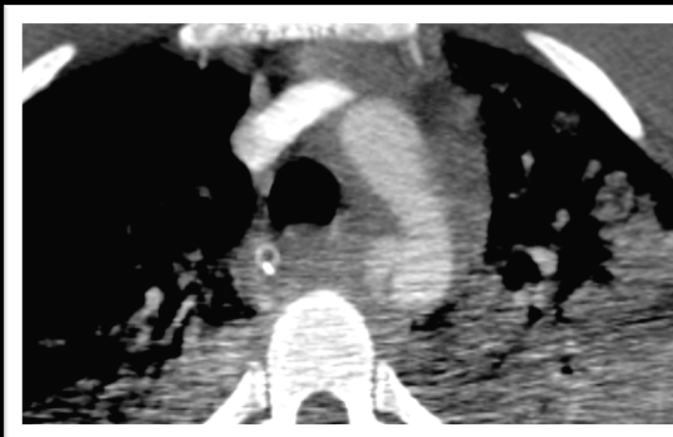
Infection

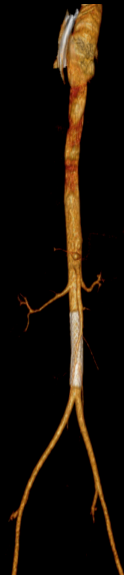
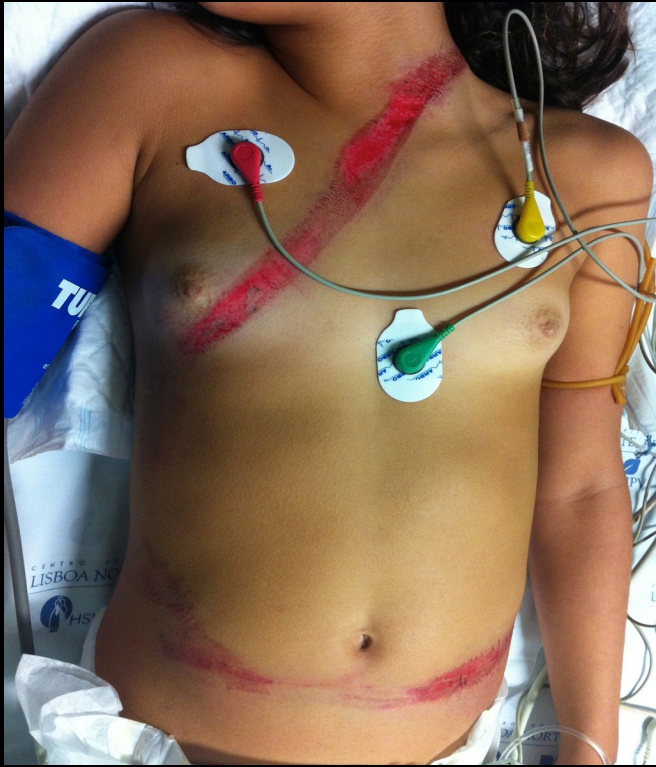
INFORMED PATIENT'S PREFERENCE



CONCLUSIONS

- **Endovascular Repair of Abdominal and Thoracic Aortic Aneurysms should be reserved for patients with suitable aneurysm anatomy.**
- **Branch and fenestrated stentgrafts are an effective and less invasive treatment for patients with Complex Aneurysms and suitable anatomy.**
- **Spinal cord injury and stroke are still concerns and future strategies for their prevention are required.**
- ***Open Surgery in Aortic Disease should be reserved to patients with unsuitable anatomy for endo repair, connective-tissue disease, younger and good risk patients.***
- **Endovascular repair is becoming a suitable alternative for management of acute aortic syndromes.**





**2018 - 6 YRS LATER:
BALLOON DILATATION OF THE ENDOGRAFT**

Blunt Thoracic Aortic Injury: Endovascular Repair Is Now the Standard

Presented at the Southern Surgical Association 130th Annual Meeting, Palm Beach, FL, December 2018.

[Thomas M. Scalea](#), MD, FACS, [David V. Feliciano](#), MD, FACS, [Joseph J. DuBose](#), MD, FACS, [Marcus Ottochian](#), MD, [James V. O'Connor](#), MD, FACS, [Jonathan J. Morrison](#), PhD, FRCS  

R Adams Cowley Shock Trauma Center, University of Maryland Medical System, Baltimore, MD

3 774 patients: 46 yrs (29 - 62) and ISS of 34

196.8% increase in diagnosis of BTAI in the last decade

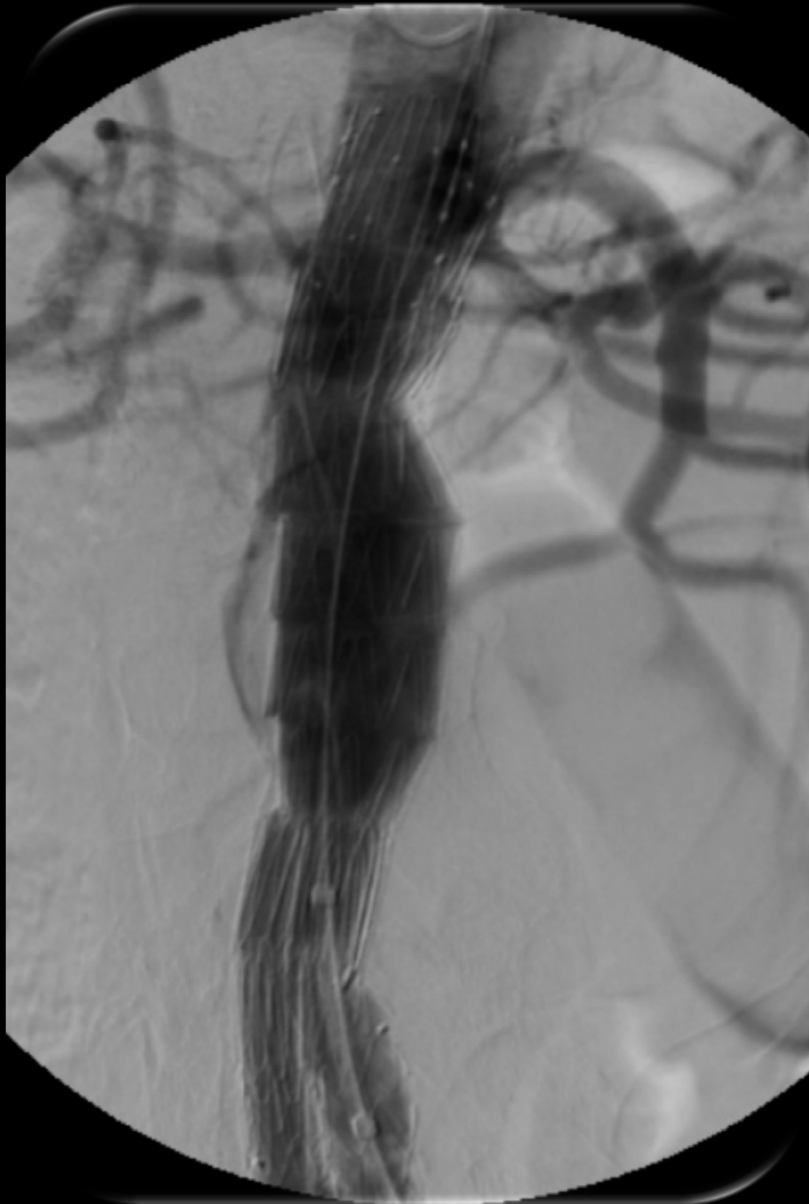
Use of TEVAR was associated with reduction in:

	TEVAR	OPEN REPAIR
MORTALITY	9.3%	16.6%
ICU - LOS (days)	9	12

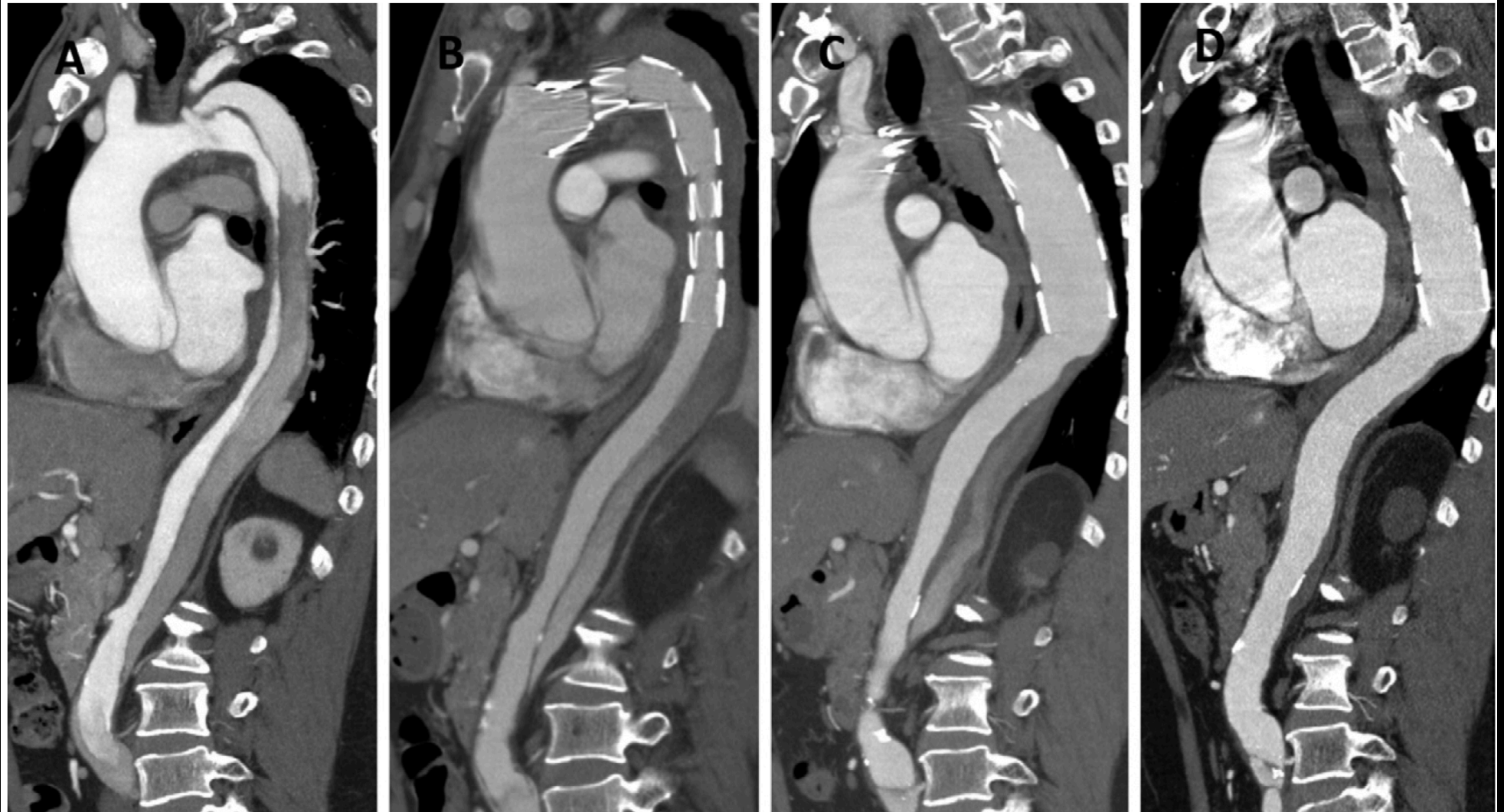
CASE 5



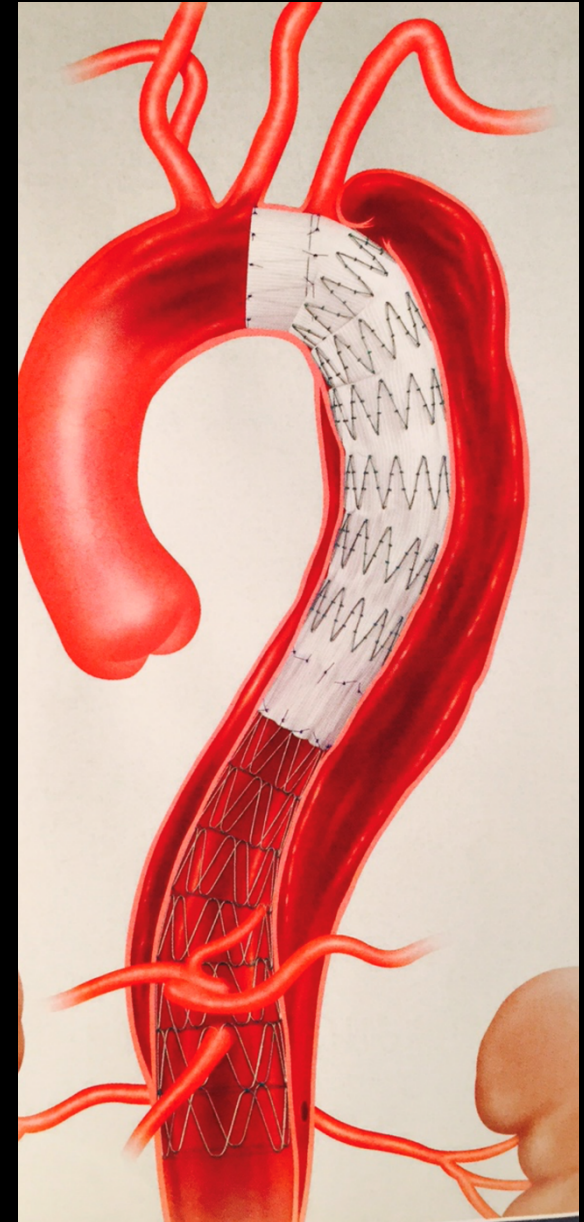
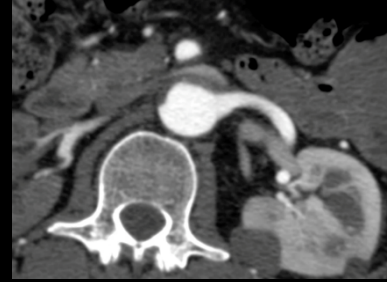
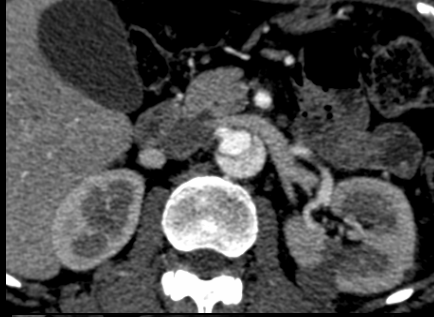
CASE 5



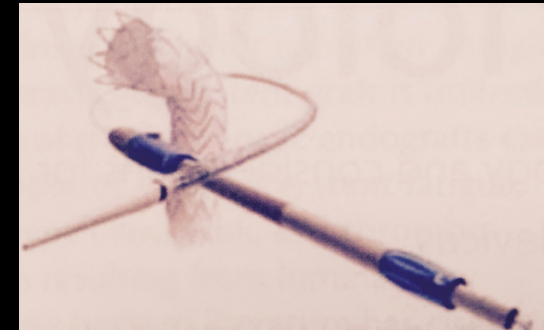
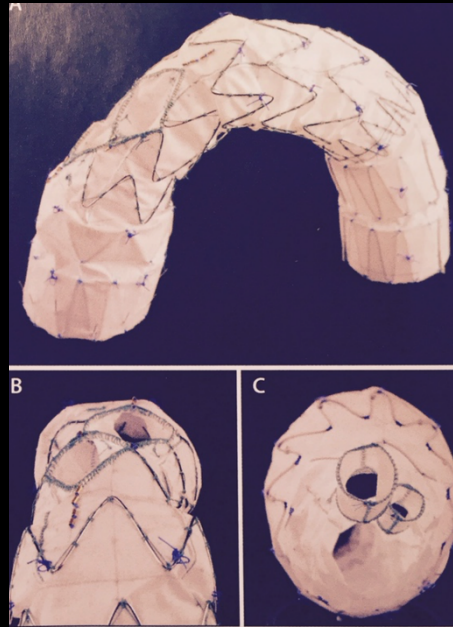
ACUTE TYPE B AORTIC DISSECTION



J. F., 45 yrs, male



AORTIC ENDOVASCULAR REPAIR – NEW FRONTIERS



ASCENDING AORTA – THE LAST FRONTIER?

Feasibility of endovascular repair of ascending aortic pathologies as part of an FDA-approved physician-sponsored investigational device exemption

Ali Khoynzhad, MD, PhD,^a Carlos E. Donayre, MD,^b Irwin Walot, MD,^b Matthew C. Koopmann, MD,^b George E. Kopchok, BS,^c and Rodney A. White, MD,^b *Los Angeles and Torrance, Calif*

Objective: Endovascular treatment of ascending aortic lesions has been reported, but to date, no FDA-approved studies have been conducted to define feasibility and the use of endografts in this particular location or to analyze the critical factors involved.

Methods: Patients were consented for entry into an FDA-approved physician-sponsored investigational device exemption study to investigate the outcome of those with ascending aortic pathologies. These patients were suitable according to the instructions for use for endovascular repair with a Valiant Captivia (Medtronic, Inc, Minneapolis, Minn) thoracic stent graft, a device designed specifically for deployment in the ascending aorta. All patients had sequential gated-cardiac computed tomography scans, with data being entered into the VQI Complex TEVAR software (West Lebanon, NH). All procedures were performed in a hybrid room, with the capability to convert to an open repair to ensure maximal patient protection. The first five patients constituted the feasibility study, with continued enrollment based on initial results and submission of an annual report to the FDA.

Results: Thirty-nine patients were screened, and six patients were entered into the physician-sponsored investigational device exemption study. Although there was no early mortality, there was one late death. All patients had sequential computed tomographies and cardiac echocardiograms with no evidence of migration, one type 1a endoleak, one post-operative stroke, and regression of the aortic lesions in the excluded aortic segment.

Conclusions: In this feasibility study, the preliminary evaluation of endovascular treatment for ascending aortic pathologies demonstrates uniform accuracy of deployment and secure fixation up to 17.5 months of follow-up. There is positive remodeling of the excluded aortic segments similar to surveillance studies involving the descending aorta. (*J Vasc Surg* 2016;63:1483-95.)



VASCULAR SURGERY AT CROSSROADS



RESEARCH ON MOLECULAR DETERMINANTS OF ANEURYSMAL DISEASE

Identification of high risk individuals
Preventive intervention
Reversal of the disease process

