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EVAR-TAVR in Patients with Hostile Anatomies

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Chairman Interventional Cardiology
Hospital & Favaloro University Board
SOLACI Past-President
Associated Director of TCT
SCAI Board of Thrustees

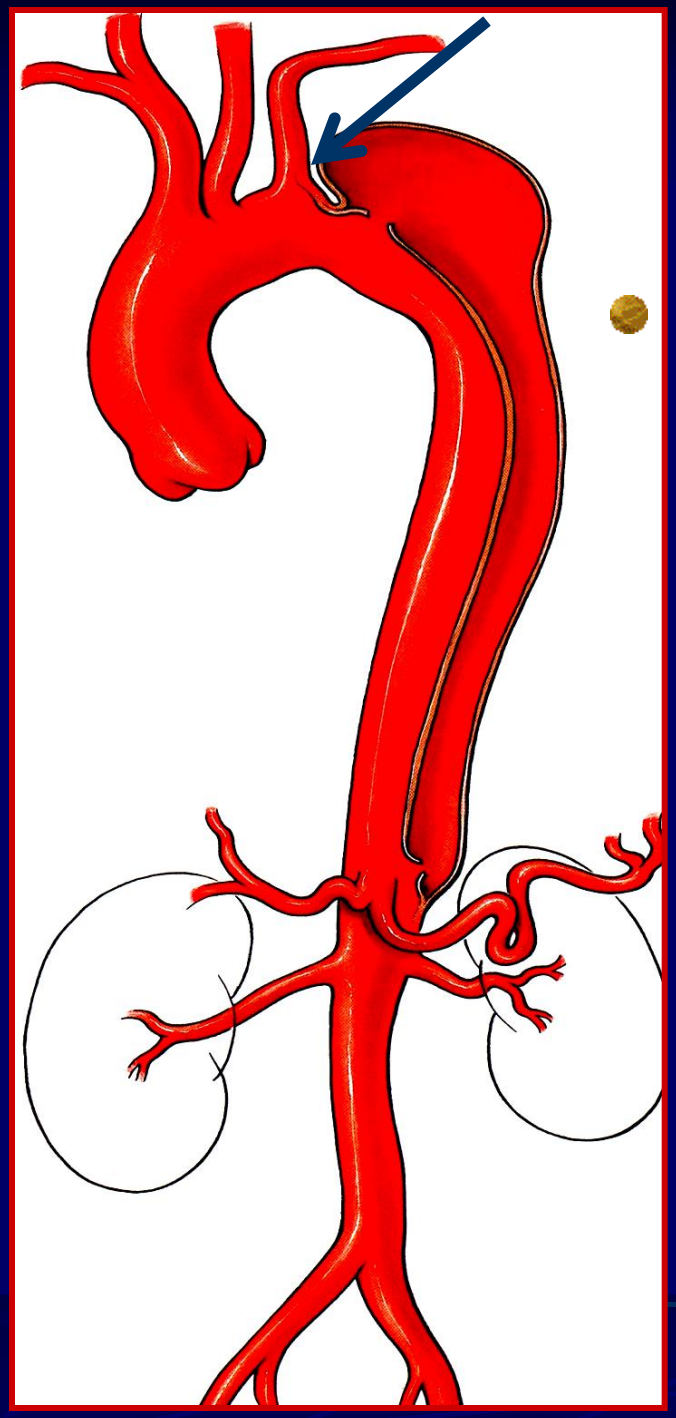
Disclosure

Nombre: Oscar A. Mendiz

- ☐ Consultant: Medtronic, Astra Zeneca.
- ☐ Meeting Sponsorship; Cook, Endologix

EVAR-TEVAR Limitations

- Long term EVAR-TEVAR success depends highly upon the proximal aortic neck for effective “seal” at this point to exclude the aneurysms, without Type I endoleak, and device fixation to avoid migration.
- Distal fixation zone is also important for these issues.
- The following are anatomic limitation for successful procedures:
  - Short neck (<15mm, abdominal < 20 Thoracic)
  - Neck angulations > 40º
  - Presence of mural thrombus in the neck
  - Tapering or reverse tapering
  - Both iliac compromise.
  - Thoracoabdominal aneurysms
  - Juxtarenal aneurysms



Limitation for TEVAR

- Short Neck, Left subclavian artery compromise. The most common.

EASPCI.texbook 2012

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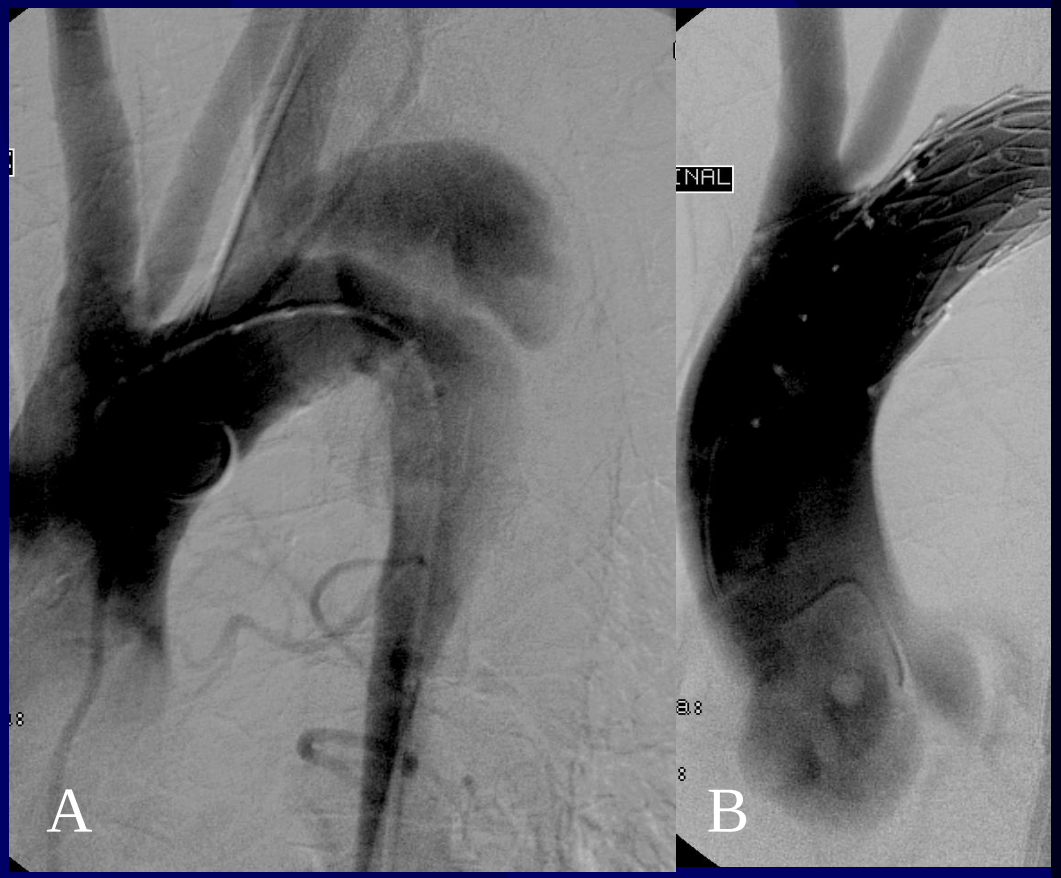
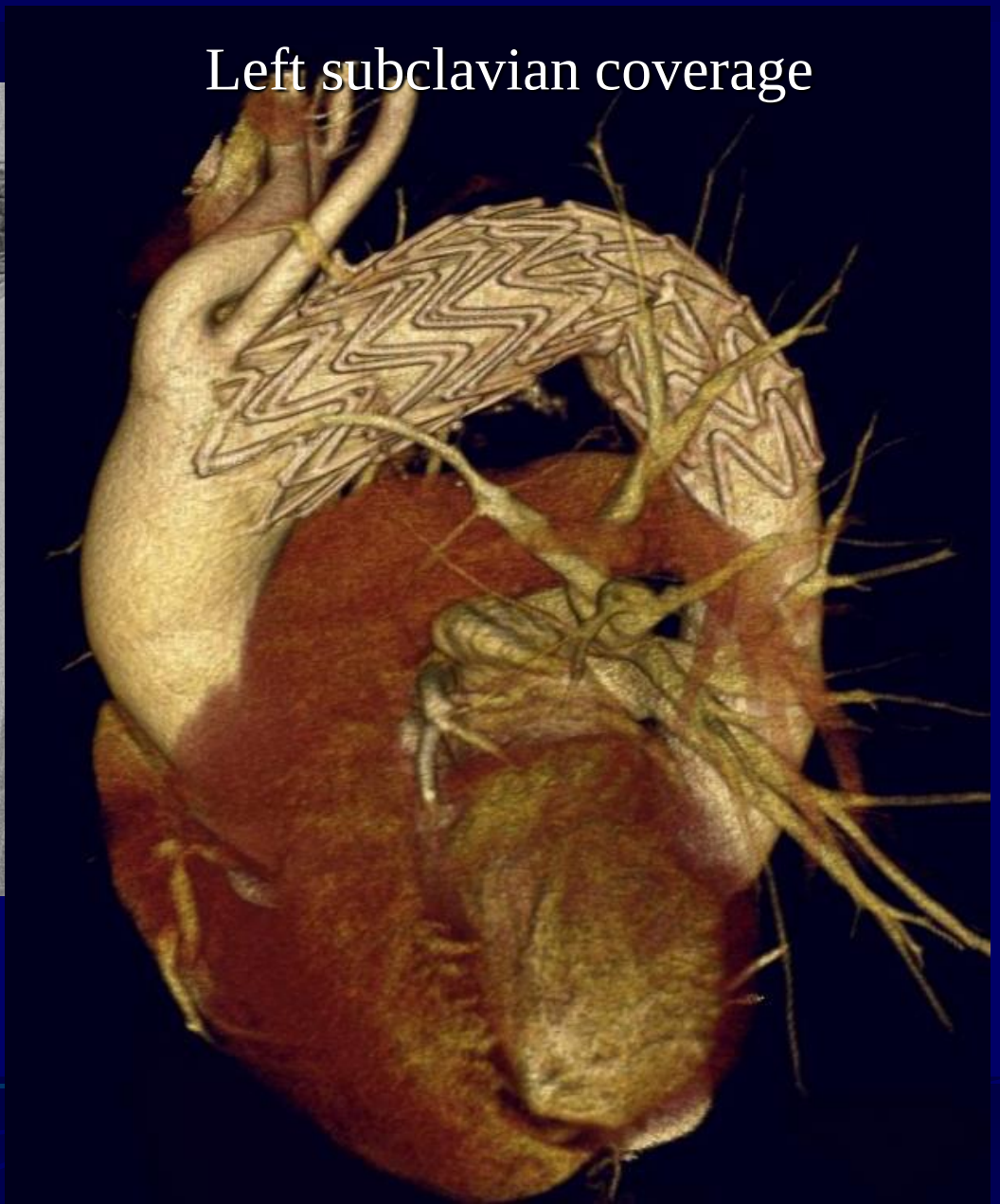
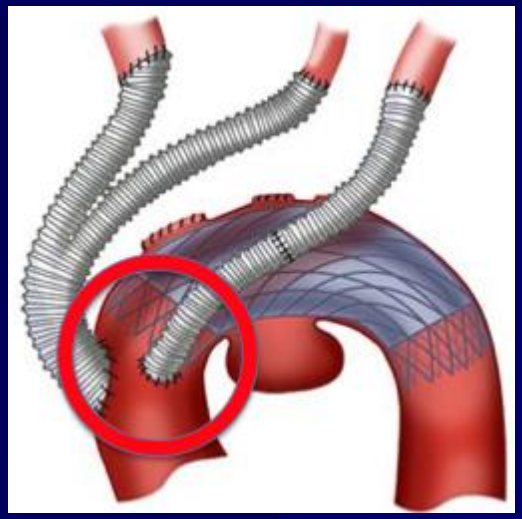
Type B Aortic Dissection: Left Subclavian coverage

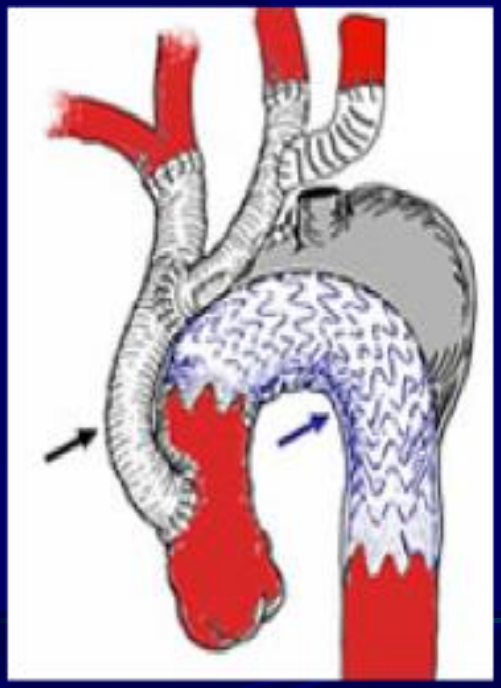




Mendiz O, et al. Rev CACI 2005

Aortic Dissection Compromising the Aortic Arch: Hybrid Approach





Author	Year	Nº Ptes	30-day Mortality	1-year Survival	Stroke
Bergeron	2006	25	8%	88%	8%
Melissano	2007	37	11%	86	5.4%
Czerny	2007	27	7.4%	83%	0
Bockler	2010	40	7.5%	87.5%	2.5%
Total		129	10%	85%	3%

Outcomes	n=24
In-hospital Mortality	4.2%
False Lumen Thrombosis	95.6%
Survival @ 28 months	92.1±8%

Marullo A et al. Ann Thor Surg 2010;90:1847-53

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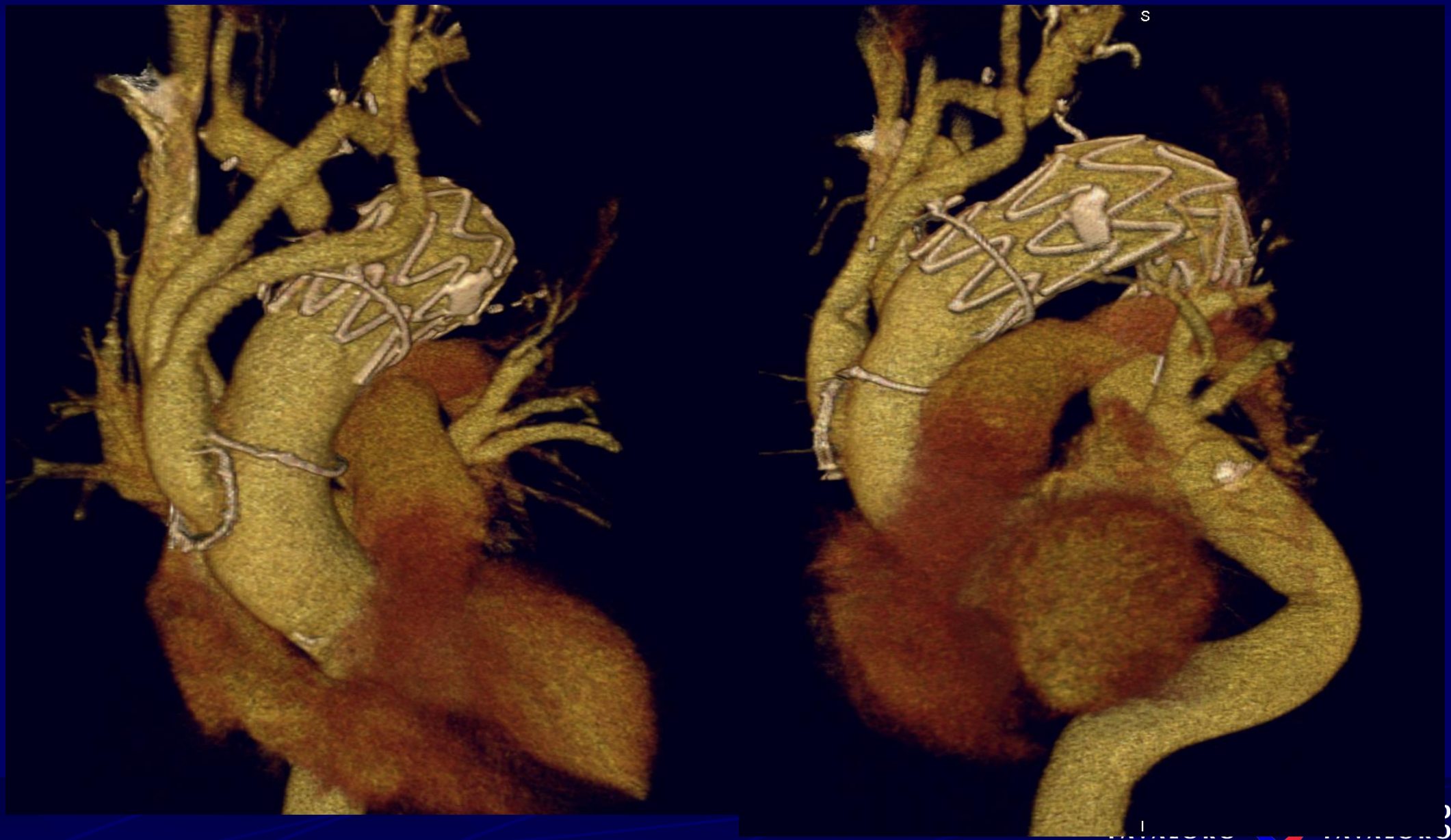
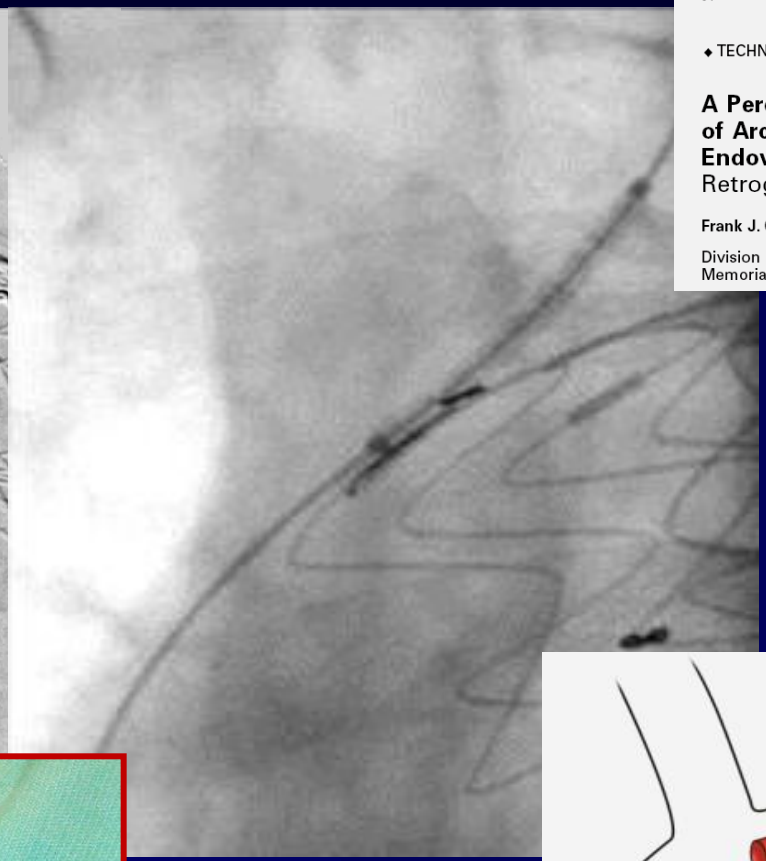
Combined Approach: Surgical Debranching



2003



54 J ENDOVASC THER 2007;14:54–58

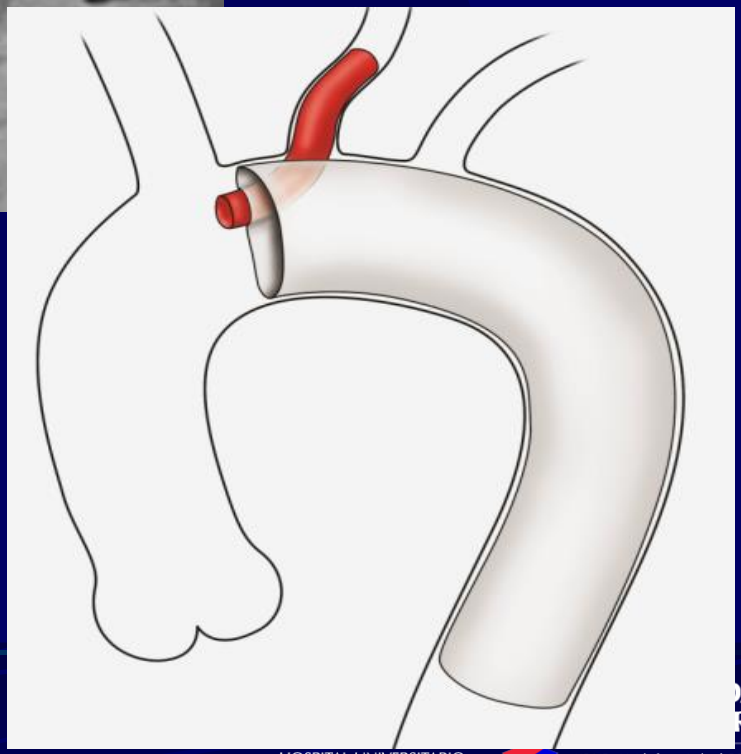
◆ TECHNICAL NOTE ◆

A Percutaneous Technique for Preservation of Arch Branch Patency During Thoracic Endovascular Aortic Repair (TEVAR): Retrograde Catheterization and Stenting

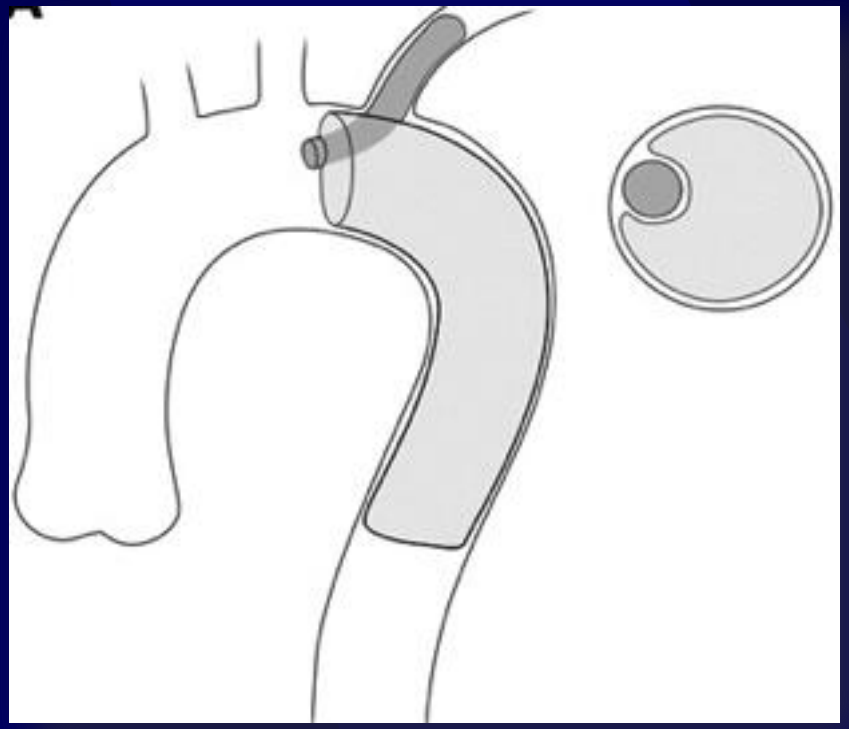
Frank J. Criado, MD

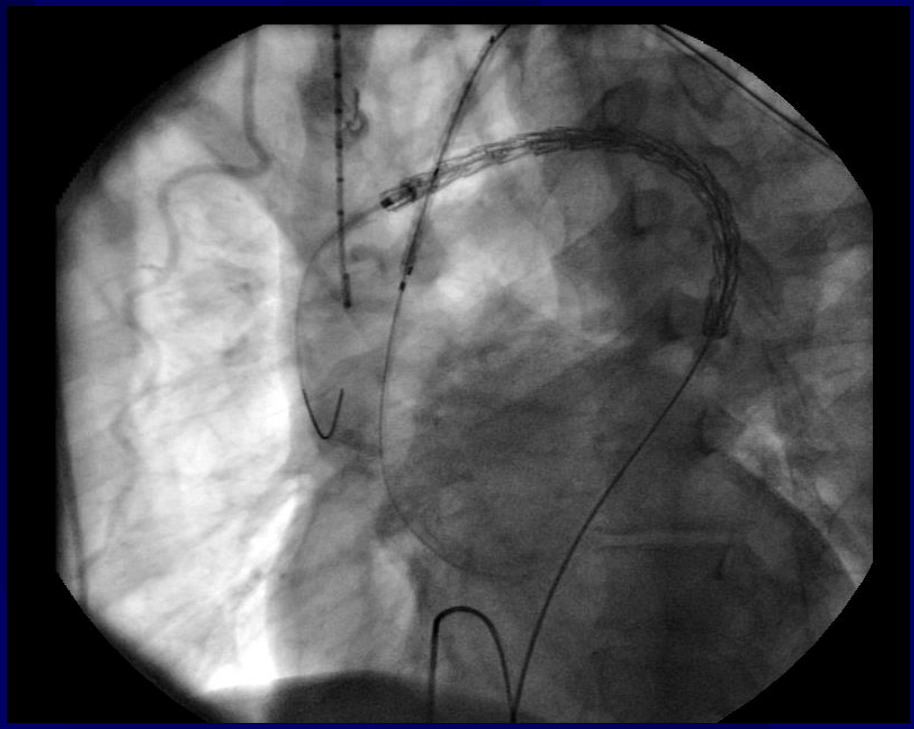
Division of Vascular Surgery and Vascular Intervention, Union Memorial Hospital-MedStar Health, Baltimore, Maryland, USA.

Modified from Criado F. tctmd.com



Endovascular Options: Chimney

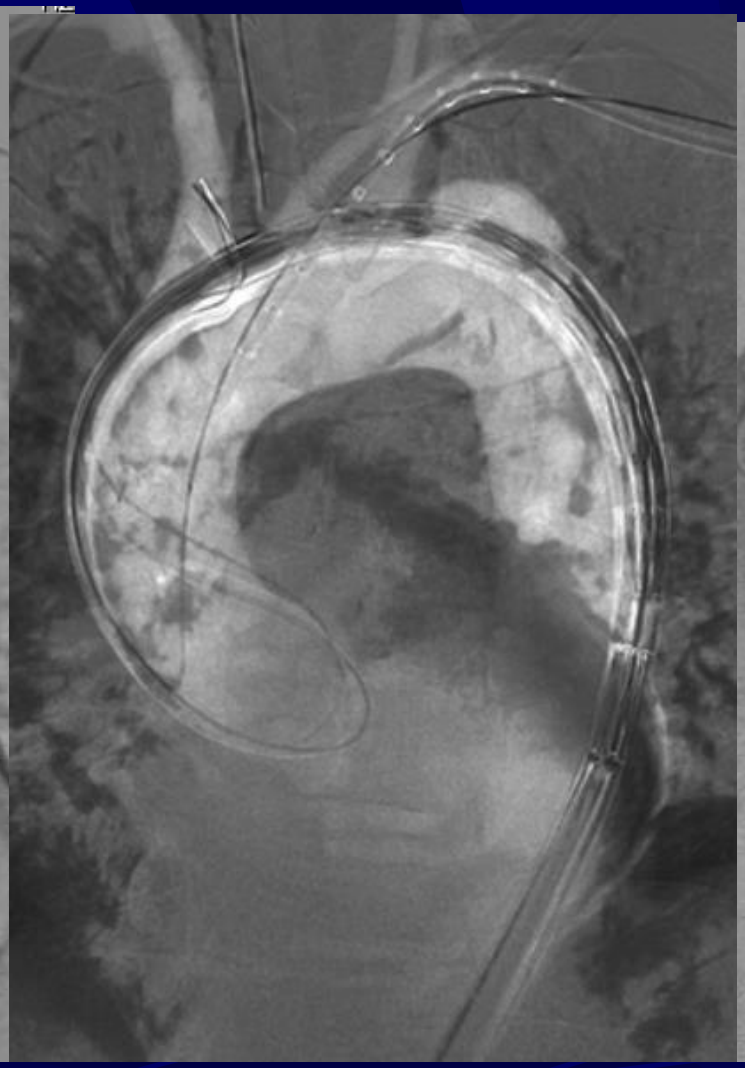


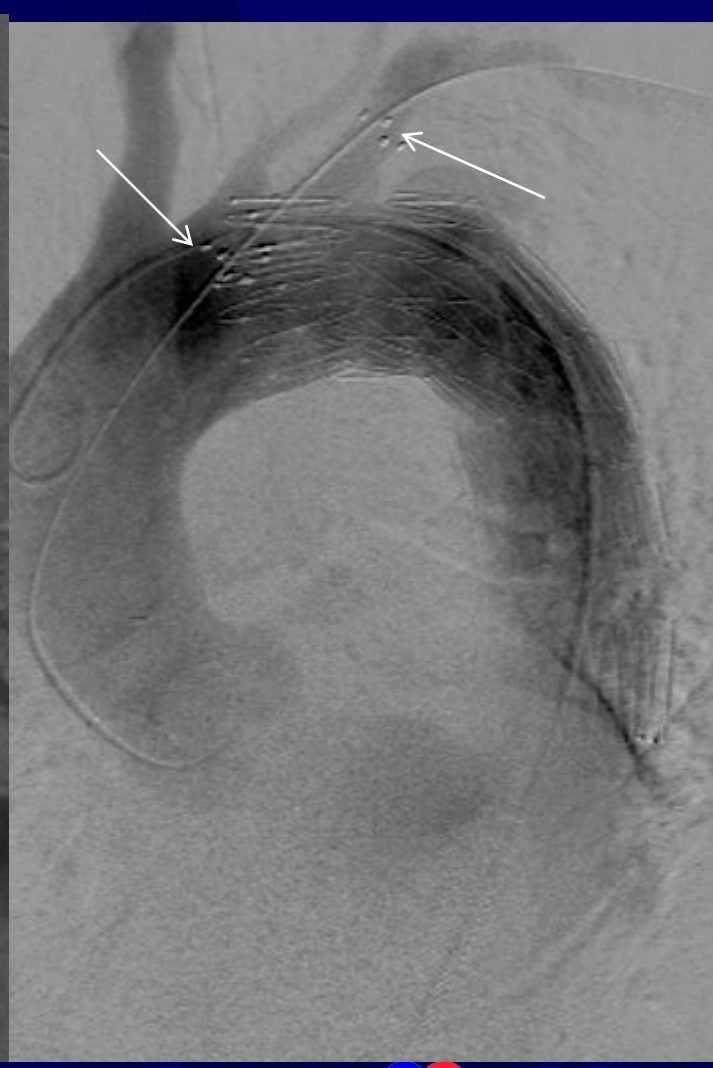


Planned treatment:
iliac extension graft stent to allow left subclavian artery patency
.Endoprothesis in arch and discending aorta

Endovascular procedure: 13mm x 7.5 cm iliac extension in subclavian artery and 38mm x20 cm tubular segment in arch and toracic aorta

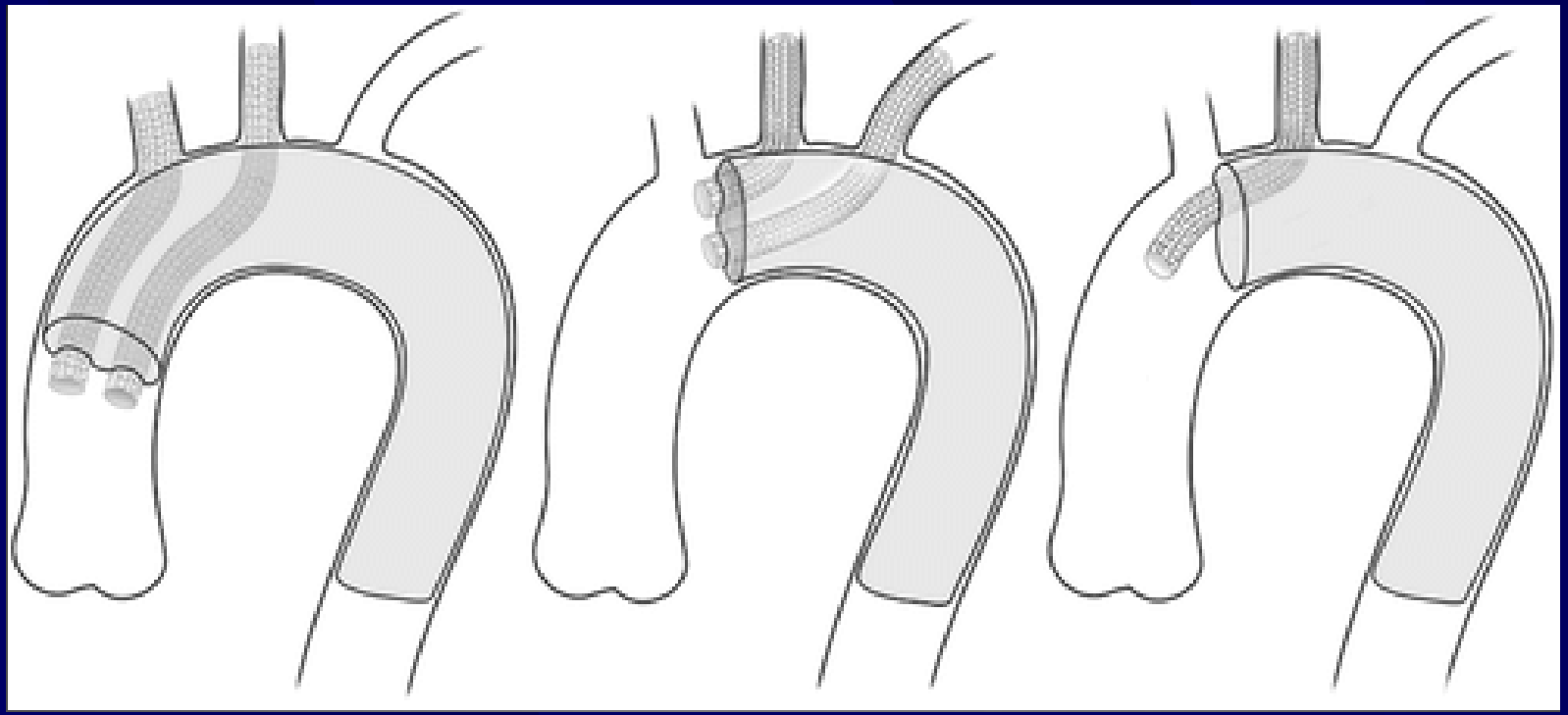
Chimney Technique

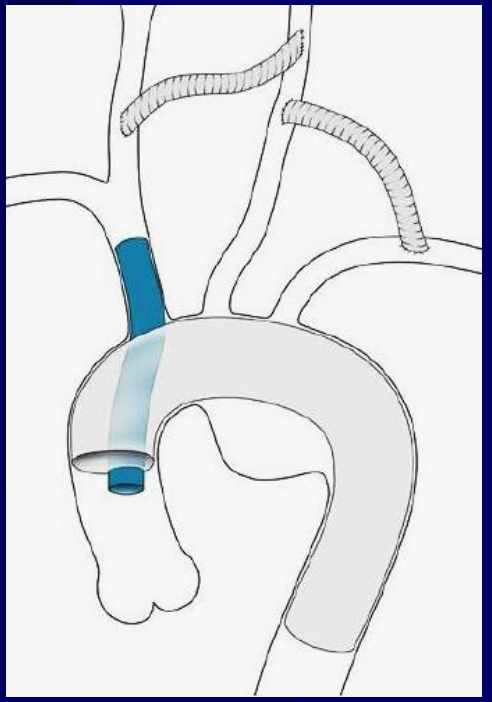




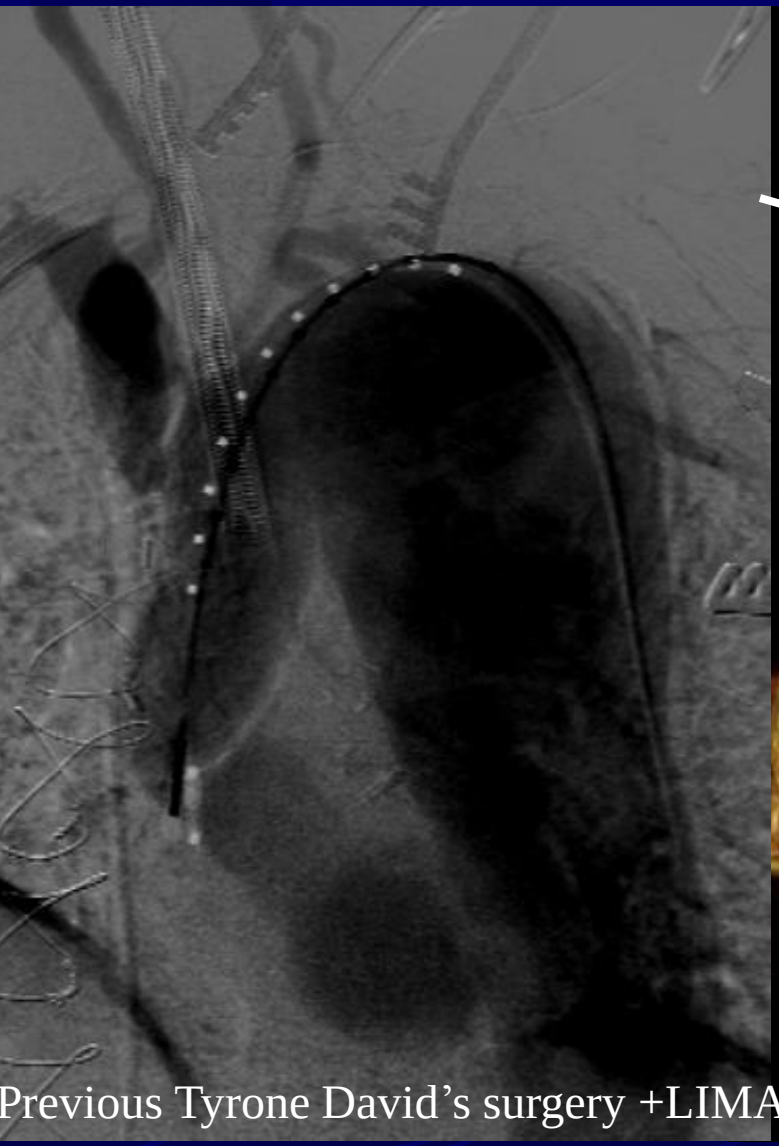
Aortic Arch Chimney (Endovascular Debranching)

Hybrid

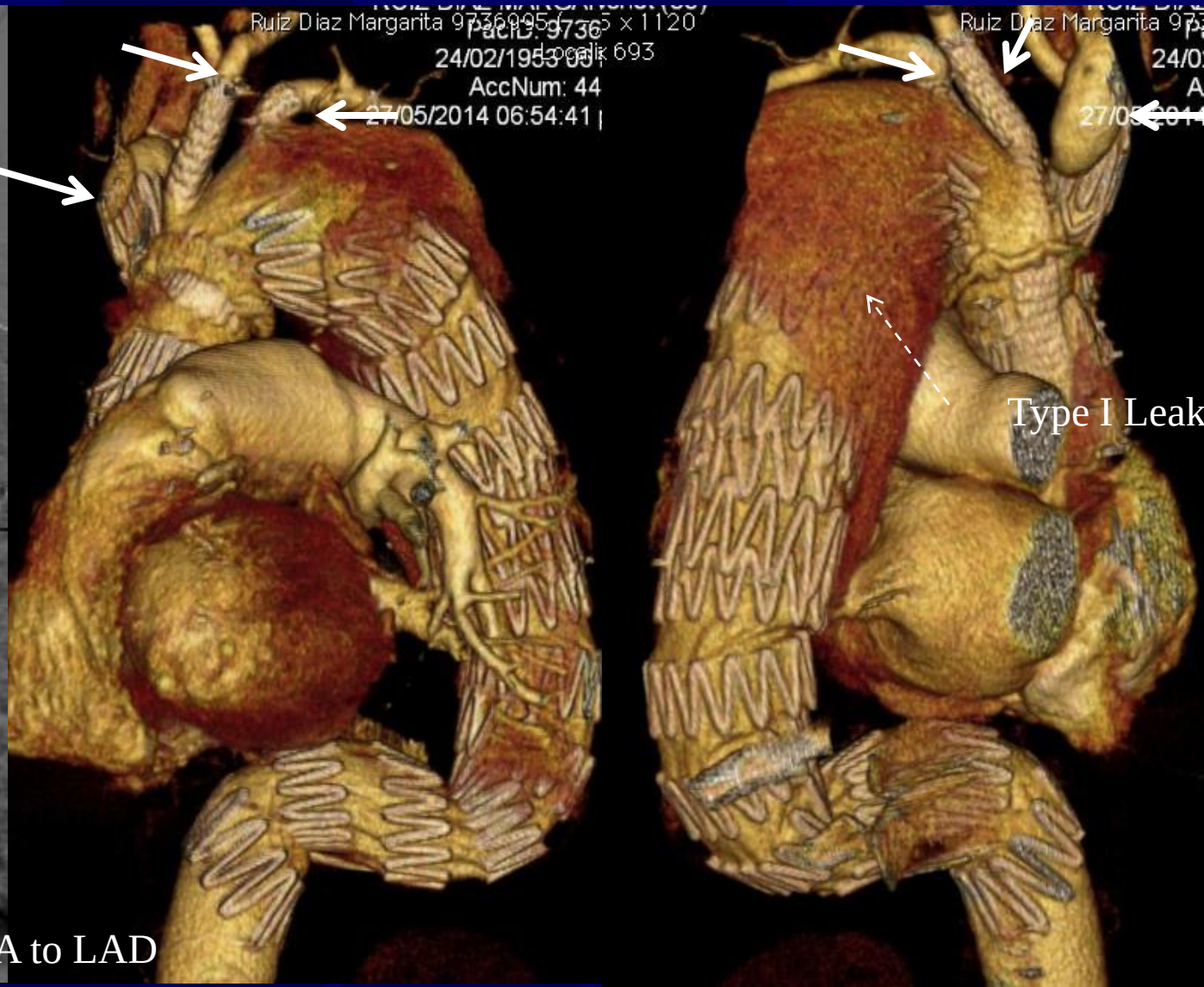




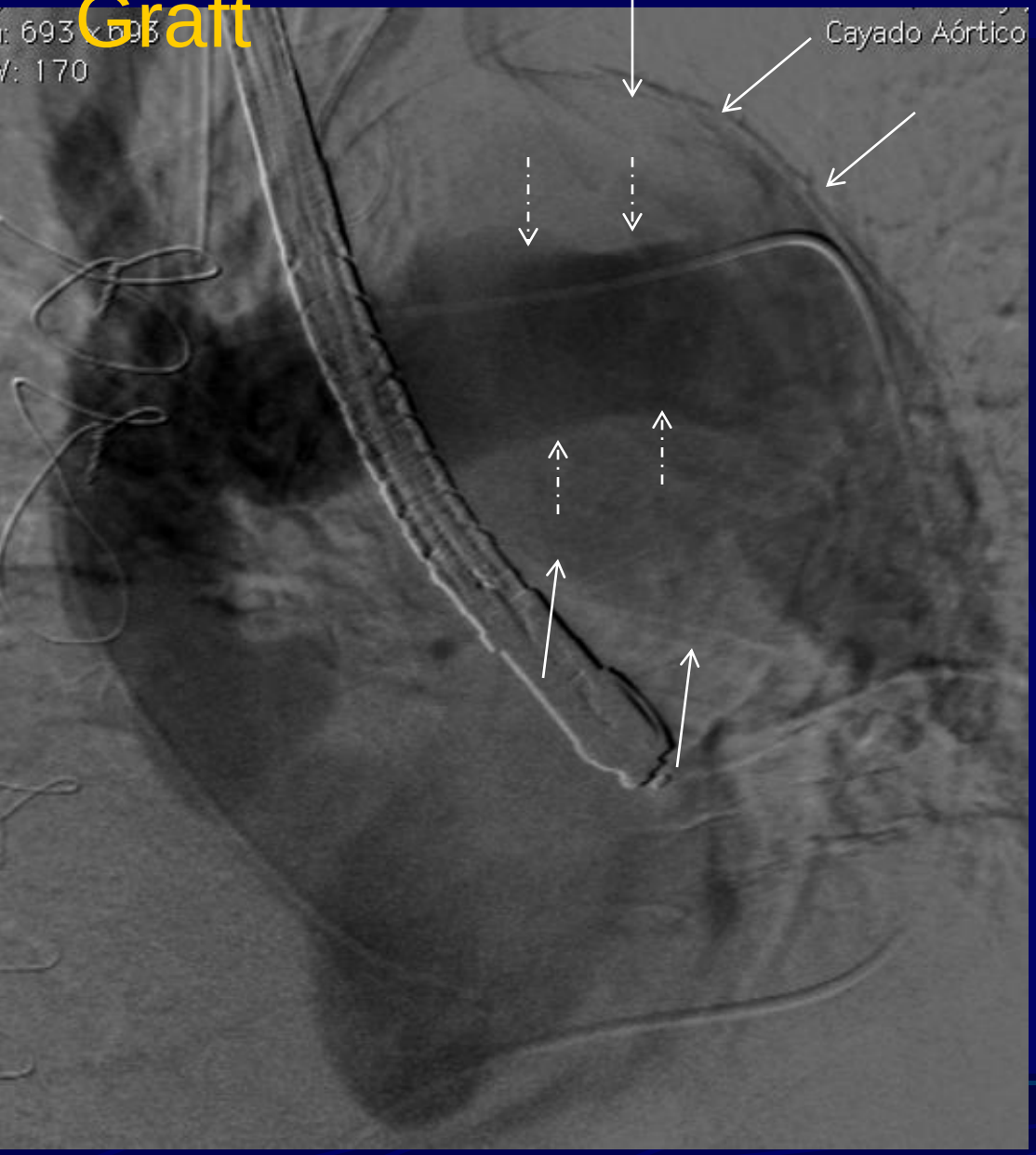
Aortic Arch Chimney (Endovascular Debranching)



Previous Tyrone David's surgery +LIMA to LAD



Stent Graft Inside a Previous “Elephant Trump” Graft

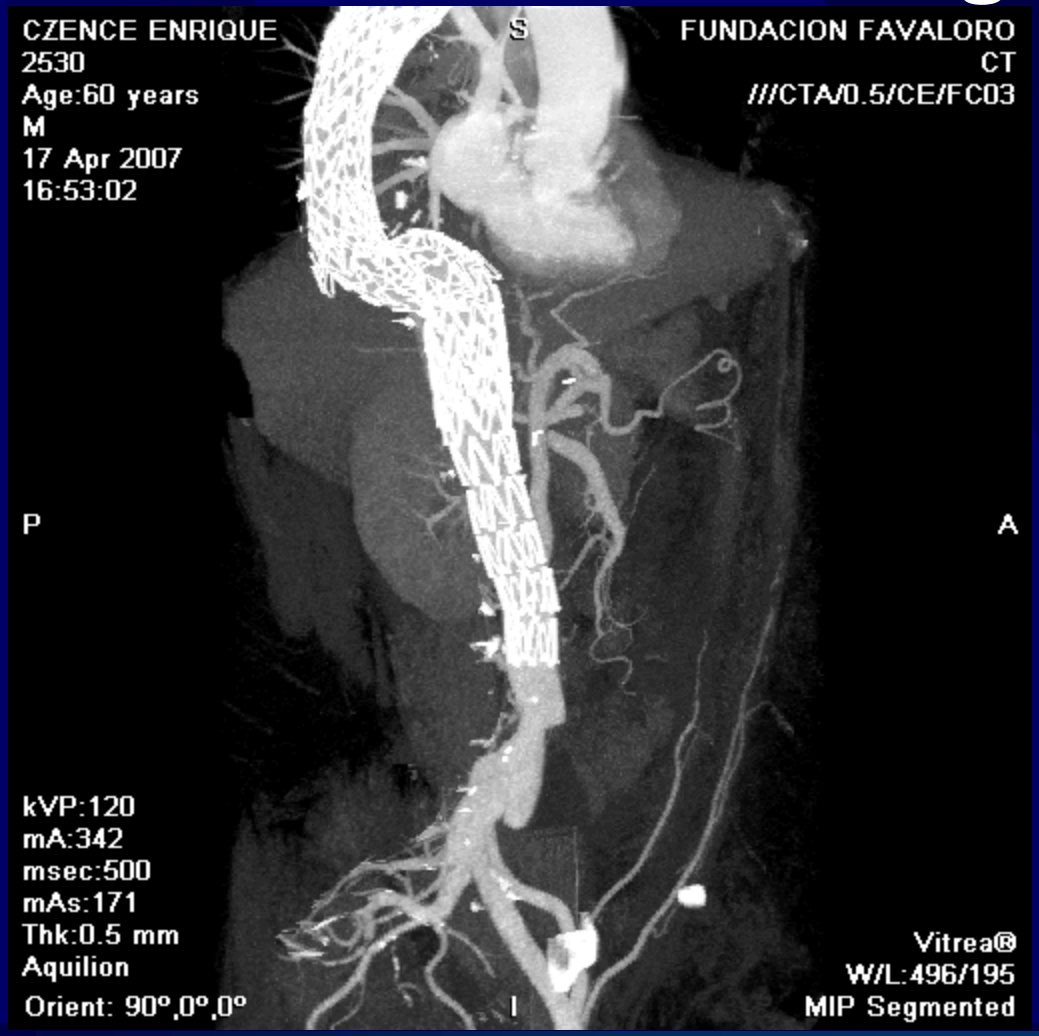


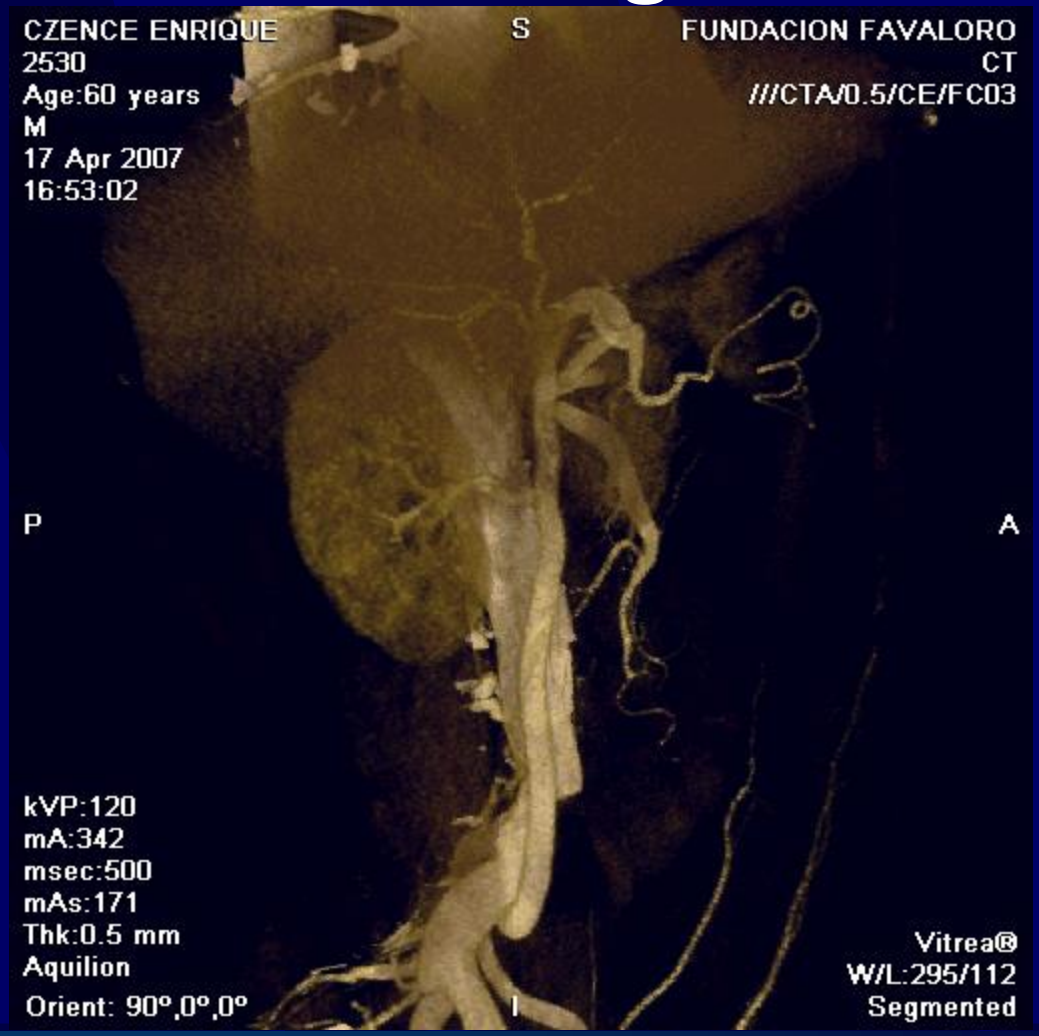
Thoraco-Abdominal Aneurysms

Thoraco-Abdominal Aneurysms

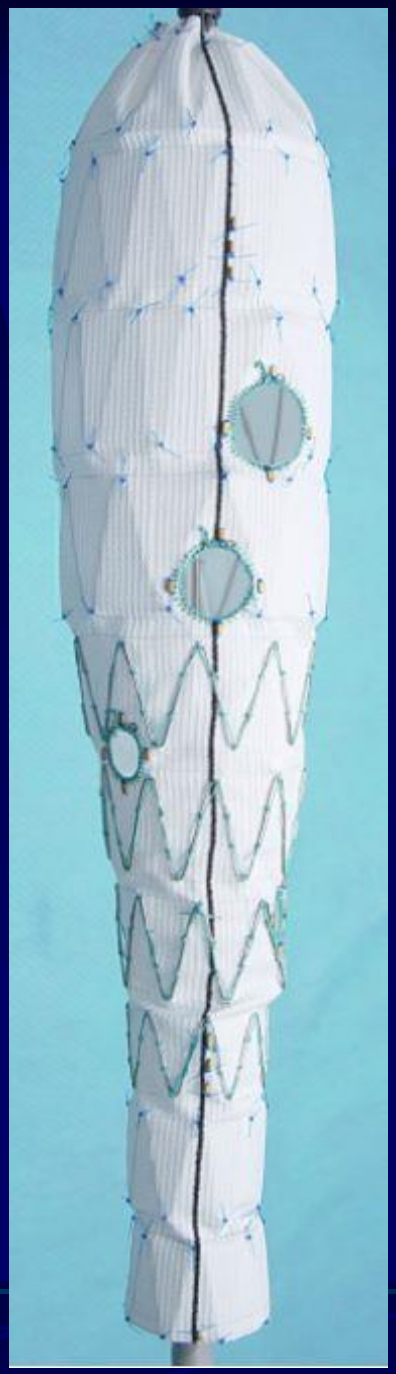
TEVAR for Thoraco -abdominal Aneurysms:

Abdominal Surgical Debranching





Fenestrated Graft



Thoraco-abdominal aneurysm

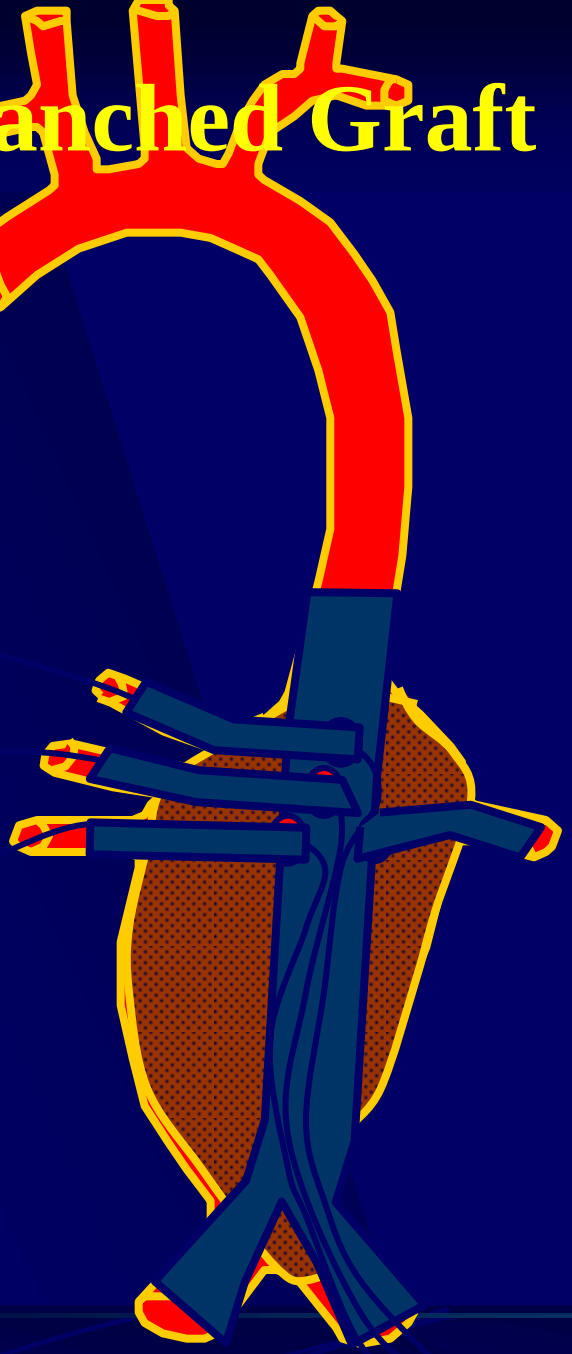
Previous surgical AAA repair

Images courtesy of

Dr John Anderson

(tctmd.com)

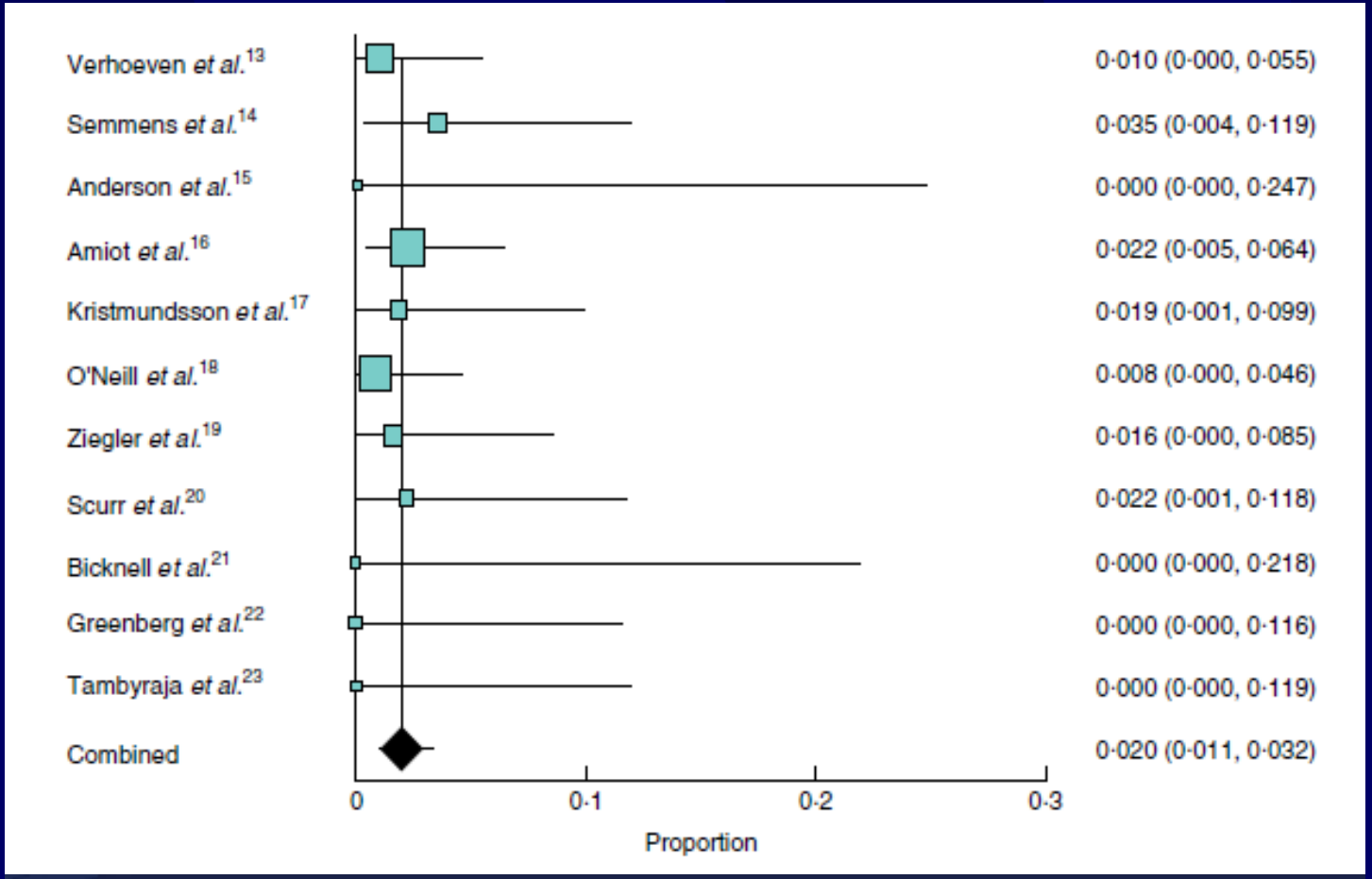
Branched Graft



Images courtesy of

Dr John Anderson (modified)

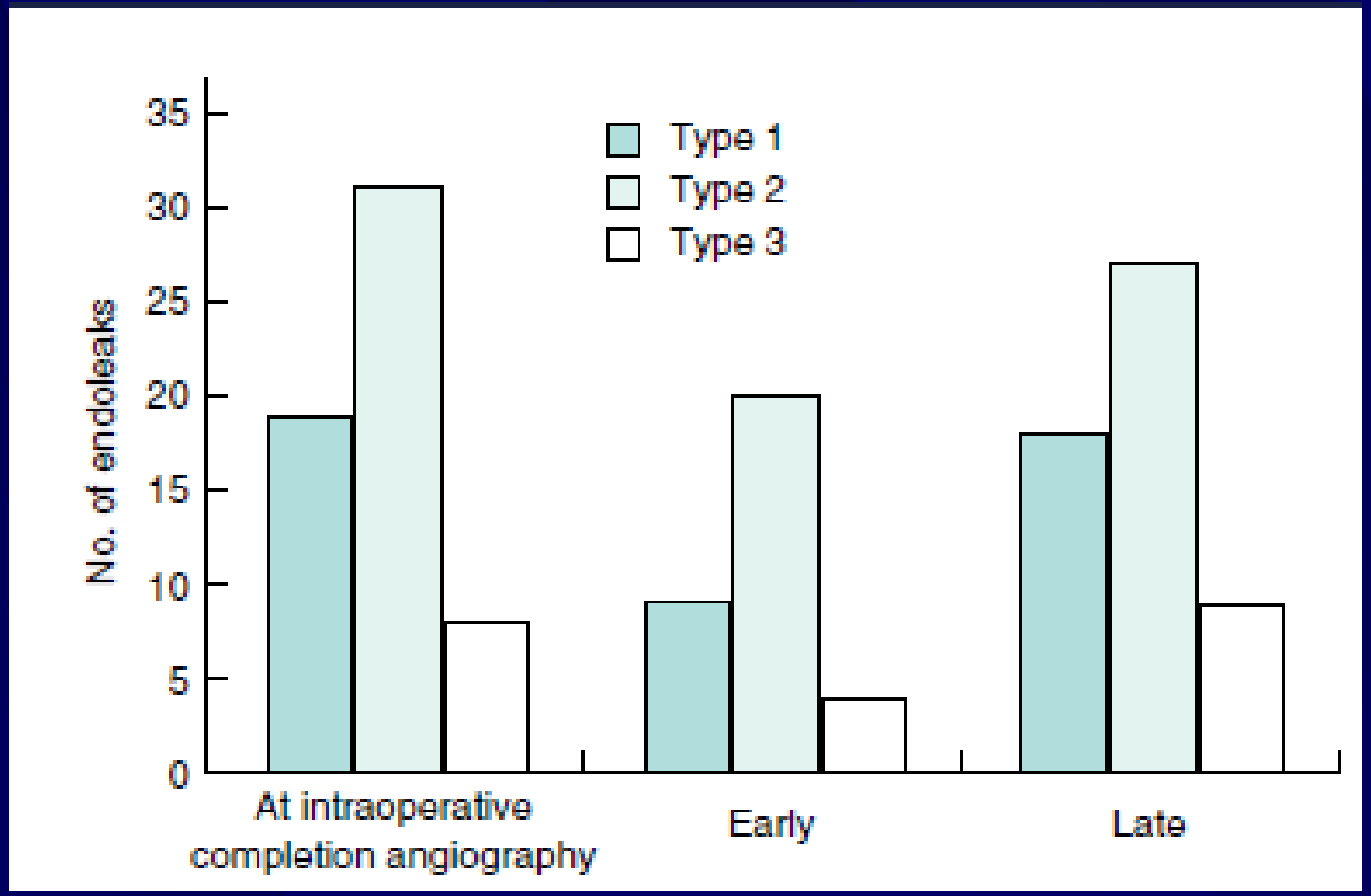
Fenestrated Endografts: Mortality



Metanalysis: 11 Studies
660 procedures
30-day mortality 2.0%

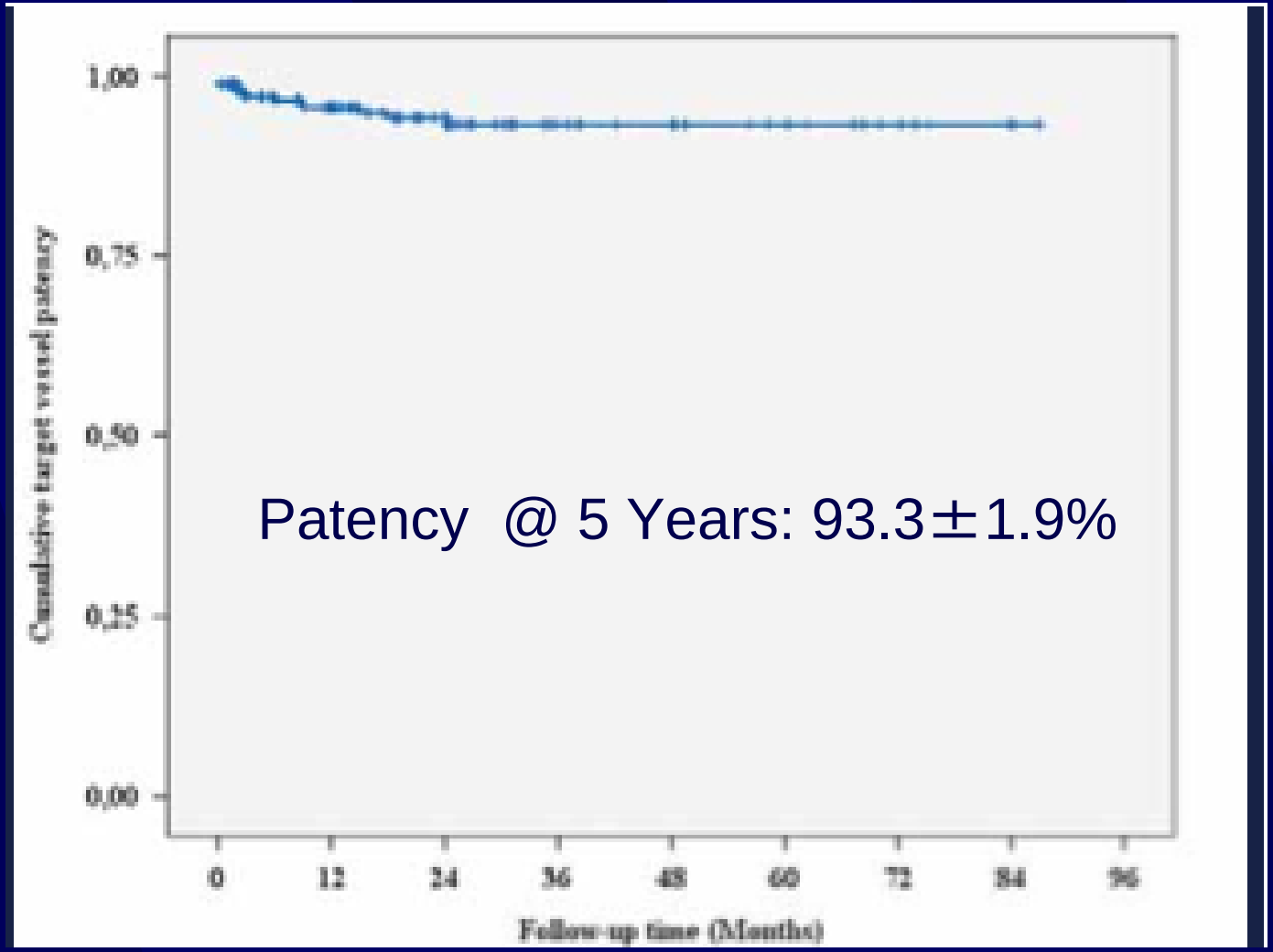
Br J Surg 2012,99:152

Fenestrated Endografts: Endoleaks



Meta-analysis, Br J Surg 2012,99:152

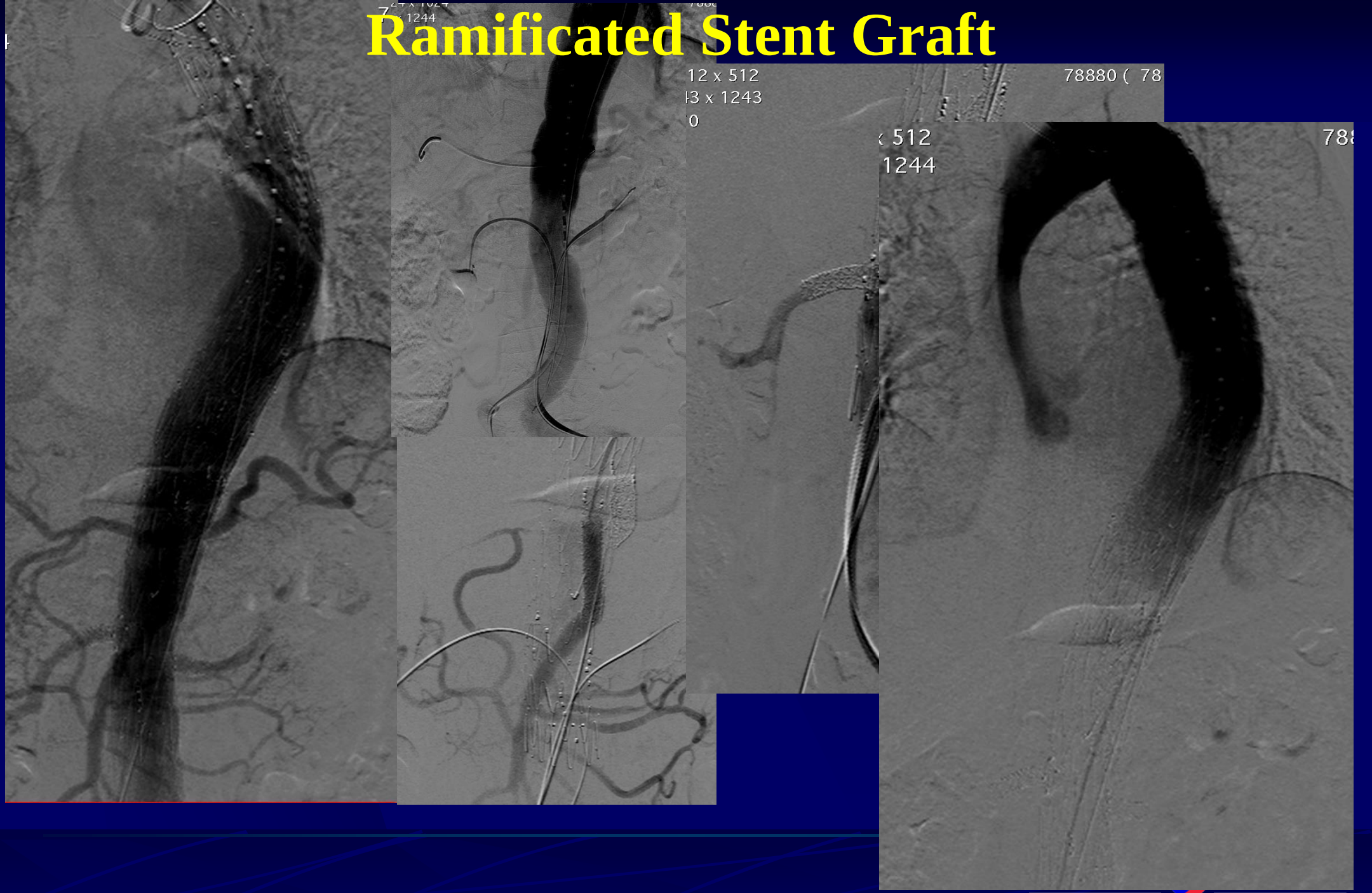
Target Vessels Patency



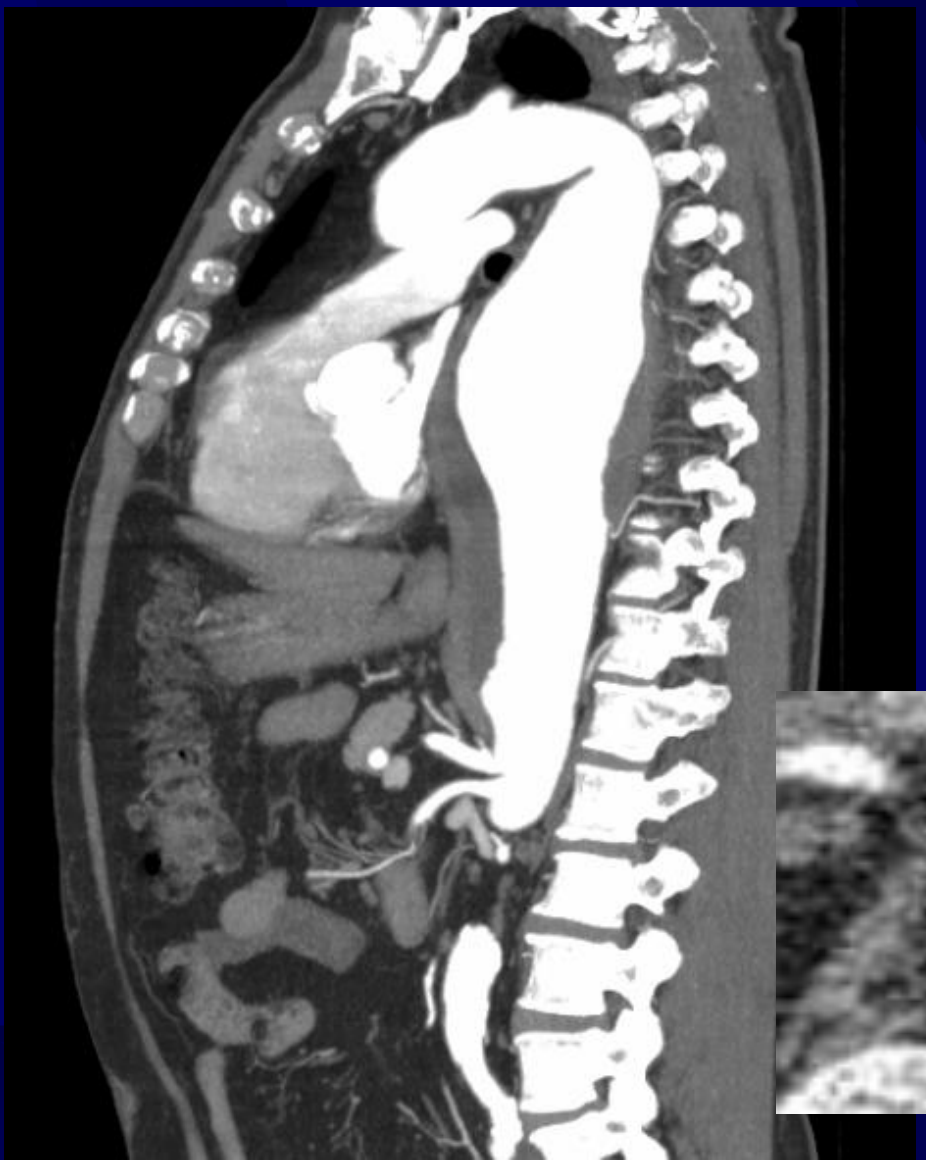
Patency @ 5 Years: 93.3±1.9%

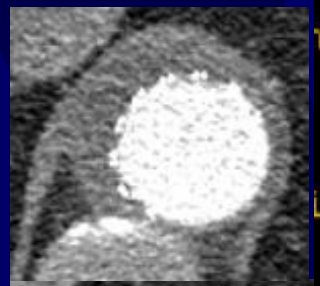
Verhoeven et al. EJVES 2010;39:529

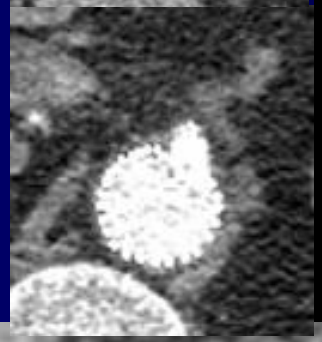
Ramificated Stent Graft

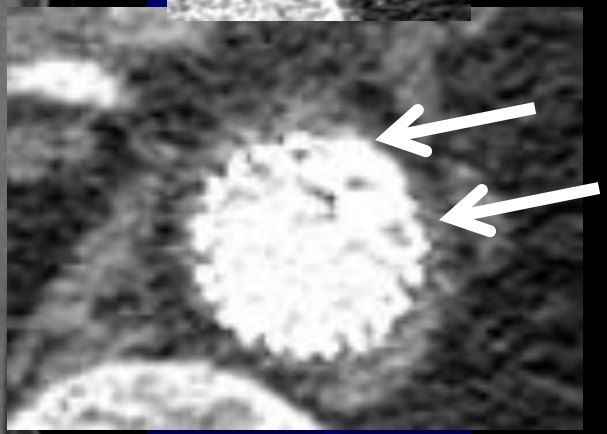


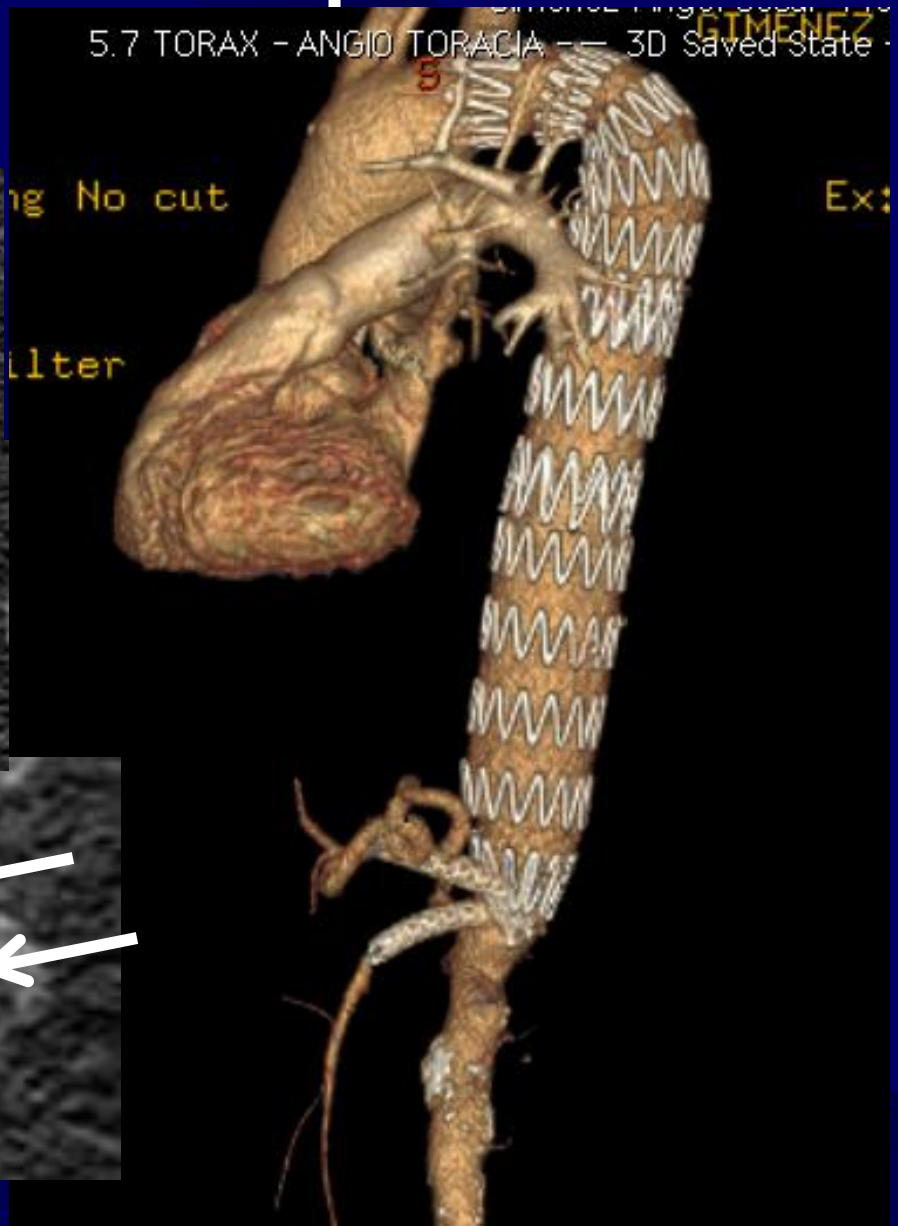
Toraco-Abdomnial Aneurysm:
Snorkel or Periscope Technique





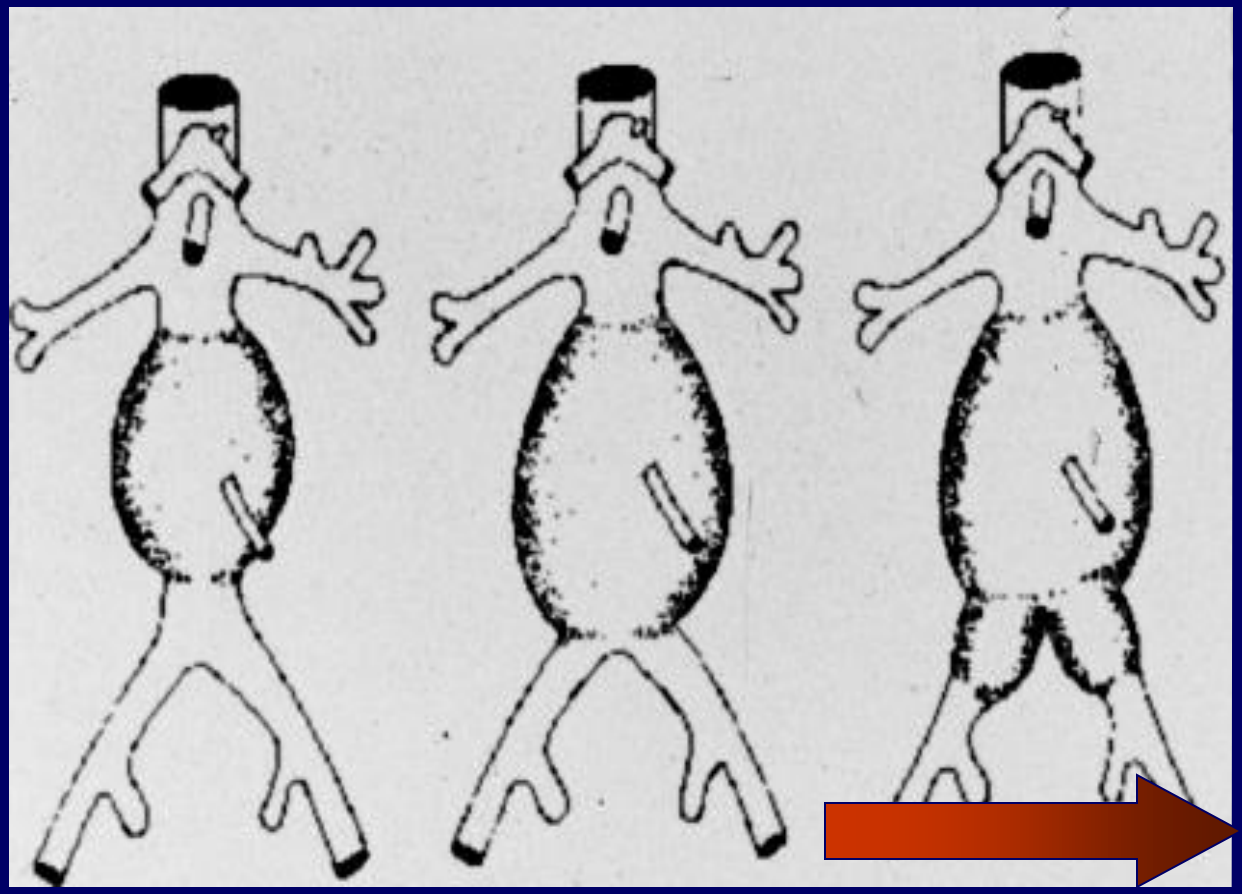




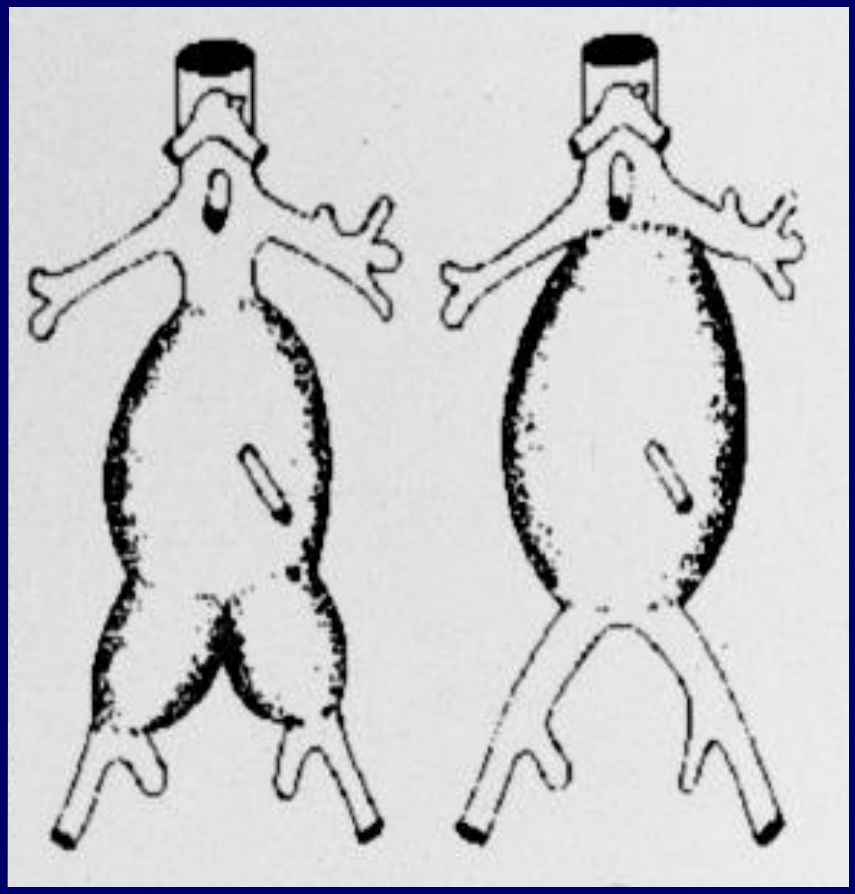


Endovascular Repair of AAA : Anatomic Indications

- *Case Selection for EVAR: Types of AAA*



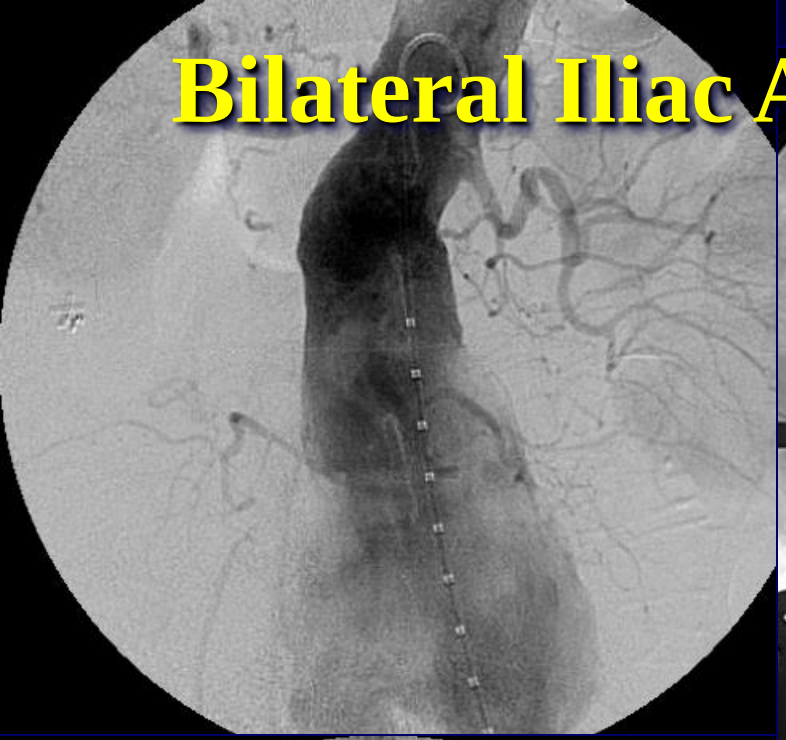
Endoluminal

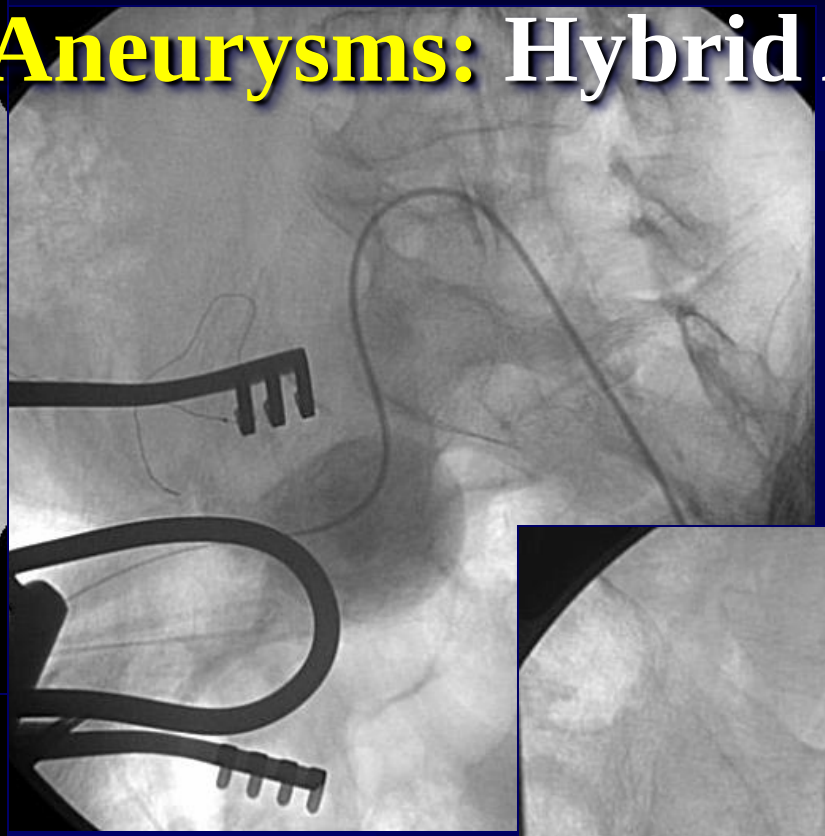


Endoluminal

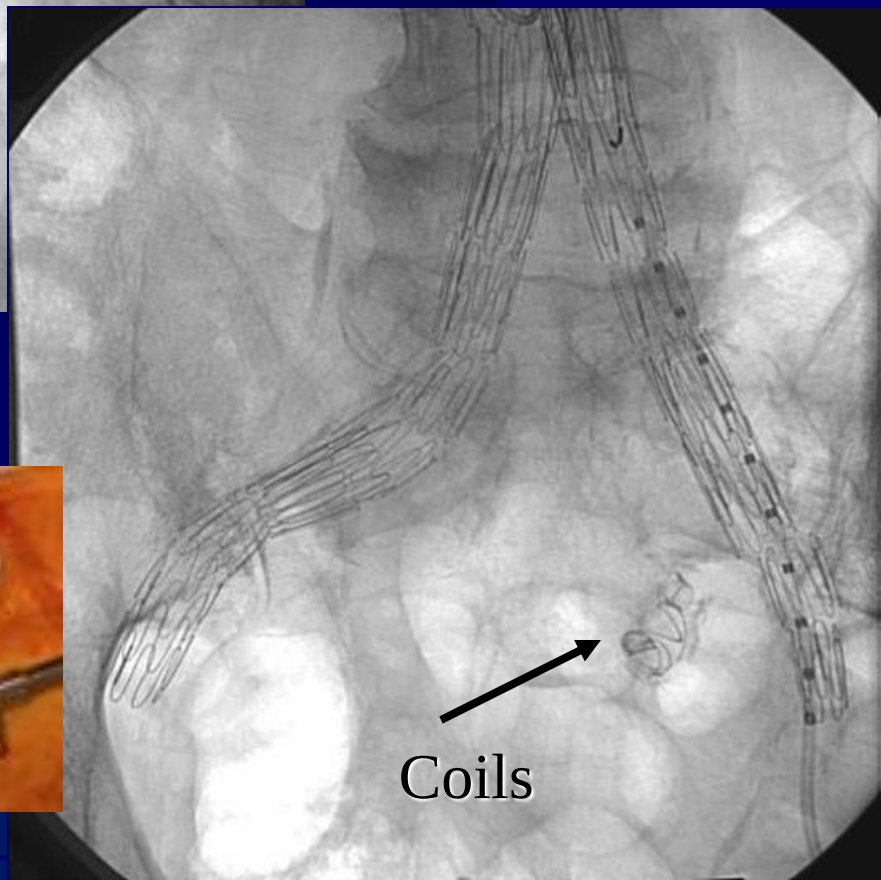
Iliac Aneurysms

Bilateral Iliac Aneurysms: Hybrid Approach



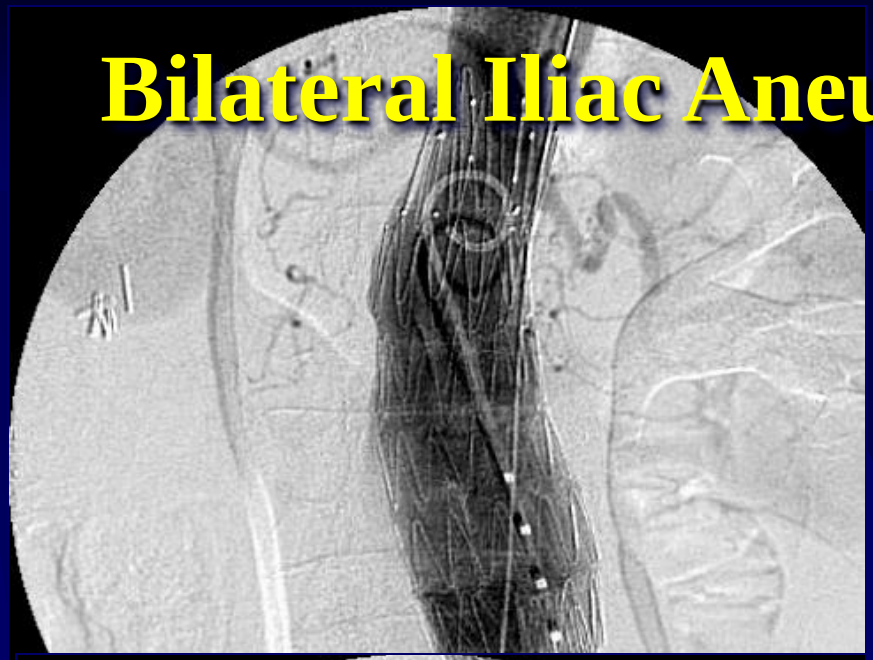


Iliac Access



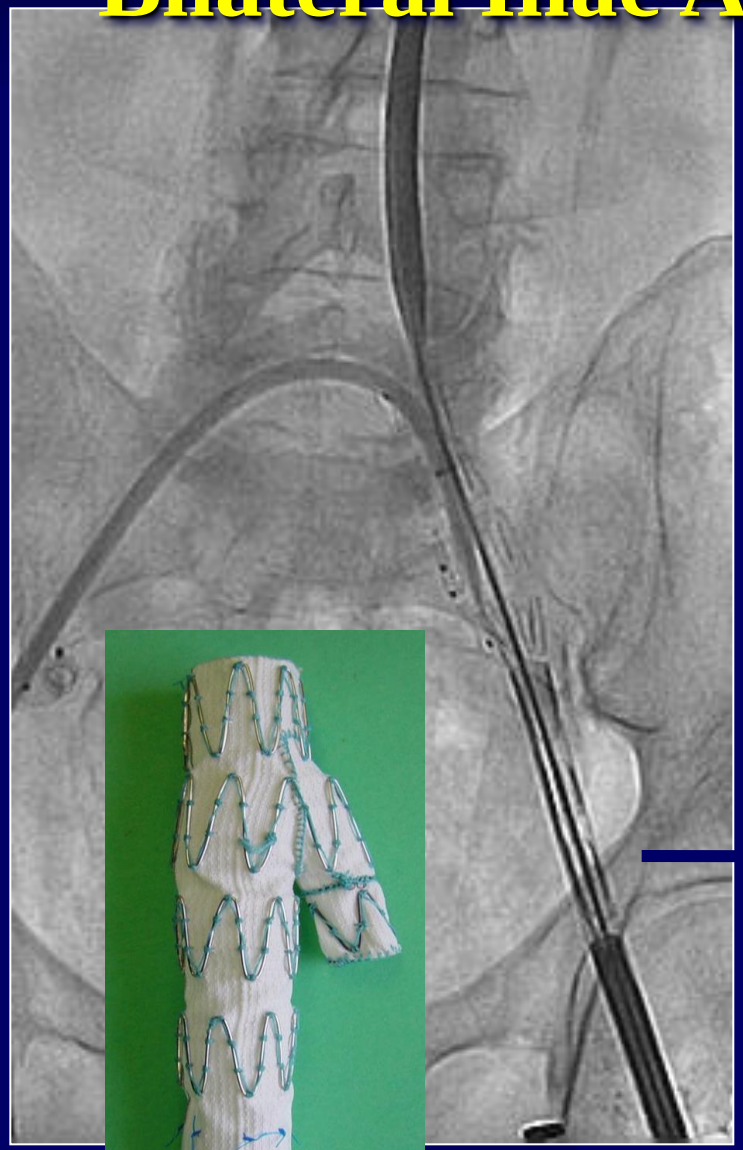
Coils

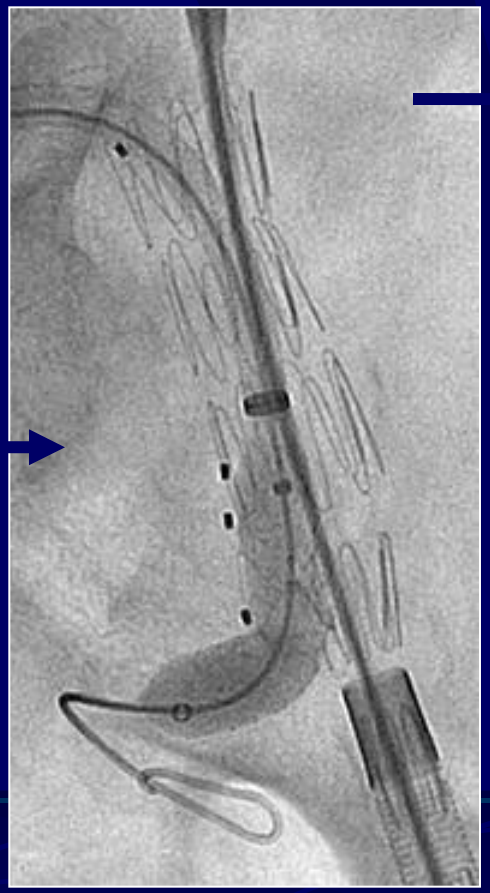
Bilateral Iliac Aneurysms: Hybrid Approach



Both Iliac Compromise: Bifurcated Branches

Bilateral Iliac Aneurysms: Bifurcated Branches

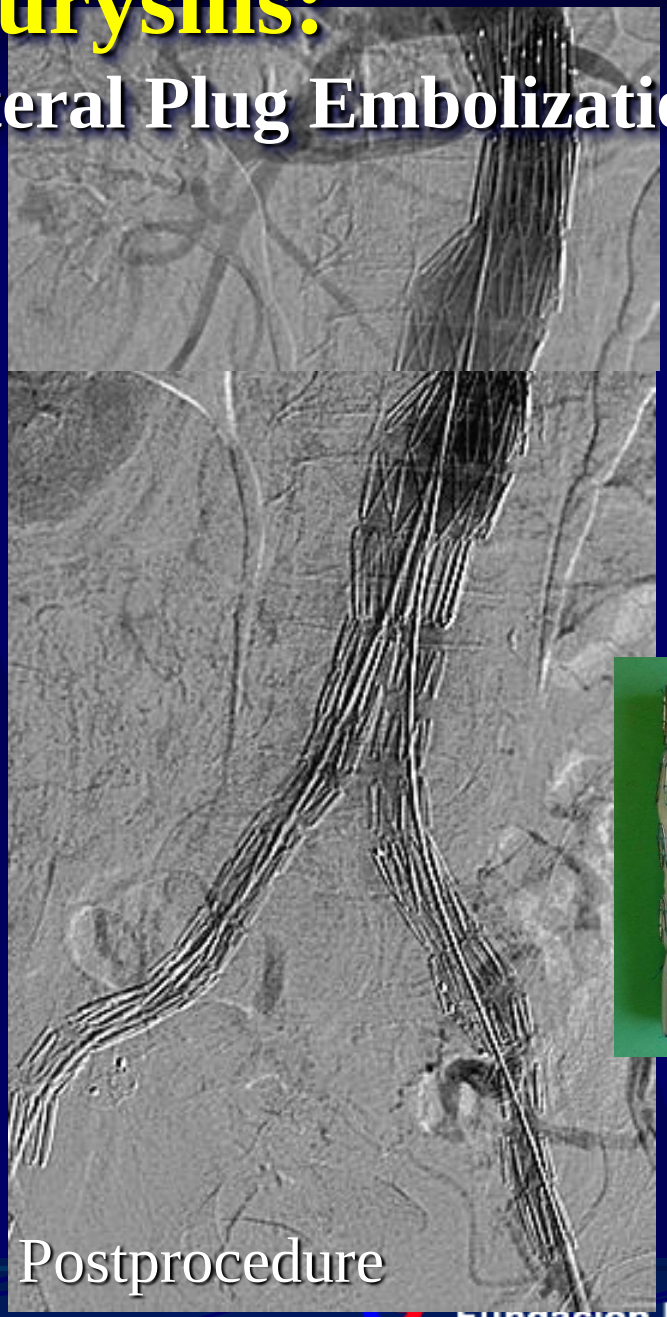




Bilateral Iliac Aneurysms:

Bifurcated Iliac Branch & Contralateral Plug Embolization

Preprocedure



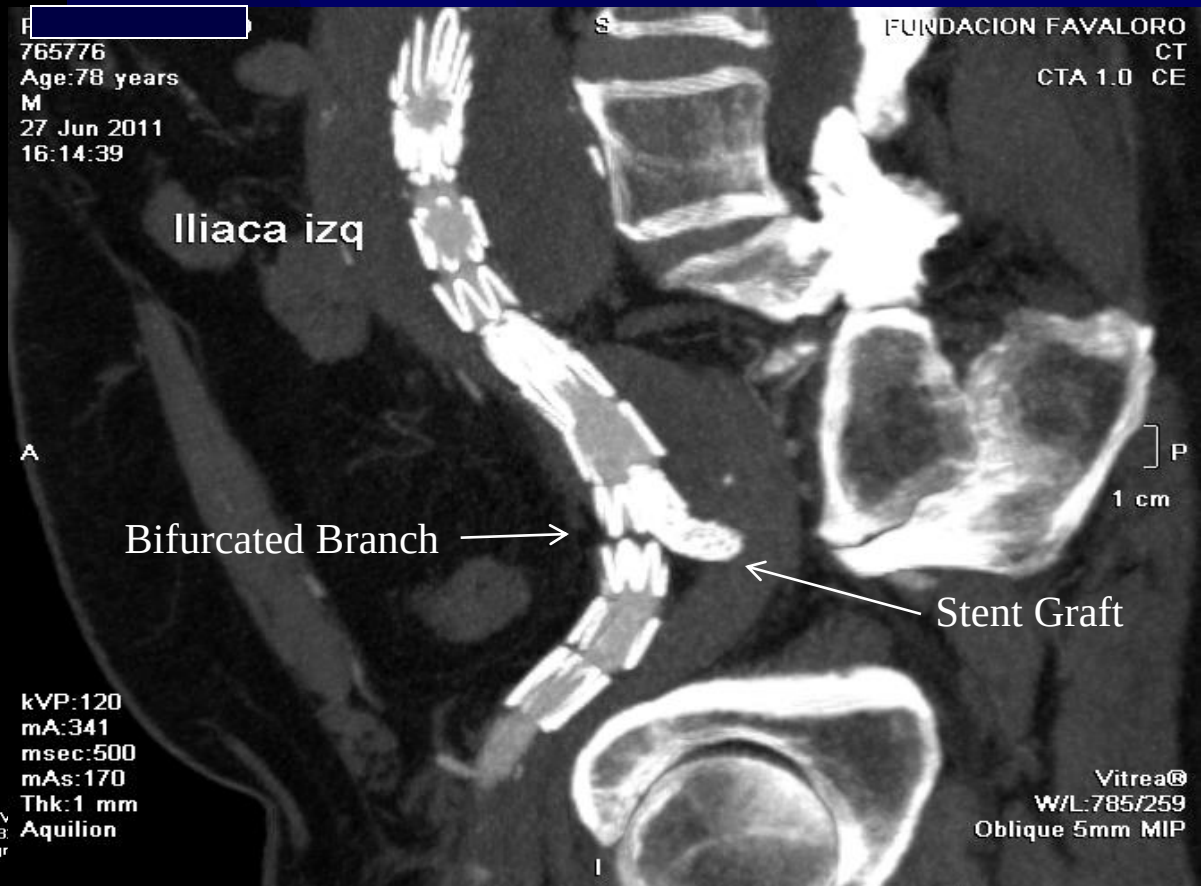
Postprocedure

Fundación Favaloro

Bilateral Iliac Aneurysms:

Bifurcated Iliac Branch & Contralateral Plug Embolization

Same patient.
Control CT scan at 6 months.



Long-term Results of Iliac Aneurysm Repair with Iliac Branched Endograft: 5-Year Experience on 100 Consecutive Cases

100 consecutive patients between 2006 and 2011.

	%
Periprocedural Technical Success	95
Mortality	-
Patency of Internal Iliac branch (5 years)	91.4
Freedom from any Reinternvention (1 year)	90

European Journal of Vascular and Endovascular Surgery 43 (2012) 287e292

Endovascular treatment of iliac aneurysm: Concurrent comparison of Side Branch Endograft vs. Hypogastric Exclusion

74 patients. 32 receiving side branch endograft and 42 with hypogastric exclusion.

No intestinal ischemia or deaths occurred.

There were no significant differences in failures of hypogastric side branch deployment (2/32) compared with hypogastric coiling (3/42).

Reintervention rates were similar (5/32 vs. 4/42) at oneyear.

Buttock claudication & erectil disfunction were more frequent after hypogastric exclusion.

J Vasc Surg 2009;49:1154-61

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Isolated Iliac Aneurysm Without Proximal Neck: "Sandwich Technique"

Two Parallel Self-expanding Nitinol Stent Grafts

Juxtarenal and hostile Neck AAA

European Journal of Vascular and Endovascular Surgery 44 (2012) 556-561

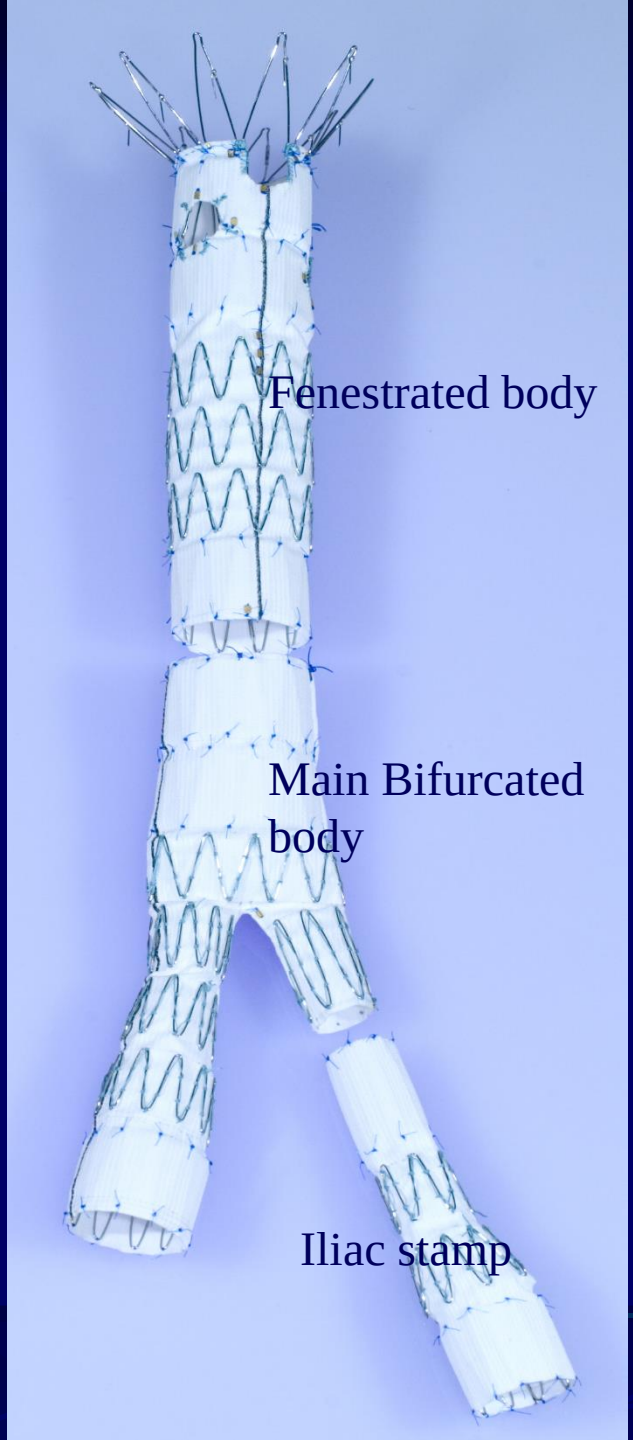
Hallet et al: Comprehensive Vascular and Endovascular Surgery, 2004

Hostile Neck for AAA

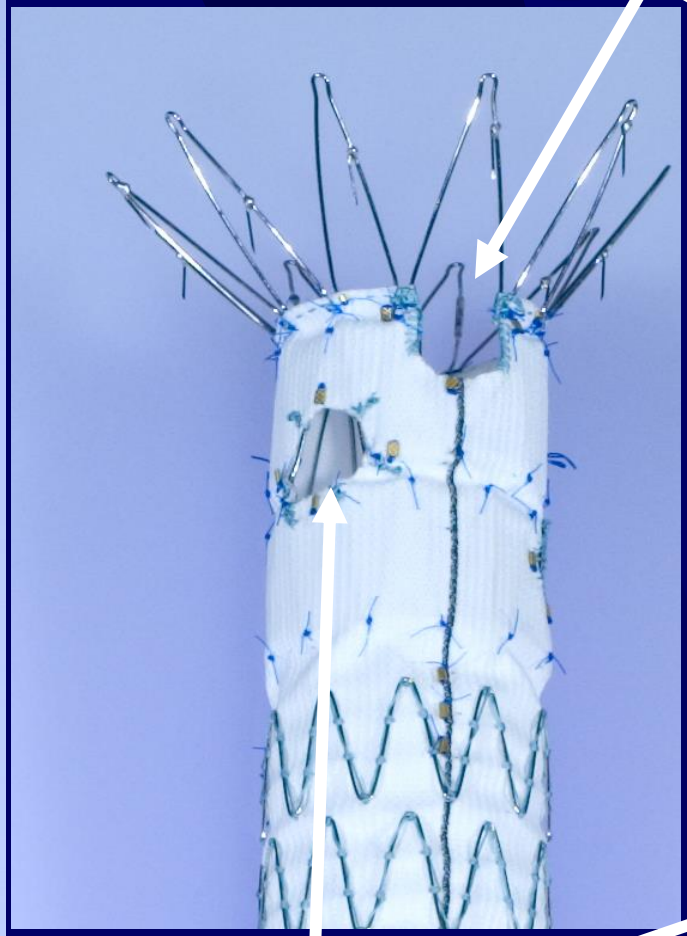
- Definition: one or more of the following anatomical features.
  - Diameter >28 mm
  - Angulation >60
  - Length <15 mm
  - Thrombus
  - Flare

Sather P, et al. European J of Vasc and Endovasc Surg 2012;44;556e561

Fenestrated Grafts:



Scallops

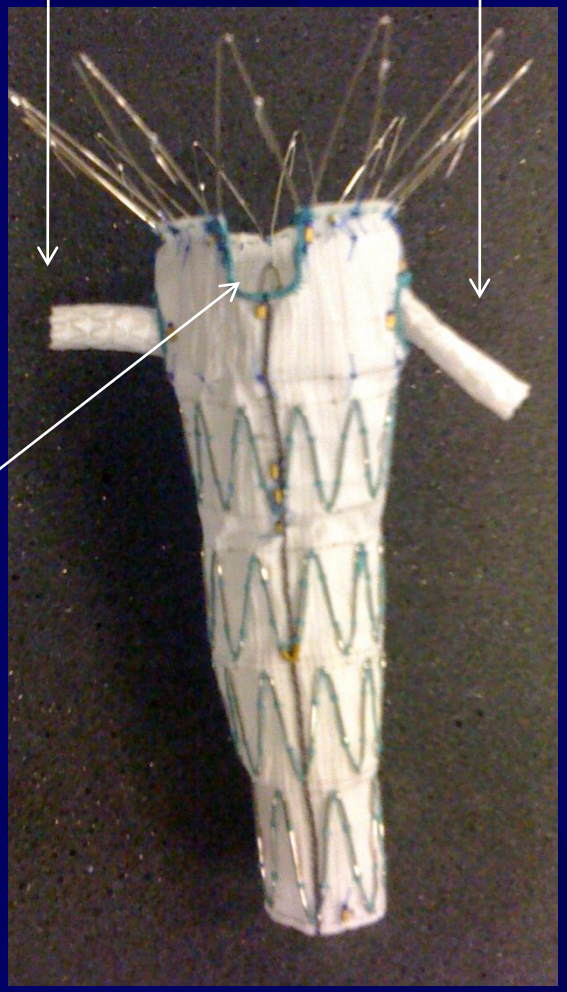


Fenestrations

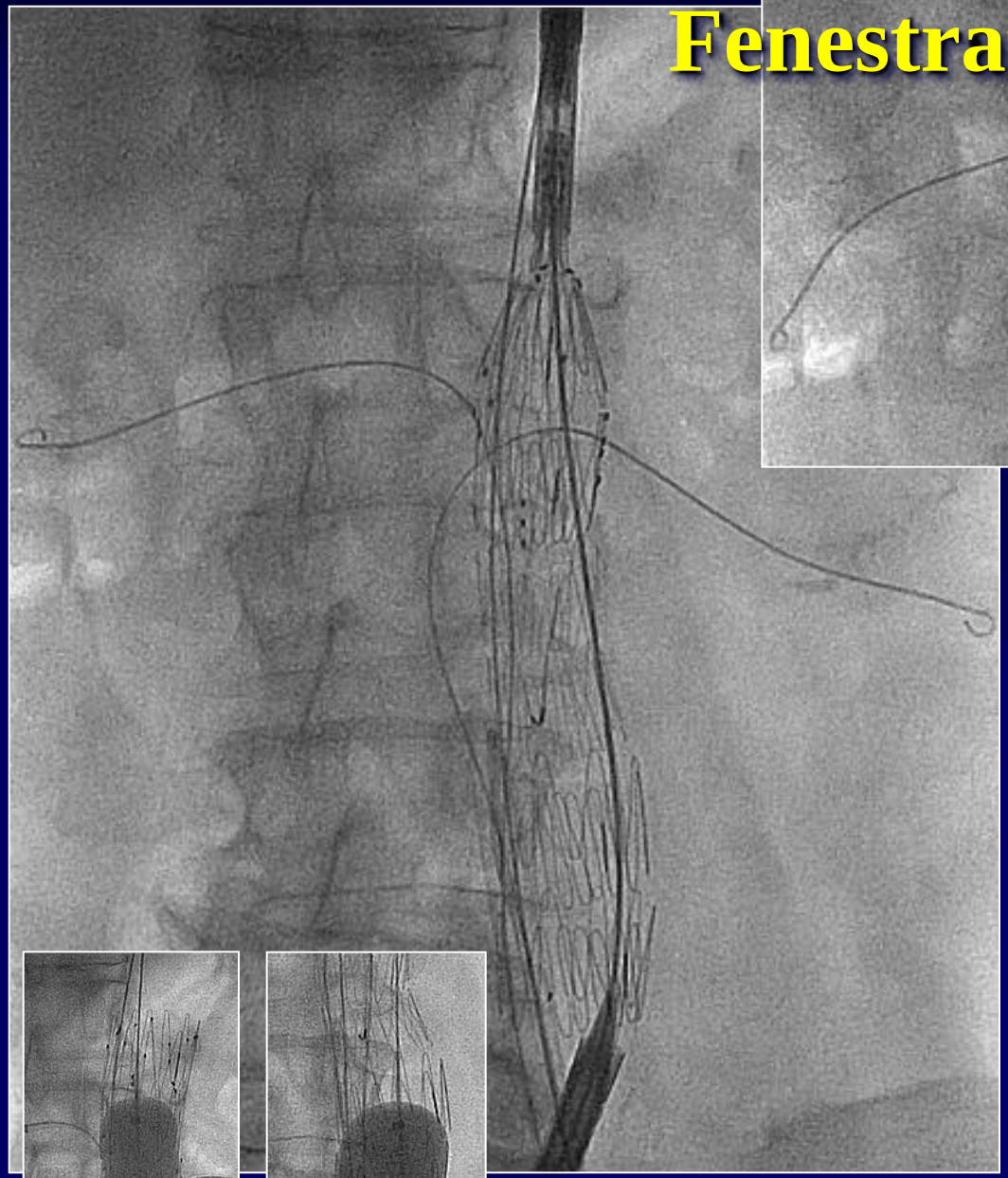
Juxtarenal pseudoaneuryms: Fenestrated Graft

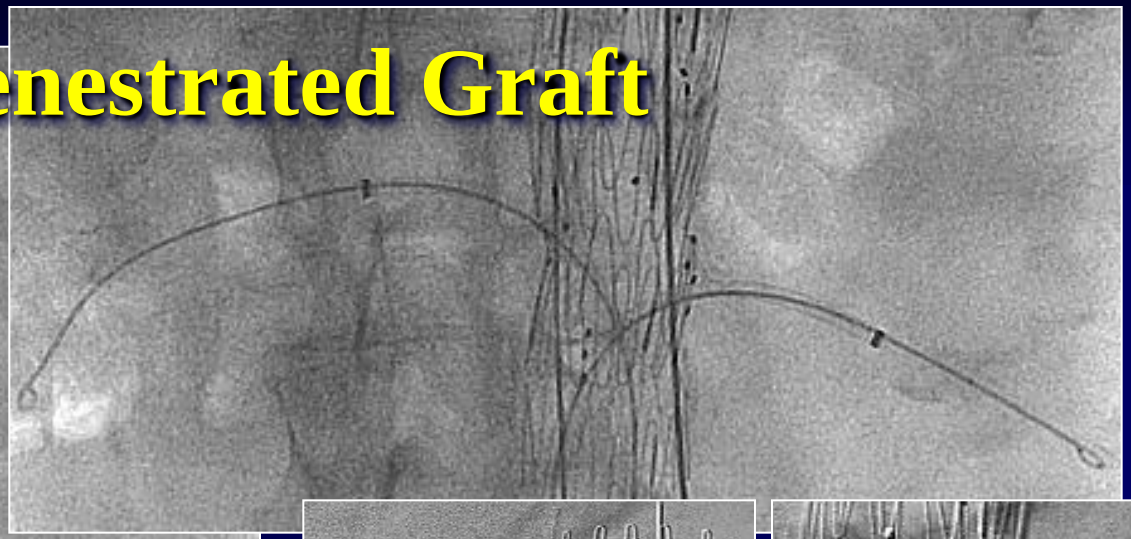
Balloon expandable stent

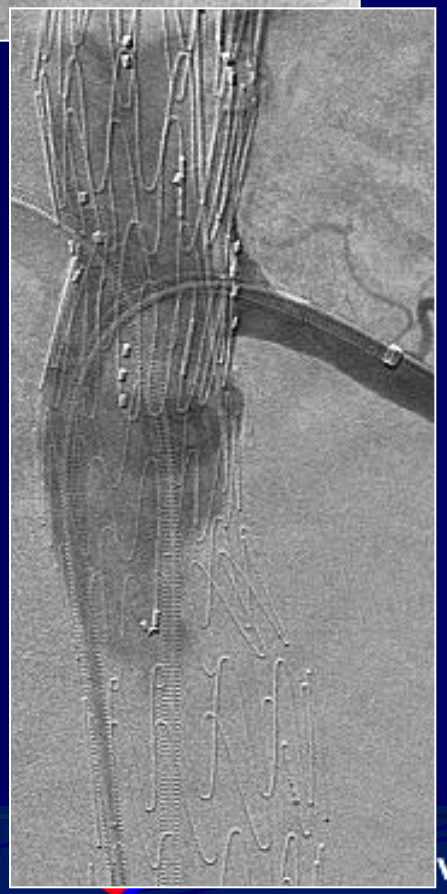
Scallops

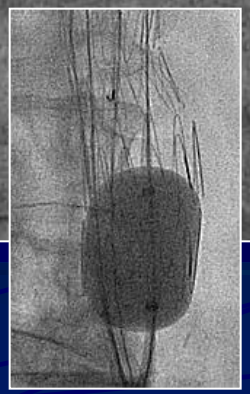


Fenestrated Graft









valoro

Fenestrated Graft

Renal stenting with balloon expandable stent

Fenestrated Graft

Preprocedure

Postprocedure

Fenestrated Endovascular Grafting: The French Multicentre Experience

134 patients from16 French centers Between 2004 & 2009.

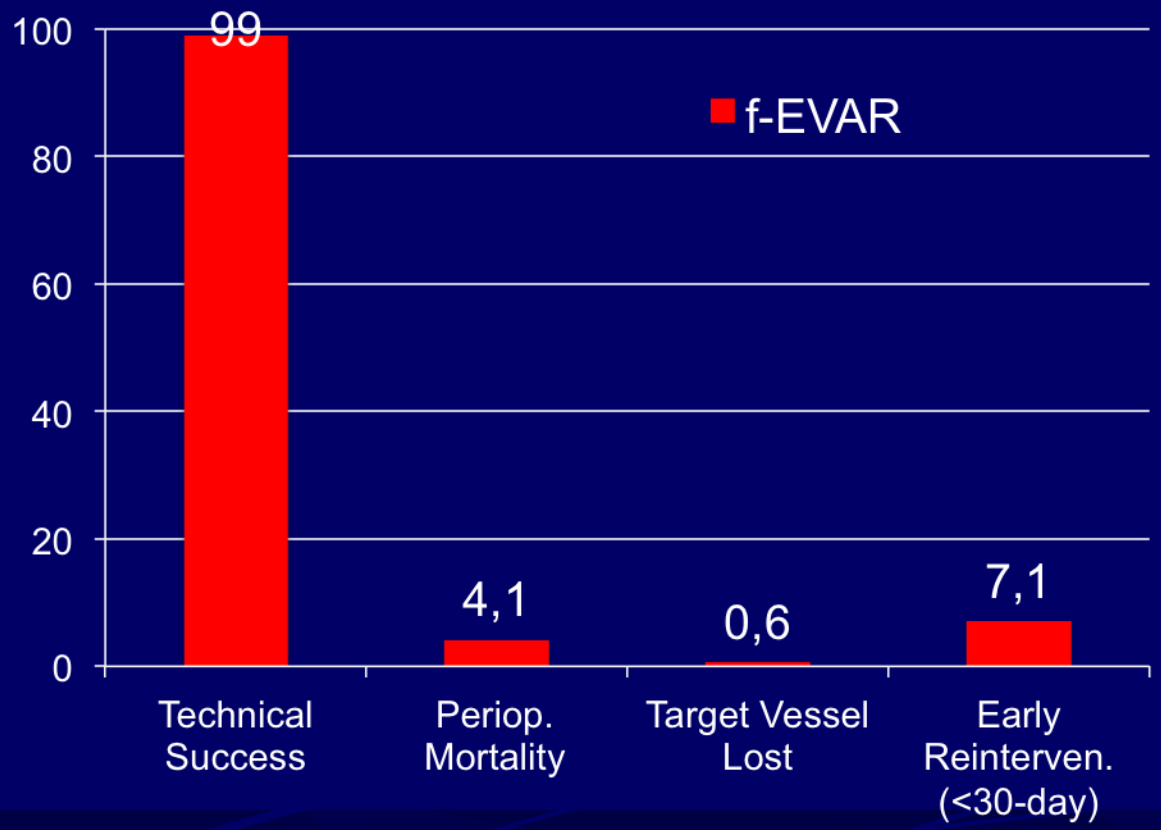
30-day mortality rate	2%
Conversion to open surgery	1%

A total of 12 procedure-related reinterventions were performed during the follow up of 15 months.

Eur J Vasc Endovasc Surg (2010) 39, 537e544

Early Results of Fenestrated Endovascular Repair of Juxtarenal Aortic Aneurysms in the United Kingdom

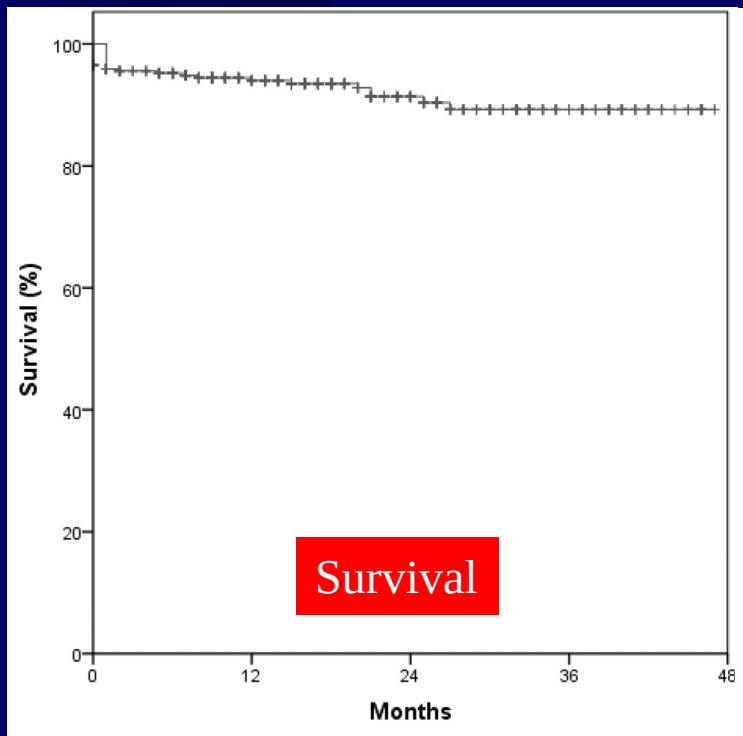
- 318 Ptes. from 14 centers (2007-2012)



GLOBALSTAR; Circulation 2012;125:2707-15

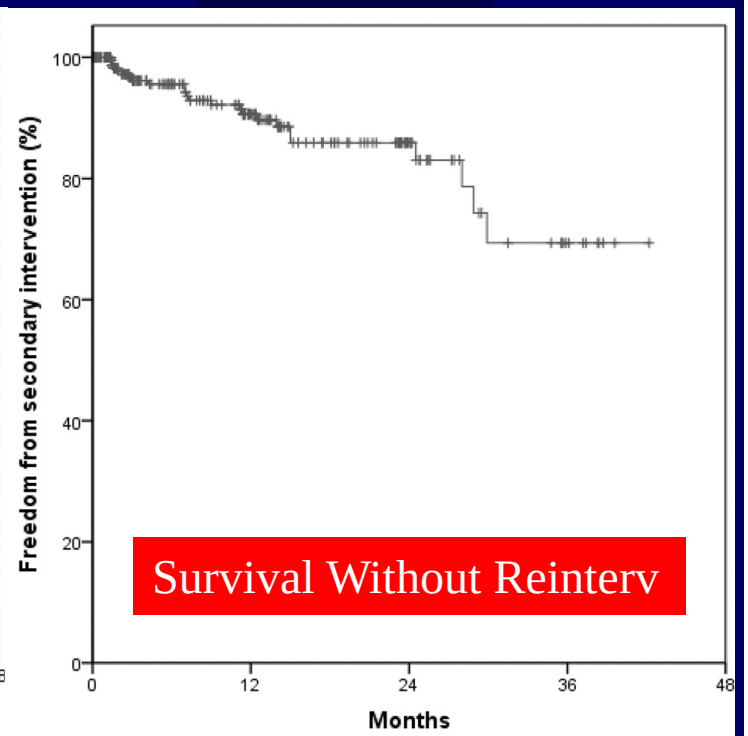
Early Results of Fenestrated Endovascular Repair of Juxtarenal Aortic Aneurysms in the United Kingdom

On behalf of the British Society for Endovascular Therapy and the Global Collaborators on Advanced Stent-Graft Techniques for Aneurysm Repair (GLOBALSTAR) Registry



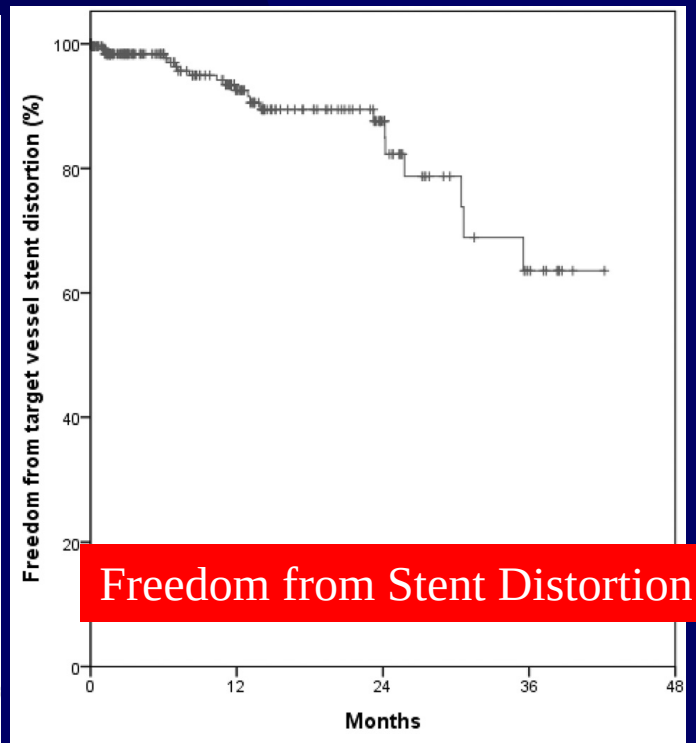
Survival

Time (months)	0	3	6	12	24	36	45
n at risk	318	284	273	215	110	38	12
Cum. Survival (%)	96	95	95	94	91	89	89
Std err (Cum.surv.)	0.01	0.01	0.01	0.01	0.02	0.02	0.02



Survival Without Reinterv

Time (months)	0	3	6	12	24	36	42
n at risk	309	198	161	122	48	12	1
Cum freedom (%)	100	97	95	90	86	70	70
Std.Err.(Cum.surv.)	0.00	0.01	0.01	0.02	0.03	0.08	0.08



Freedom from Stent Distortion

Time (months)	0	3	6	12	24	36	42
n at risk	309	197	162	123	49	13	1
Cum. Freedom (%)	100	98	98	92	87	63	63
Std.Err.(Cum.surv.)	0.00	0.01	0.01	0.02	0.03	0.09	0.09

1-year Freedom from Reintervention 90%

GLOBALSTAR; Circulation 2012;125:2707-15

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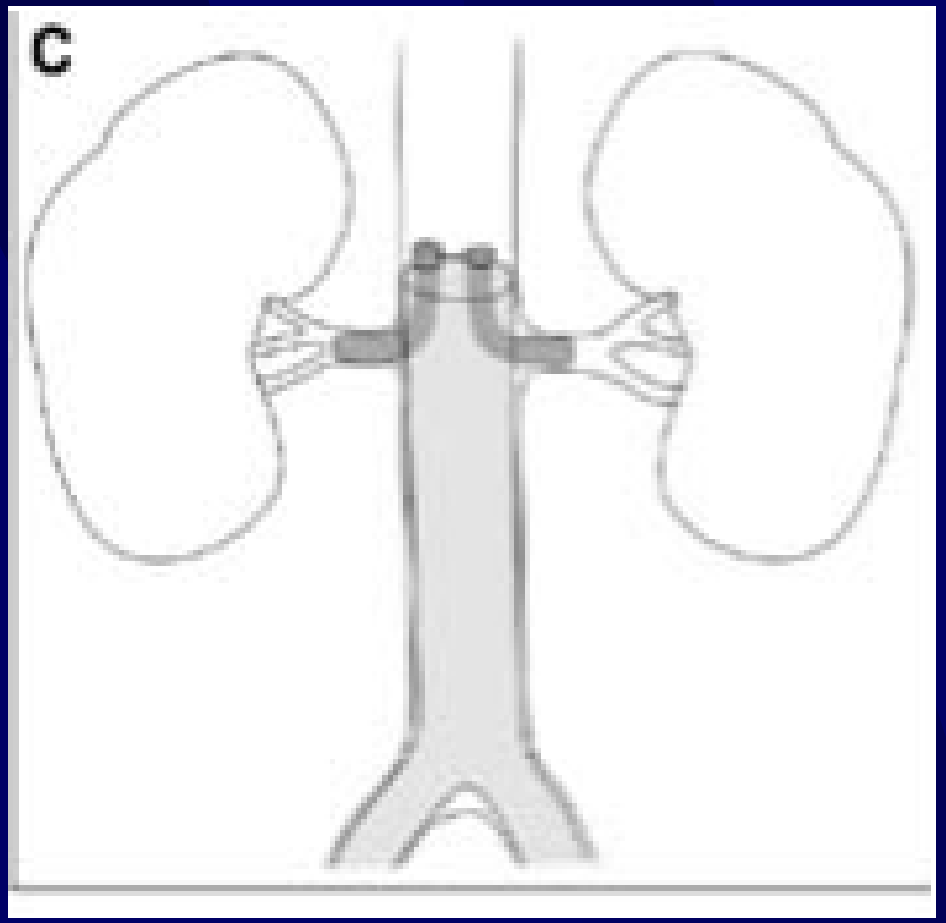
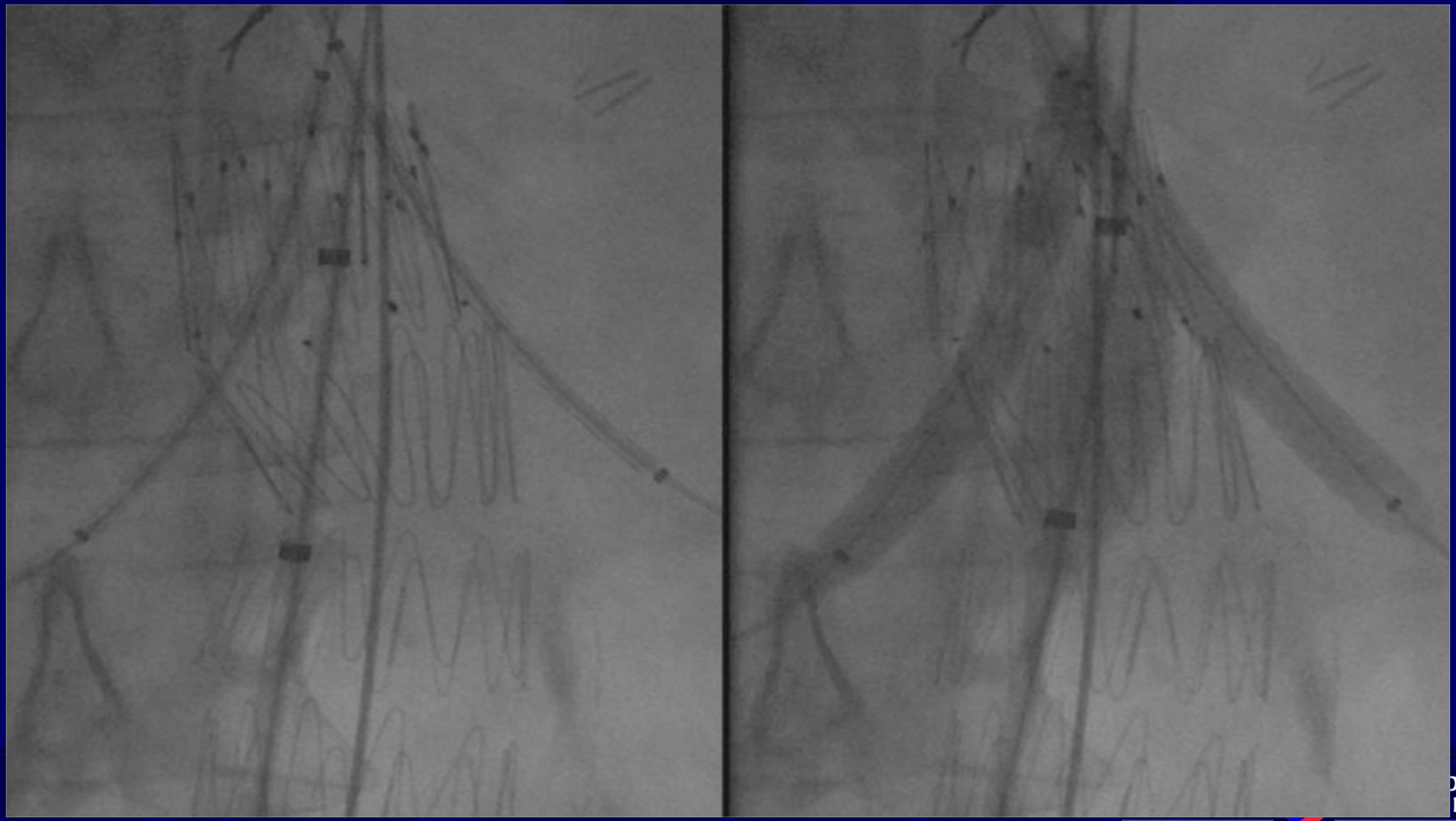
This could be the final result of the absence of neck

if you have the money to pay, the skills to implant the device and the time to wait for the prosthesis

EVAR in Short Neck AAA: Chimney Technique



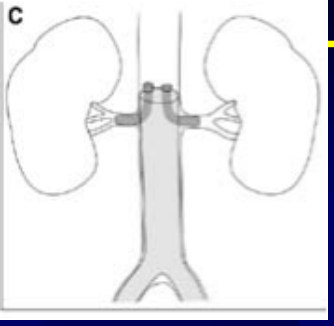
If you have no money or time, there is the chimney technique



The chimney graft technique for preserving visceral vessels during endovascular treatment of aortic pathologies

	n=93 Ptes (%)
Urgent Procedures (symptomatic or ruptured)	23 (24)
Primary Technical Success	93 (100)
Type I Endoloeak	10 (10.7)
30-day Mortality	4 (4.3)

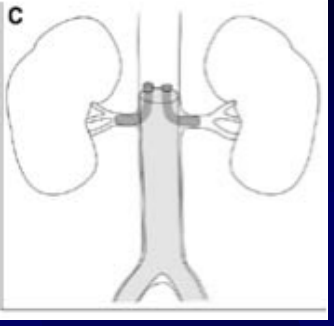
J Vasc Surg 2012;55:1497-1503



This could be a cheaper and faster final result of the absence of neck

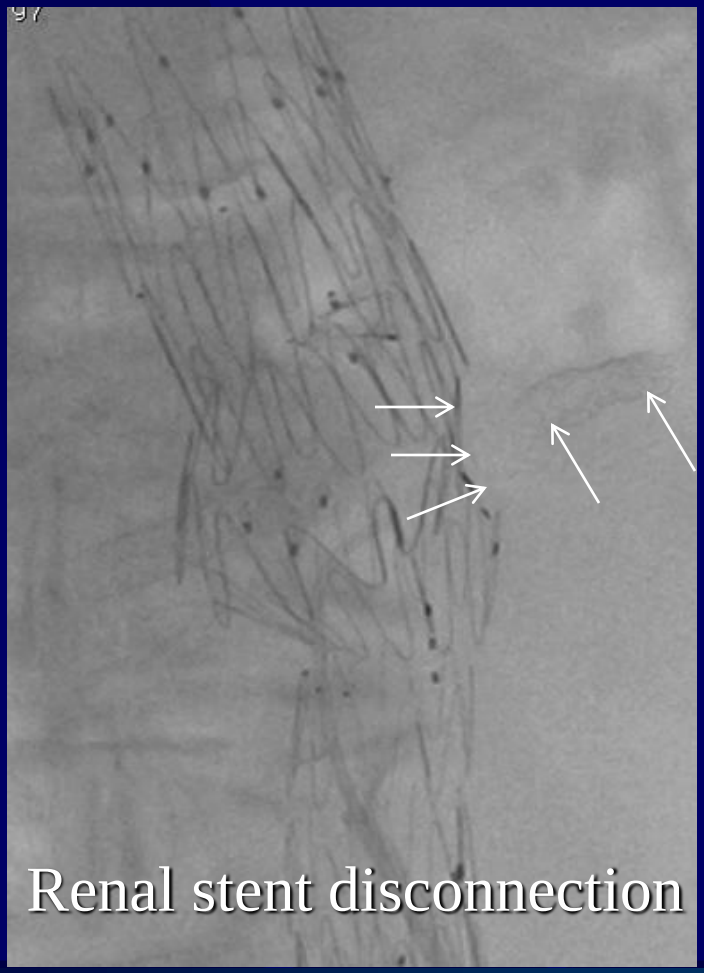
But remember that you still need skills

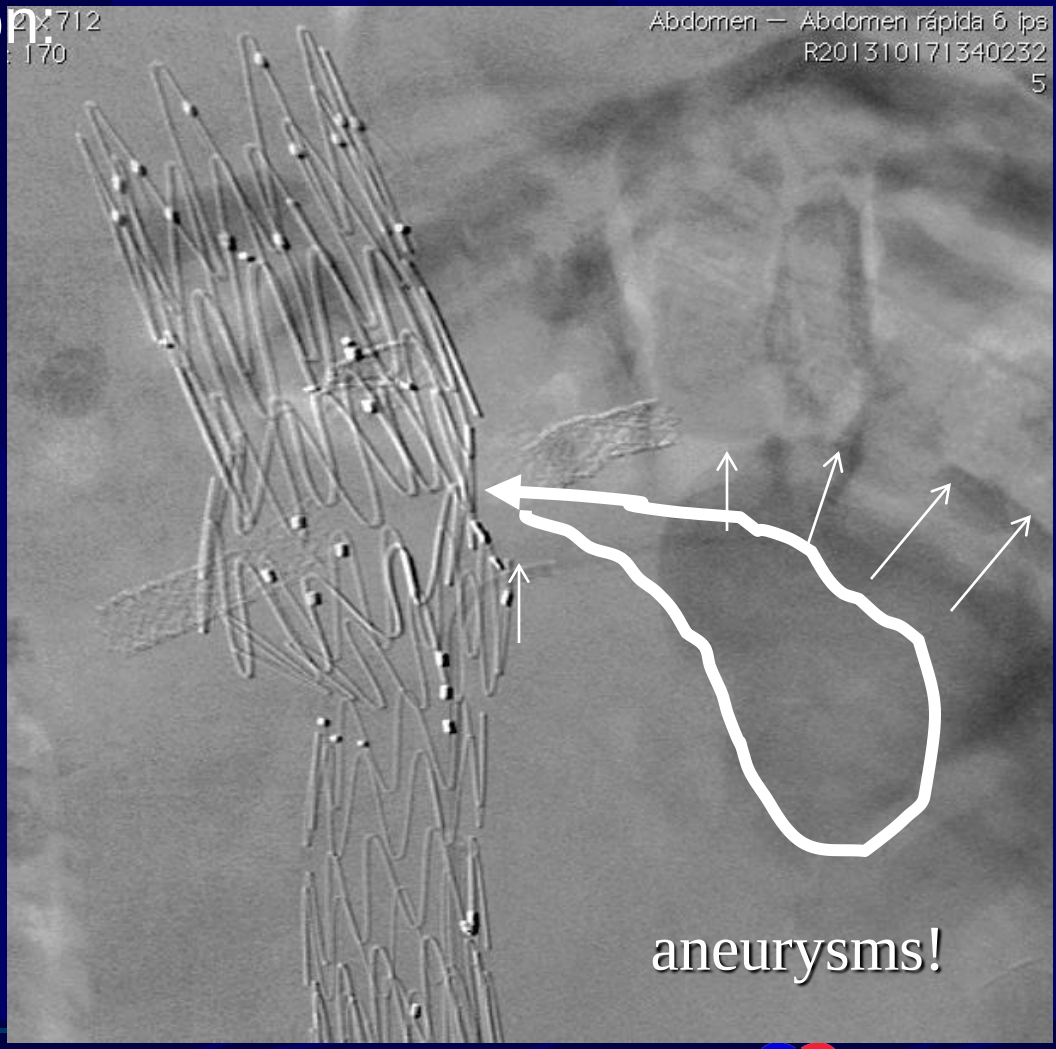
Chimney Technique:
AAA without proximal neck



Fenestrated Graft: Long term complication

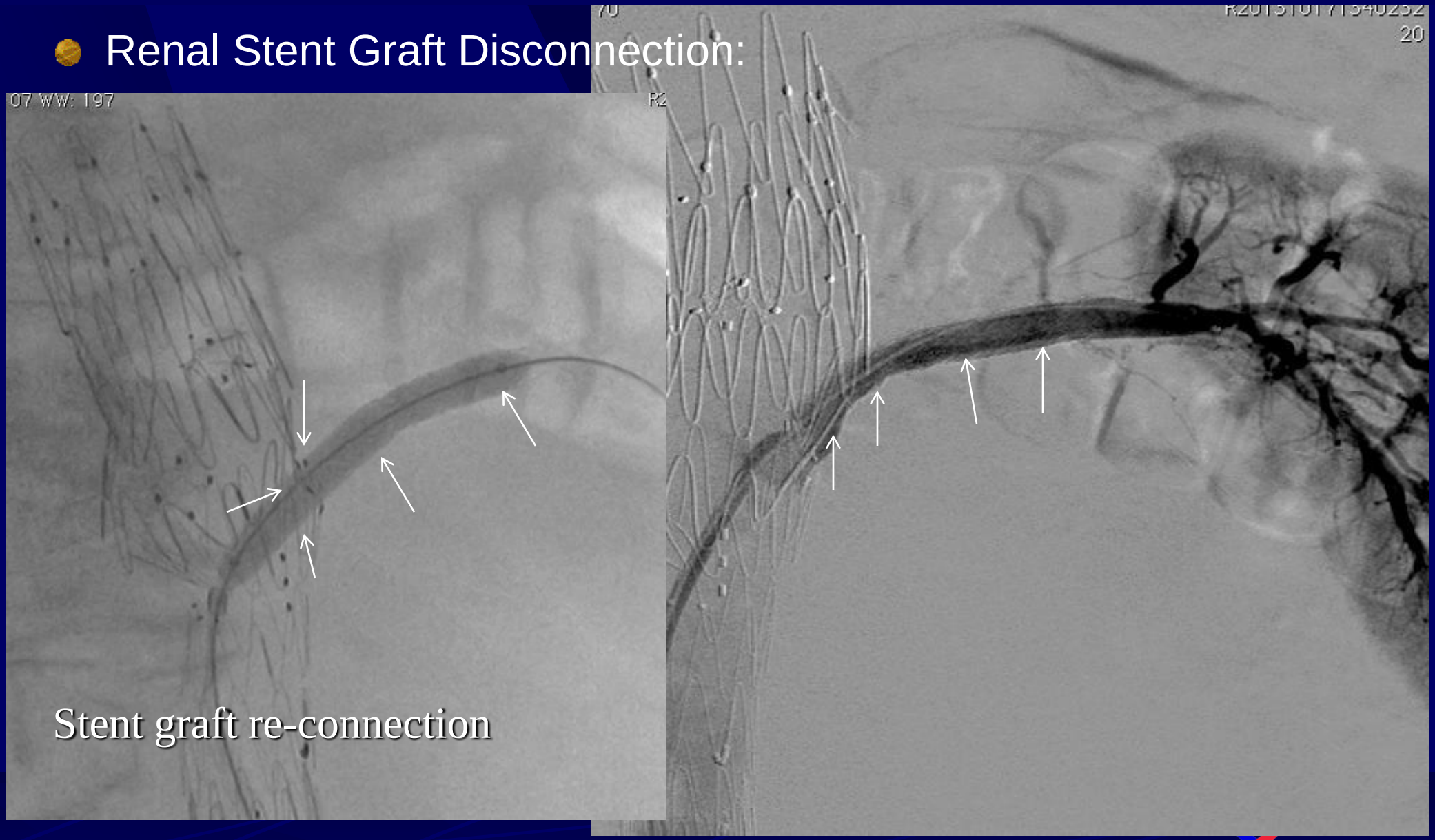
- Renal Stent Graft Disconnection





Fenestrated Graft: Long term complication

- Renal Stent Graft Disconnection:



Fenestrated Graft: Long term complication

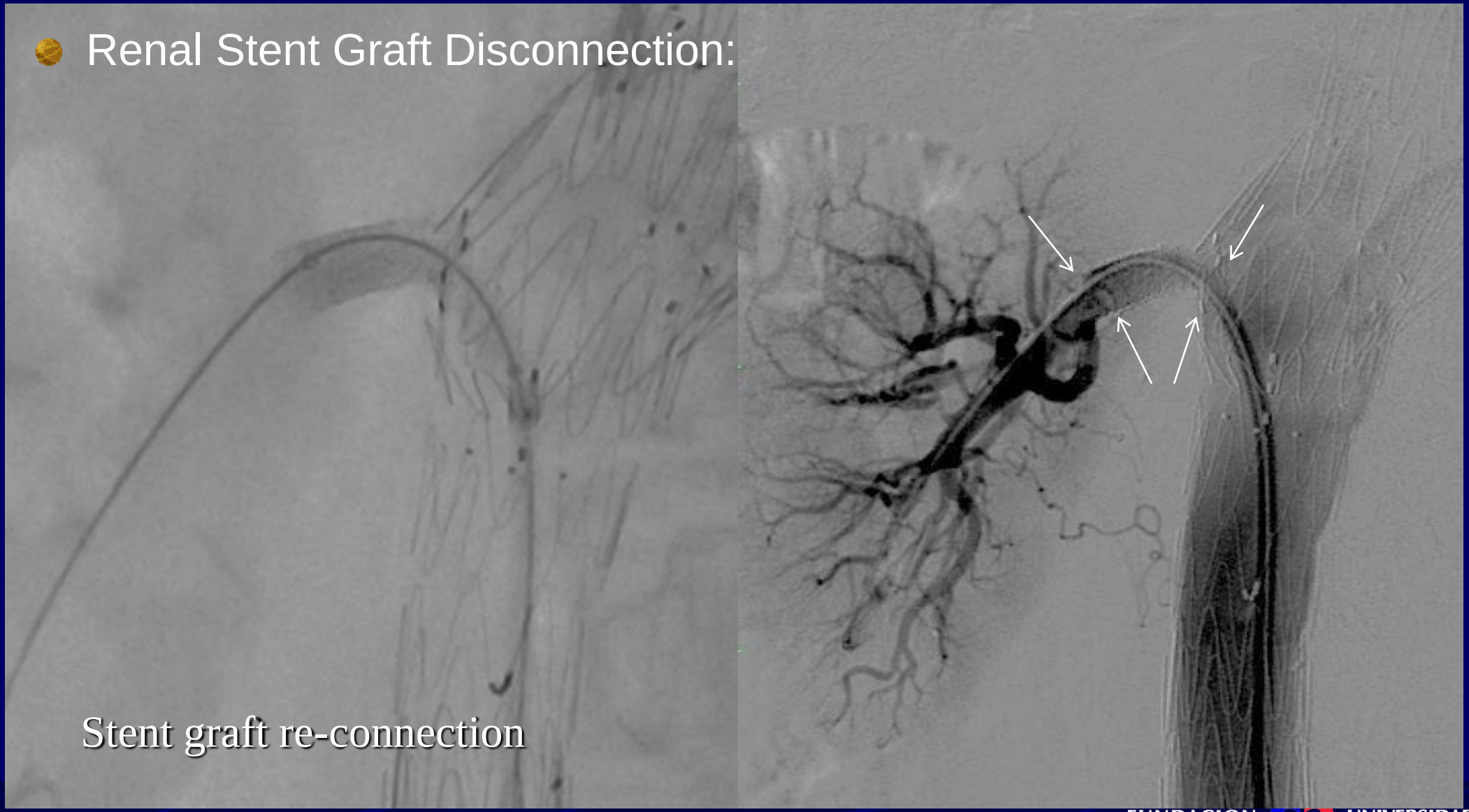
- Renal Stent Graft Disconnection:

Stent graft re-connection

aneurysms!

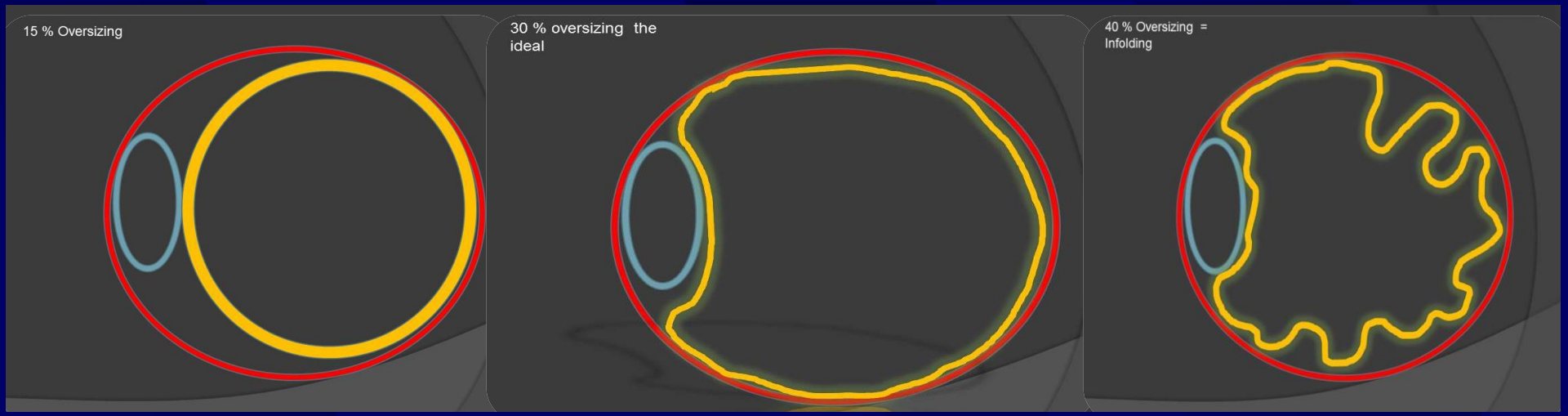
Fenestrated Graft: Long term complication

- Renal Stent Graft Disconnection:

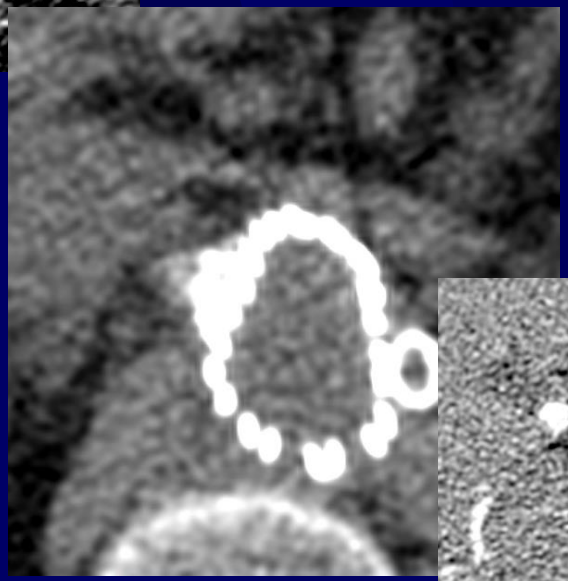


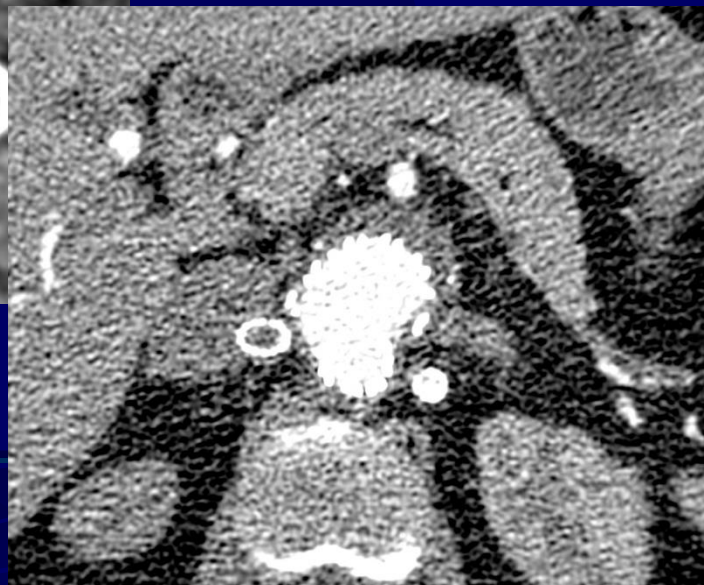
Stent graft re-connection

Importance of Oversizing



Chimney Drawback: 1-year Stent Occlusion





Comparison of outcomes with open, fenestrated, and chimney graft repair of juxtarenal aneurysms: are we ready for a paradigm shift?

2750 patients with juxtarenal aneurysms from 25 studies between 2001 & 2012

	Open Surgery (n=1725)	f-EVAR (n=931)	Chimney-EVAR (n=94)	P
30-day Mortality (%)	5.3	3.4	2.4	ns
Target Vessel Preservation (%)		98.6	98	ns
Type I Endoleak (%)	NA	4.3*	10*	0.002
Stroke (%)	0.1*	0.3	3.2*	<0.001
New Onset Dialysis (%)	3.9*	1.5*	2.1	<0.0001

J Endovasc Ther. 2013 Apr;20(2):159-69

EVAR for AAA in Ptes with Hostile Neck Anatomy

Special / Additional procedure intra index procedure	FAVOURABLE NECK (n=296) (69.5%)	HOSTILE NECK (n=139) (30.5%)	p
Unplanned Balloon Expandable Stent, Aortic Cuff or Stent Graft	25 (8.4%)	35 (25.1%)	<0.0001
Chimney technicque for both renal arteries	0	9 (6.5%)	<0.0001
Chimney technicque for the lower renal artery	0	2 (1.5%)	0.19
Fenestrated EVAR	0	3 (2.3%)	0.064
Total	25 (8.4%)	49 (35.2%)	<0.0001

35% of Ptes with Hostile Neck required additional o dedicated procedures/devices

Mendiz O, et al. Submitted

Chimney: Pros

- **PROS:** 

- Great for bail-out & rescue
- Availability (time)
- Suitable for most cases
- Cost advantage??
- Better than expected

- **CONS:** 

- Sealing (type I endoleak ~10%)
- Still Complex
- Mechanical problems (stent collapse)
- Uncertain long-term durability
- Lack of strong evidence

Modified from Criado F. tctmd.com

EVAR in Ptes with Hostile Neck Anatomy

Analysis of outcomes for hostile and favourable necks

Outcomes	Favourable Neck n=296	Hostile Neck n=139	p value
30-day Outcomes			
Technical Success	292 (98.6)	136 (97.8)	0.83
30-day mortality	3 (1.01)	3 (2.1)	0.6
Type I Endoleak	4 (1.3)	6 (4.3)	0.11
Follow-Up			
Overall Mortality	13 (4.3)	3 (2.1)	0.37
AAA related mortality	4 (1.3)	0	0.56
Type 1 endoleak	9 (3.04)	10 (7.1)	0.076
Type 2 endoleak	25 (8.44)	9 (6.47)	0.6
Type 3 endoleak	3 (1.01)	1 (0.71)	0.81
Migration	2 (0.67)	1 (0.71)	0.56
Reintervention	16 (5.4)	15 (10.79)	0.066

Mendiz O, et al. Submitted

Conclusions

- Fenestrated/branched/bifurcated grafts offer the promise of extending benefit of endovascular therapy for Ptes with aortic aneurisms & hostile anatomy.
- Fenestrated and bifurcated grafts are a potential but expensive solution
- Long time for manufacturing is a limitation for fenestrated & Branched Devices.
- However, with time, money and skill they have good short and mid-term outcomes.
- Chimney and other similar techniques can be a cheaper and faster solution, which seems to have acceptable outcomes.
- All these techniques need further investigation.

Gracias por su Atención

Thank you for your Attention

@omendiz

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