부산대학교병원
PUSAN NATIONAL UNIVERSITY HOSPITAL

Hostile Proximal Neck of AAA

Chimney Technique vs. Fenestrated SG

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Pusan National University Hospital

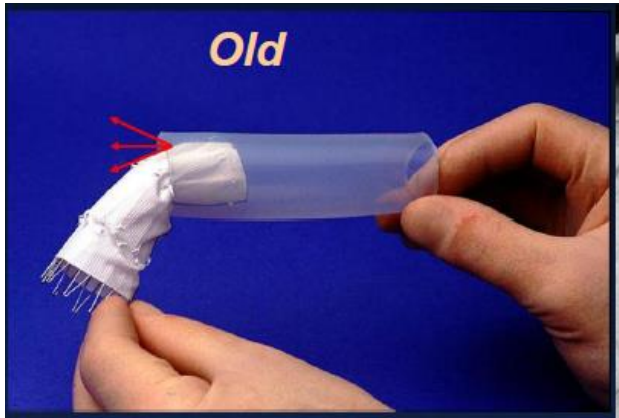
Major Difficulties of EVAR

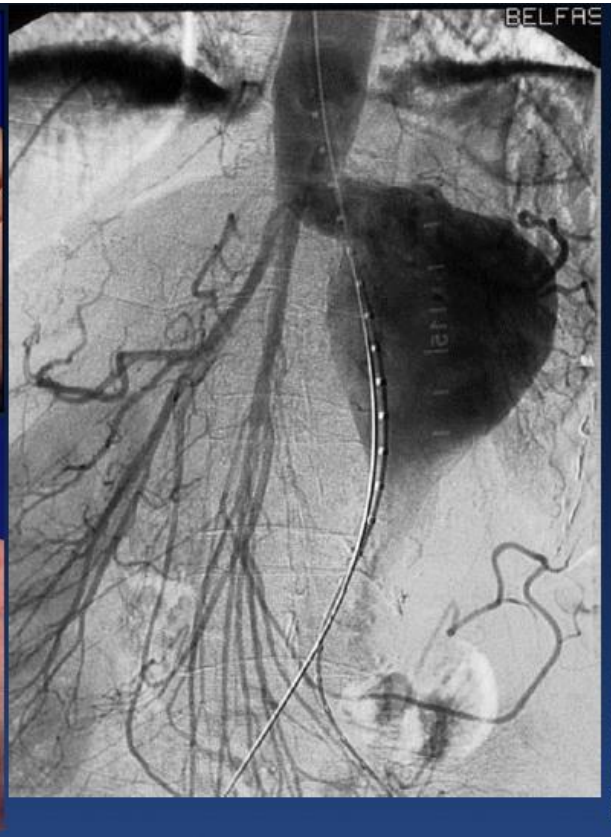
- Hostile proximal infrarenal aortic neck
- Unsuitable iliac artery

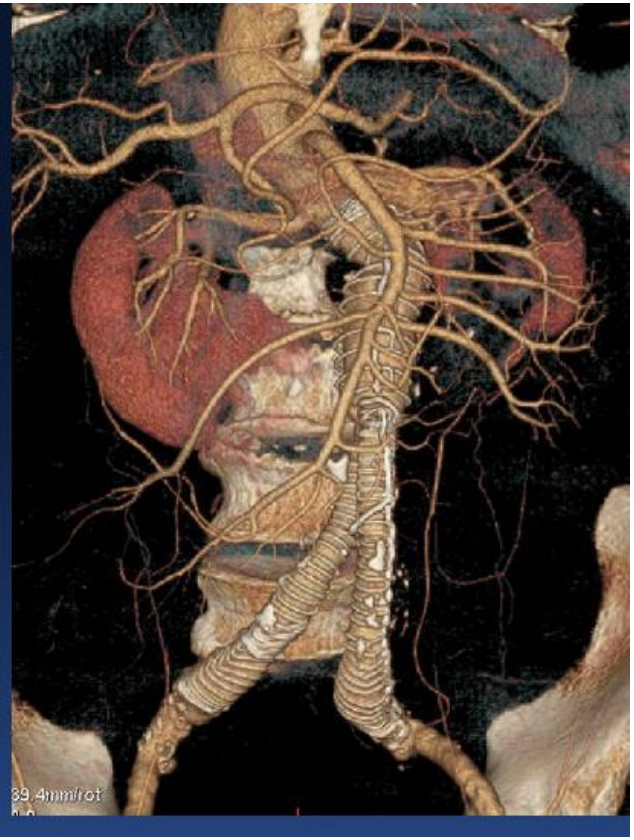
Major Difficulties of EVAR

- **Hostile proximal infrarenal aortic neck**
- Unsuitable iliac artery

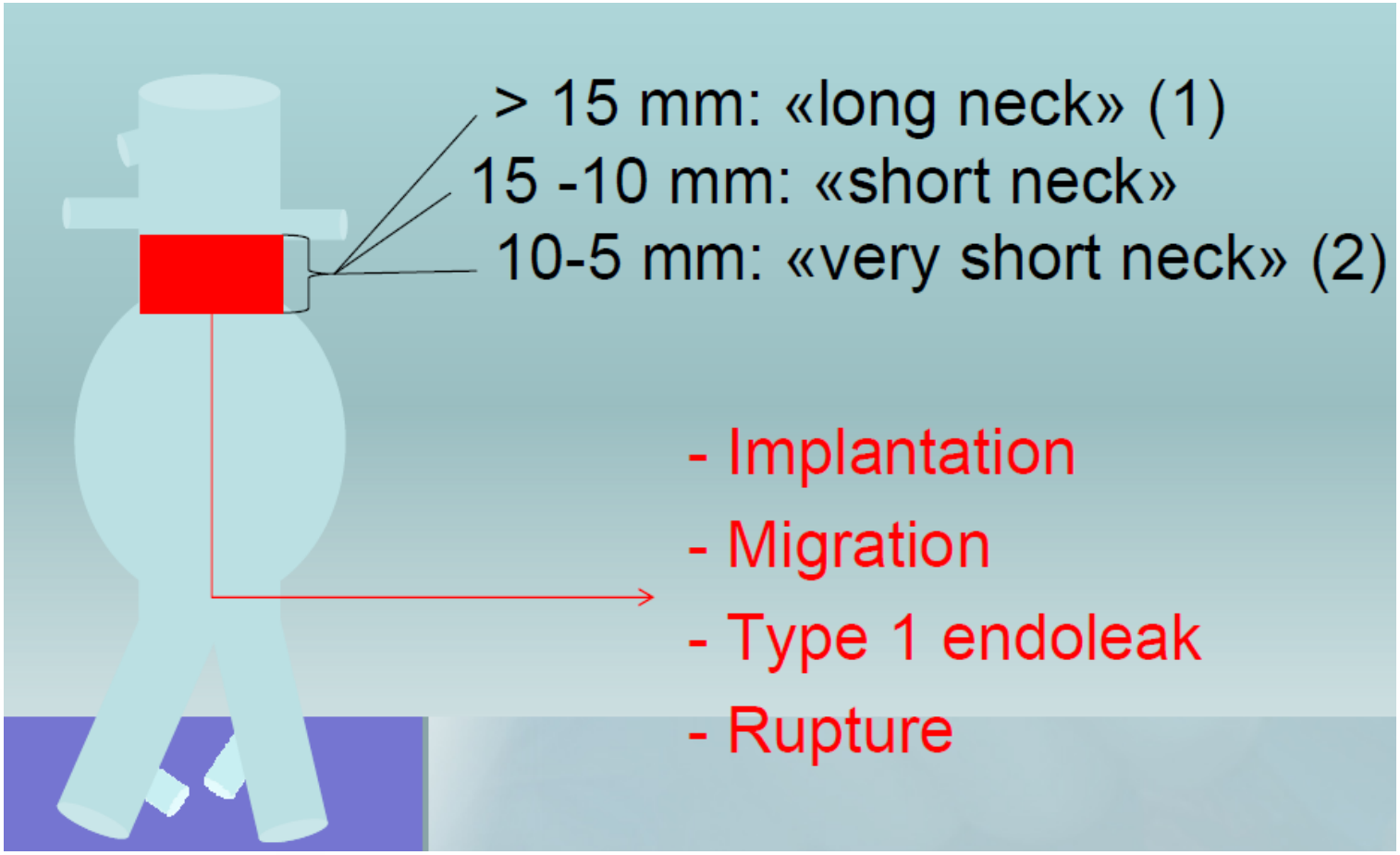
Clinical outcomes of endografts in hostile neck



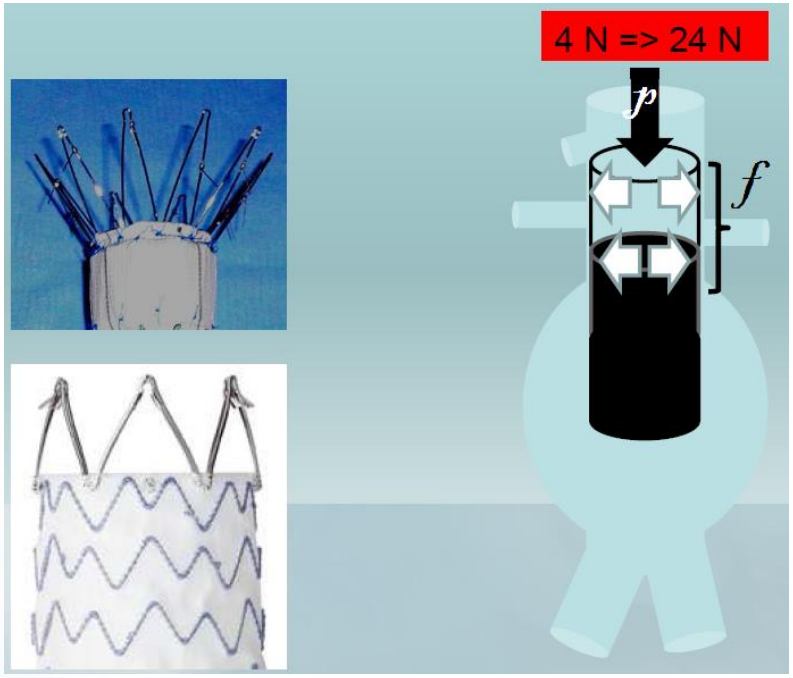


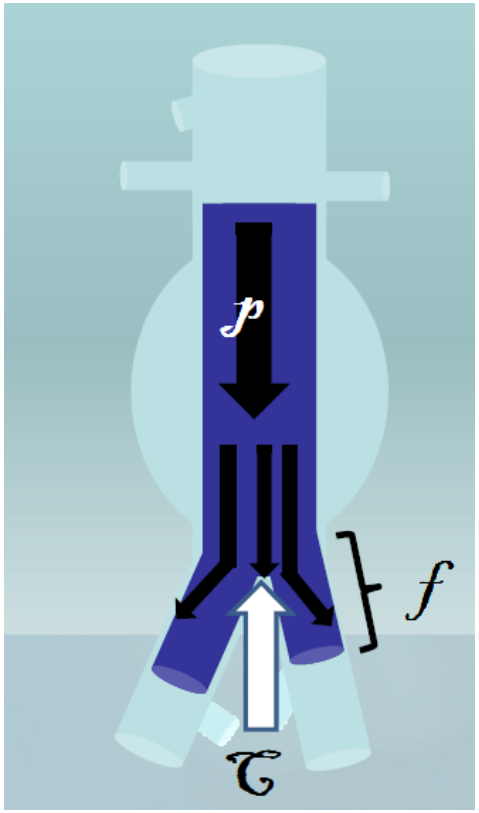


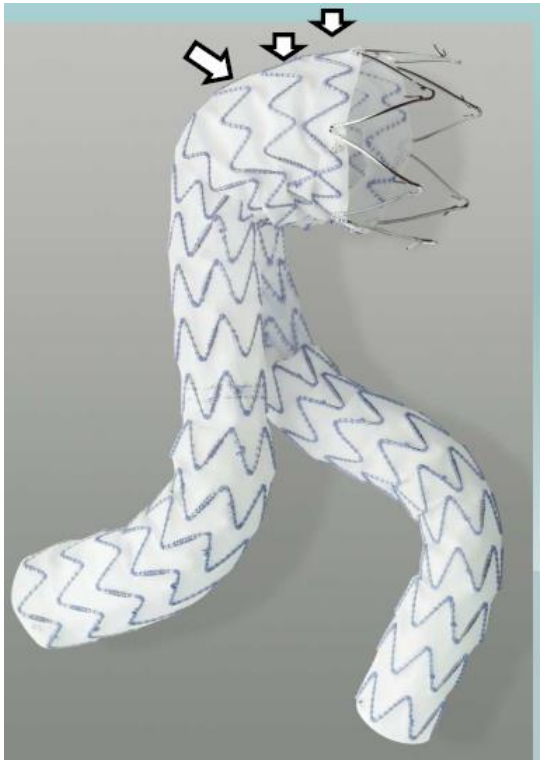
Clinical outcomes of endografts in hostile neck



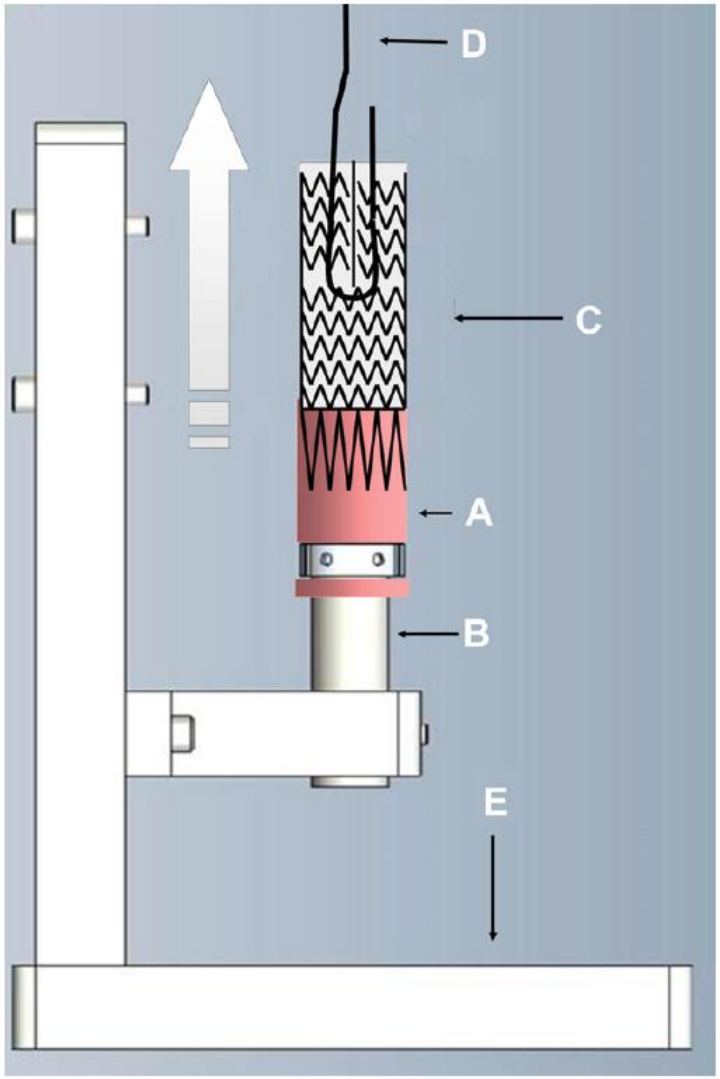
Proximal, Distal Fixation, Conformability

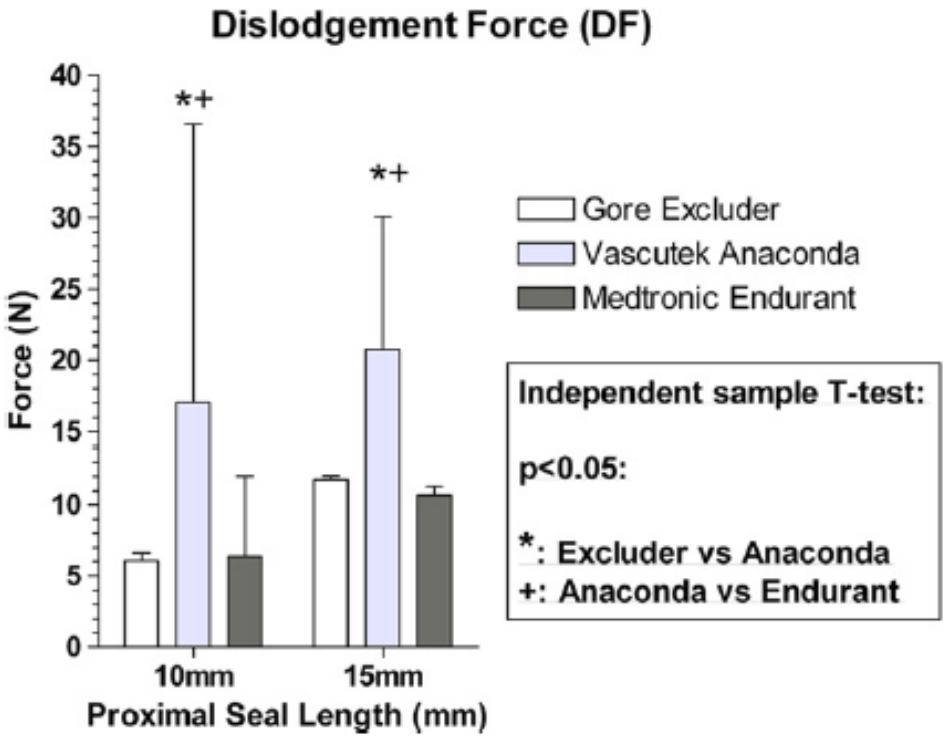






Proximal Fixation Strength





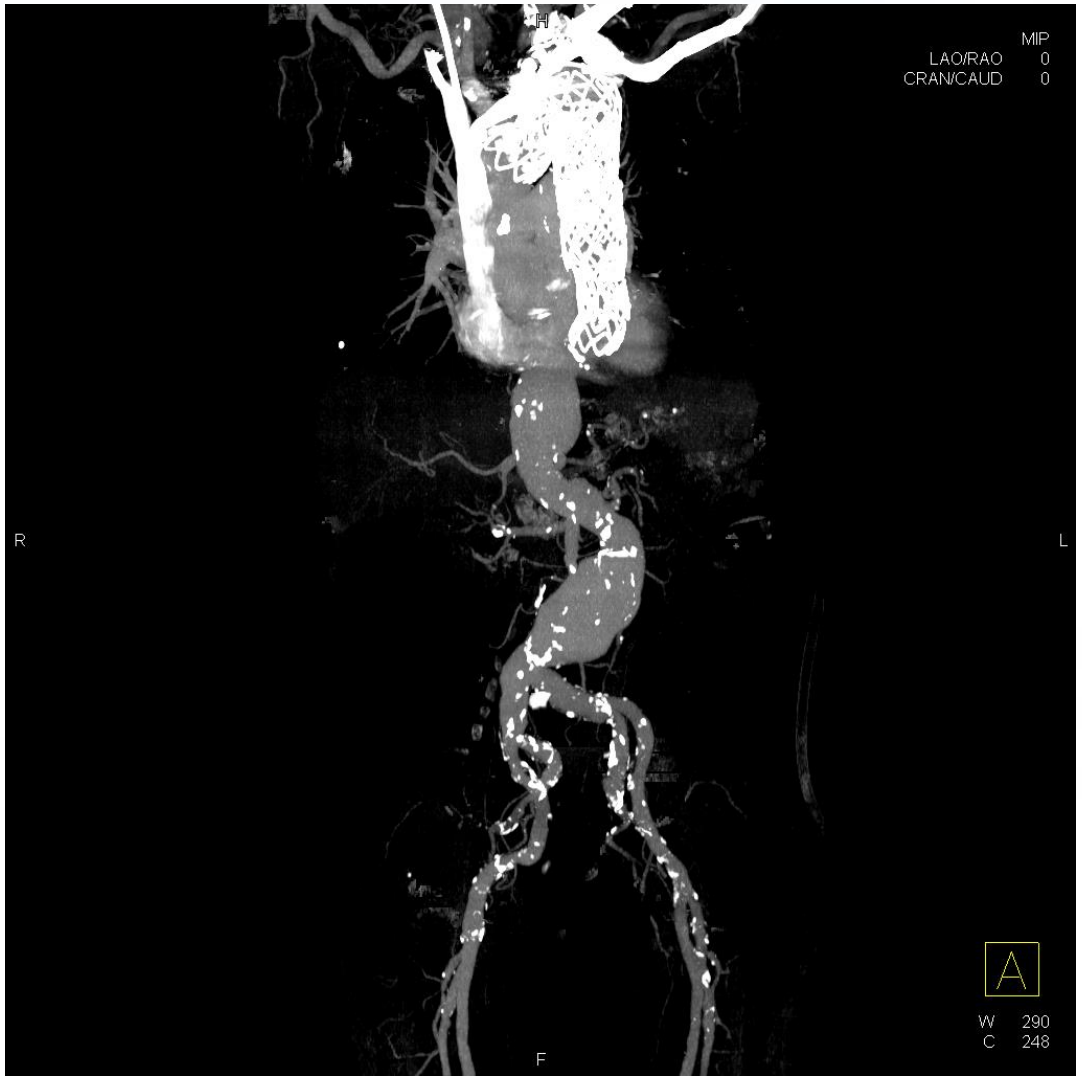
Proximal Fixation Strength

Table 3 Displacement force necessary to dislocate the device $> =$ 20 mm: 1) From the proximal fixation zone (proximal→distal). 2) From the distal (iliac) fixation zone (distal→proximal), following balloon dilatation. Data presented as mean ± standard deviation in Newton.

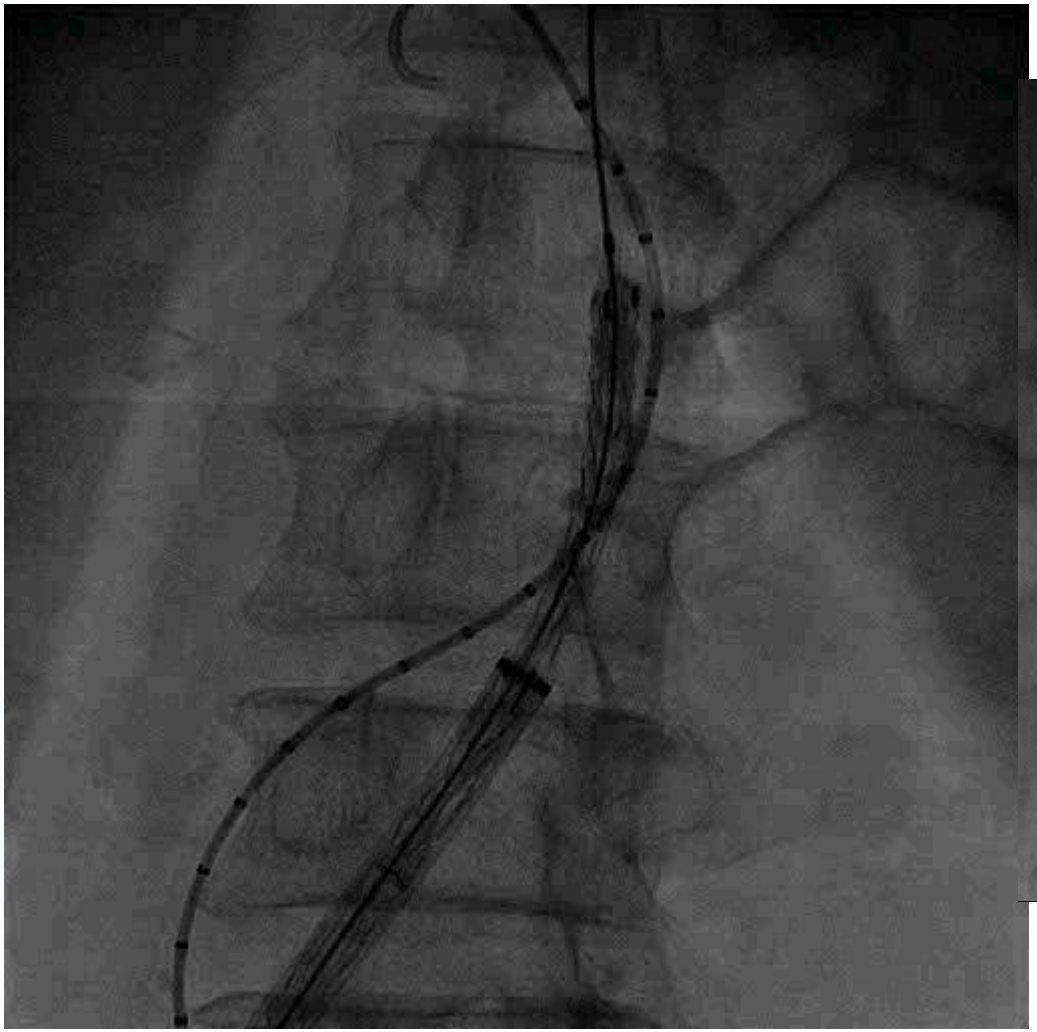
	1 (Proximal)	2 (Distal)
Talent	16.18 ± 0.47	9.23 ± 1.25
Anaconda	36.16 ± 1.30	14.58 ± 0.68
Gore	22.58 ± 0.72	10.52 ± 0.40
AUI EndoFit	13.20 ± 0.75	8.83 ± 0.48
Zenith	39.30 ± 1.55	9.55 ± 1.52
Endurant	31.75 ± 2.27	9.65 ± 0.43
Endologix	14.80 ± 0.70	4.93 ± 0.50

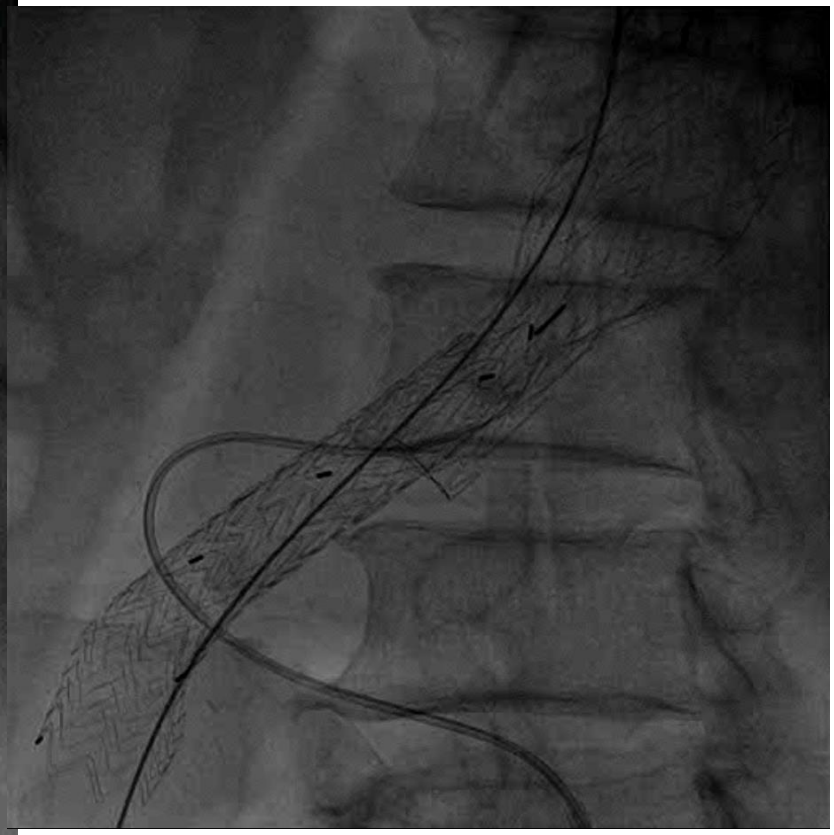
AUI: aorto-uni-iliac.

Case : AAA with Hostile Neck

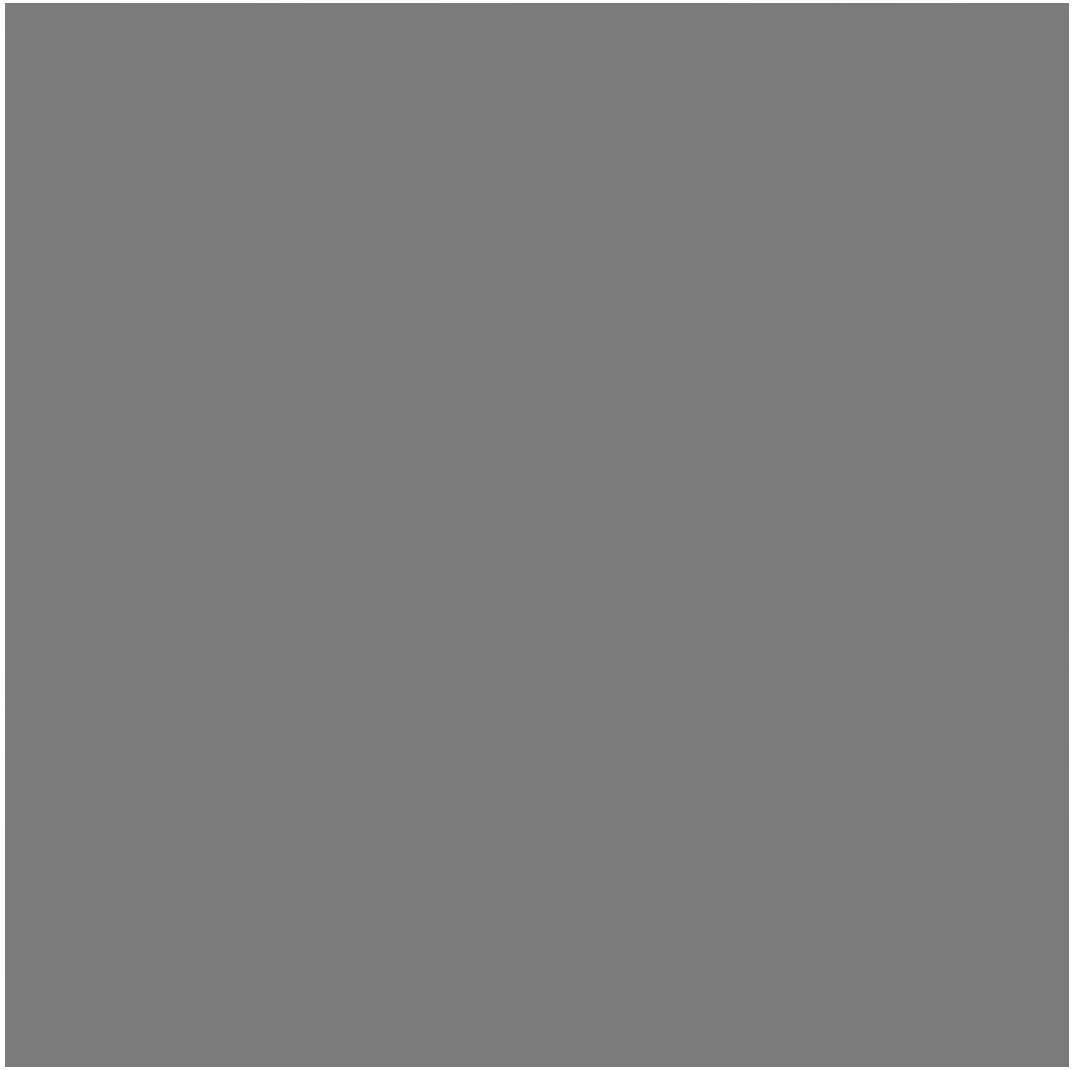


Case : AAA with Hostile Neck





Type 1 Endoleak : Additional Aortic Cuff



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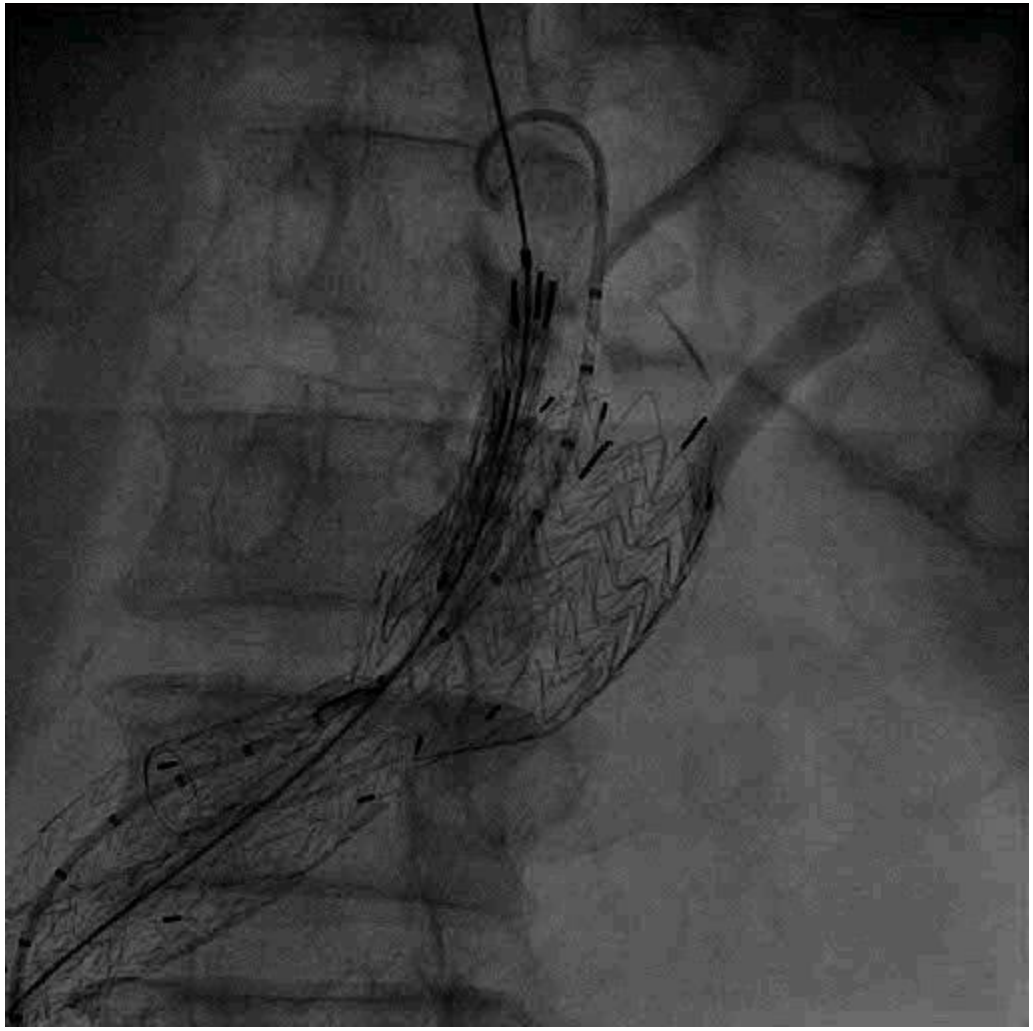

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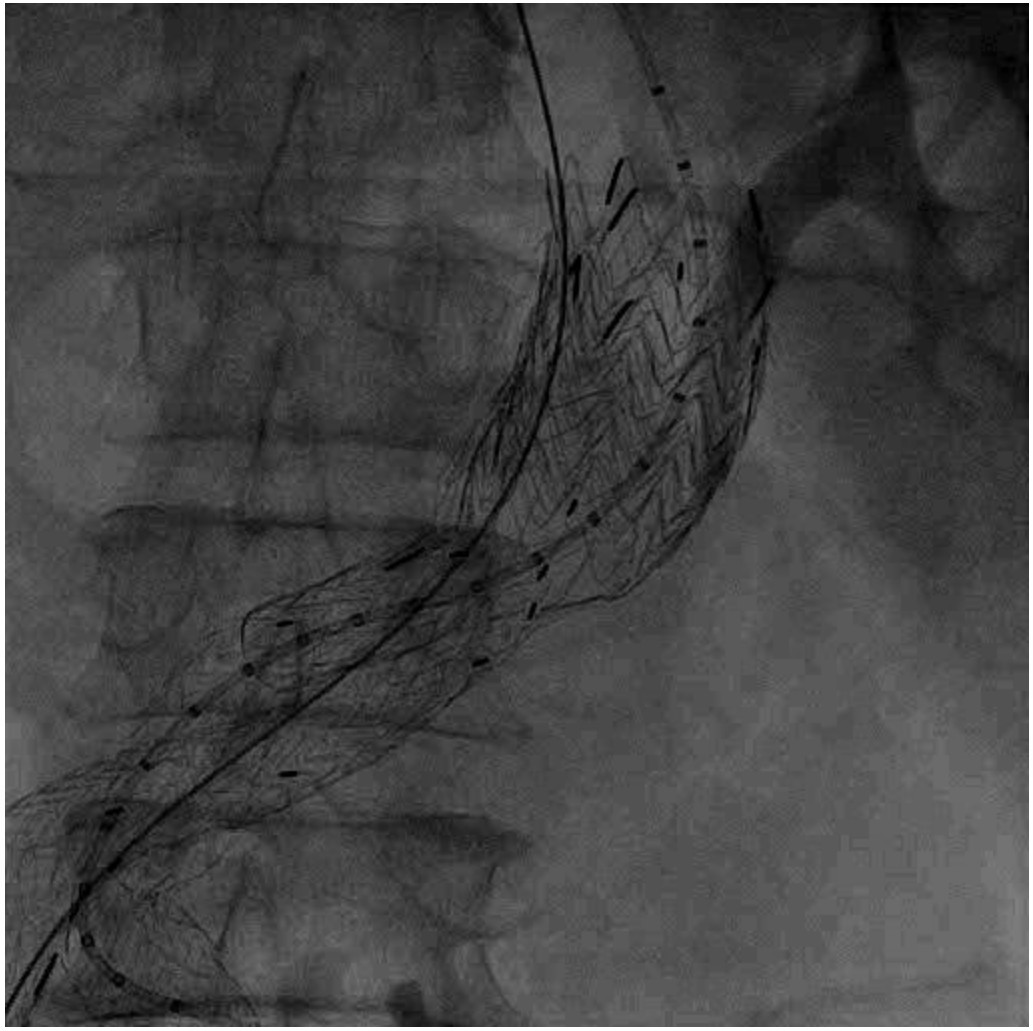
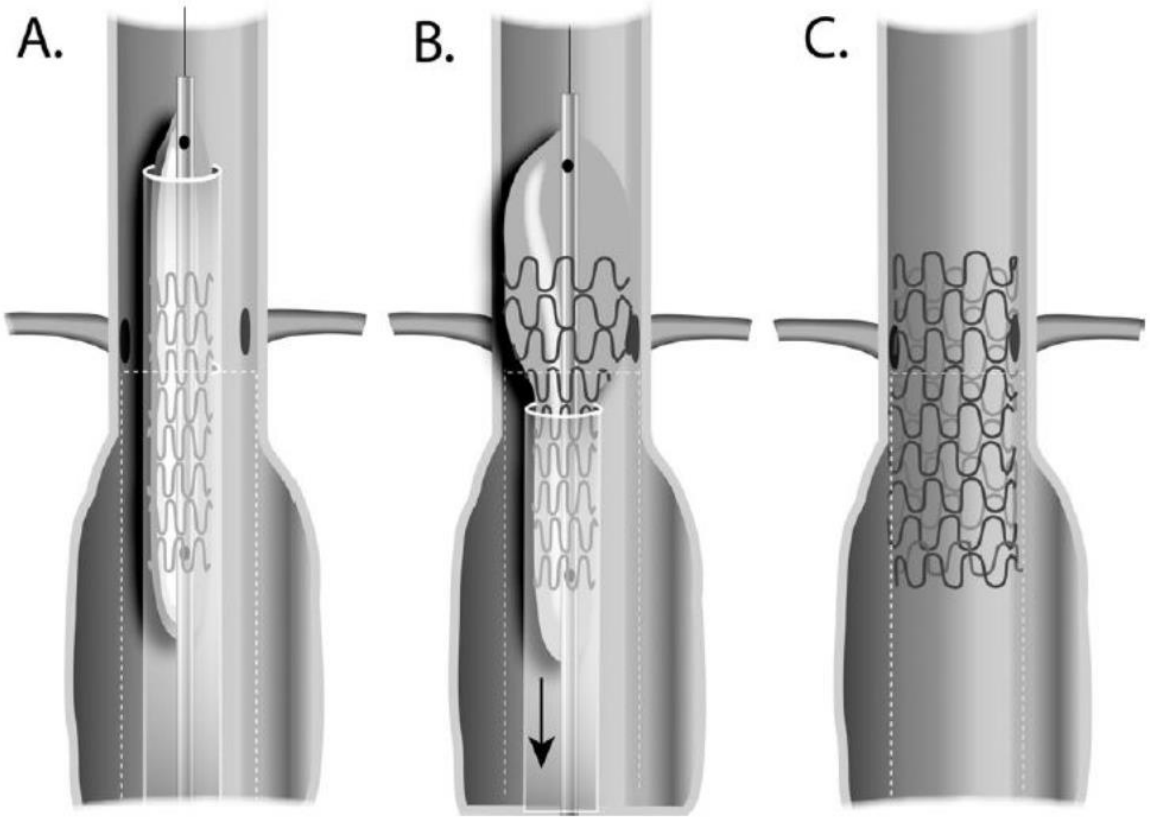


Type I Endoleak : PALMAZ stent



Type I Endoleak : PALMAZ stent

Balloon-Expandable Biliary Stents

PALMAZ® XL Transhepatic Biliary Stent (unmounted)

Product Description *Medicare C-Code: C-1877*

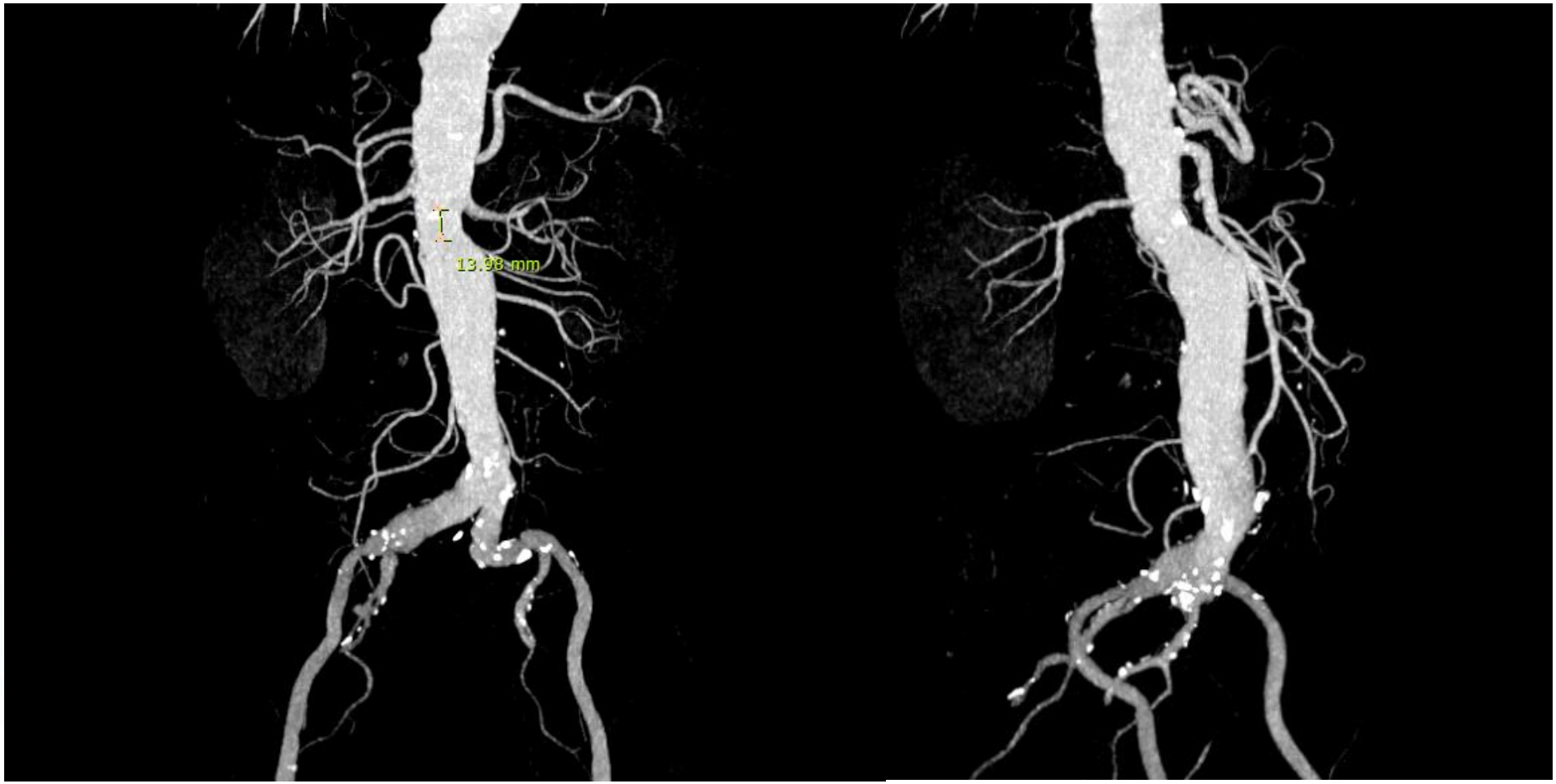
Type	Closed cell
Material	316L stainless steel
Stent Diameters (Expanded)	10mm
Stent Lengths (Unexpanded)	30mm, 40mm, 50mm
Recommended PTA Dilatation Catheter	POWERFLEX® PLUS Catheters
Sheath Introducer	10F

Ordering Information

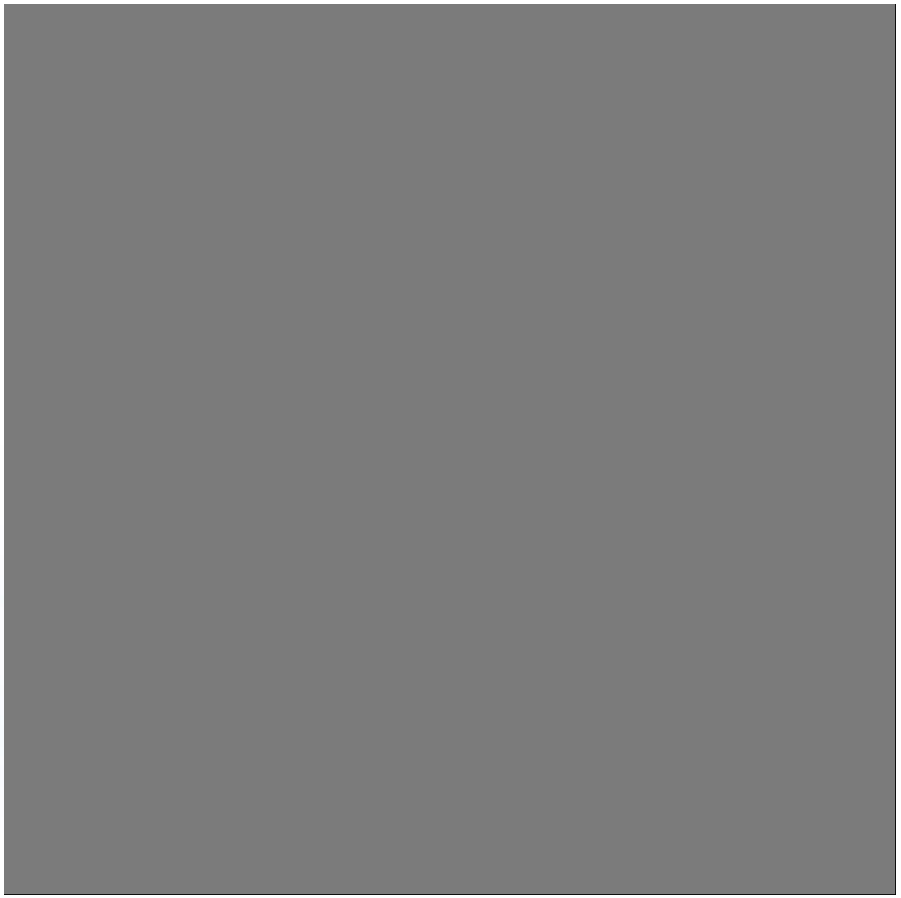
UPN	Catalog Number	Expansion Diameter, mm	Unexpanded Stent Length, mm
H739P31103	P3110	10	30
H739P40103	P4010	10	40
H739P50103	P5010	10	50

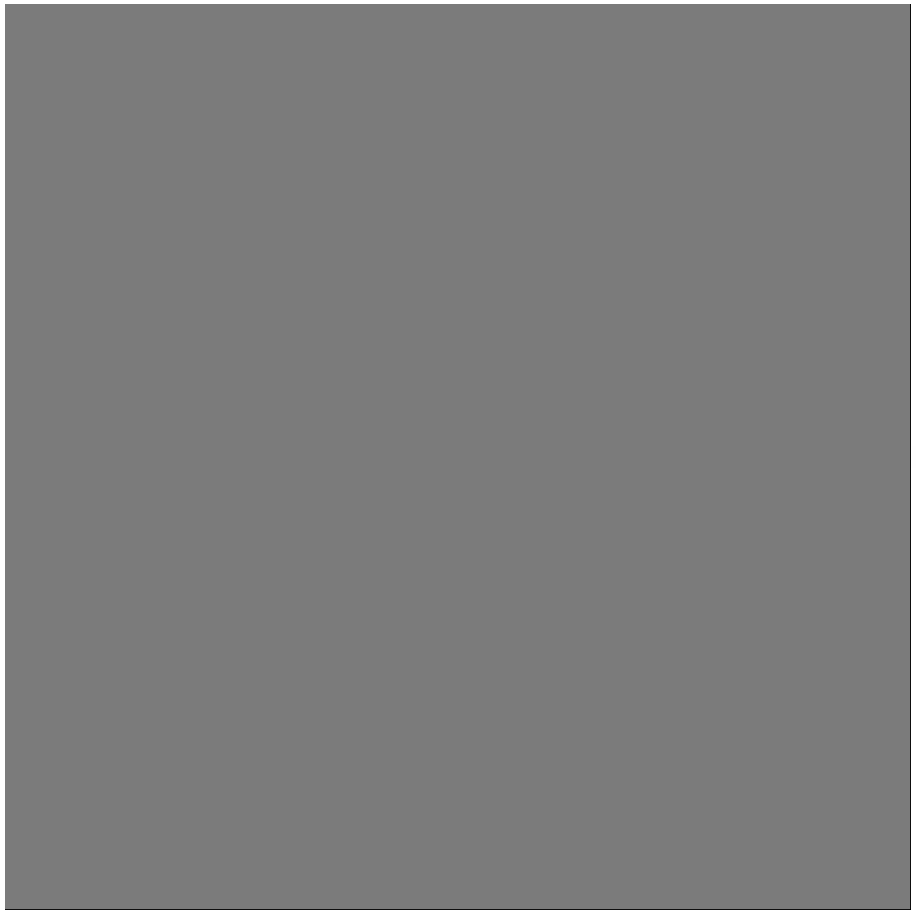
Type I Endoleak : PALMAZ stent Case

M/75



Type I Endoleak : PALMAZ stent Case





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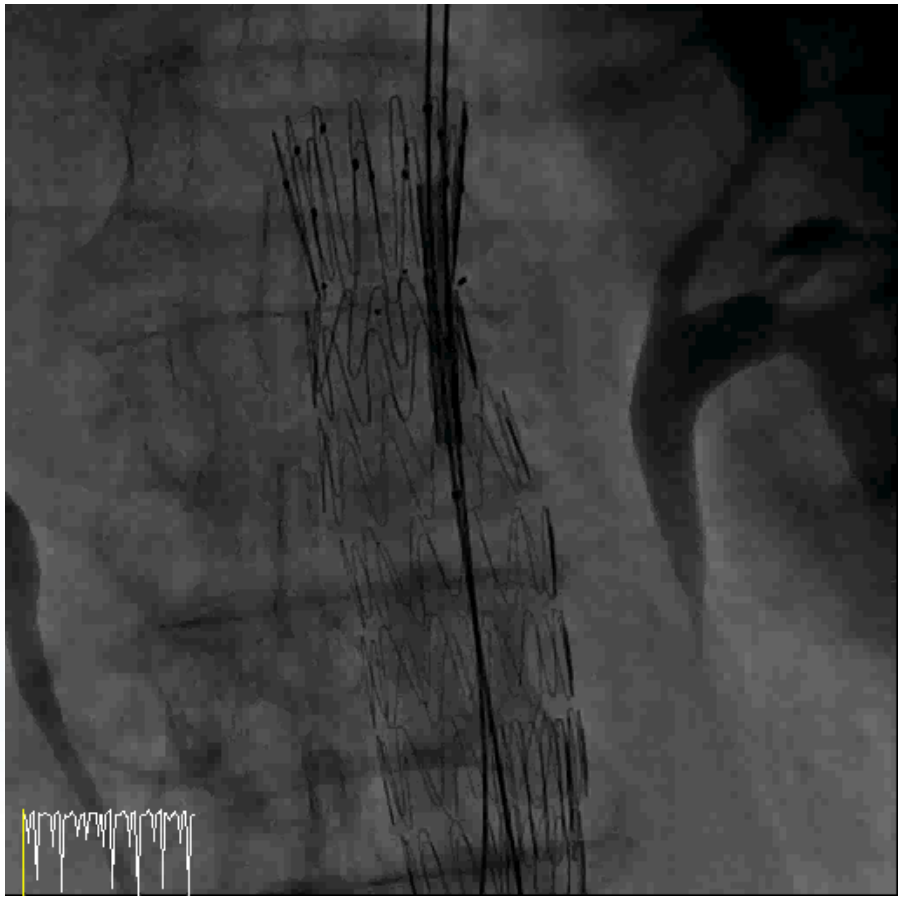
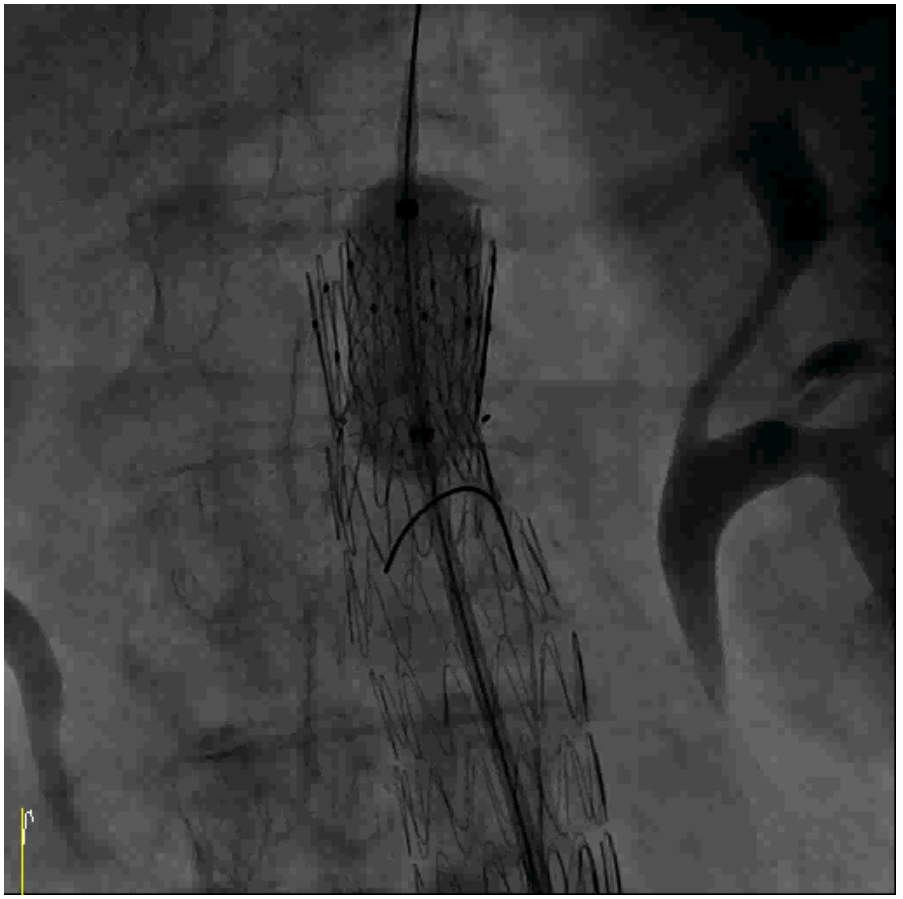
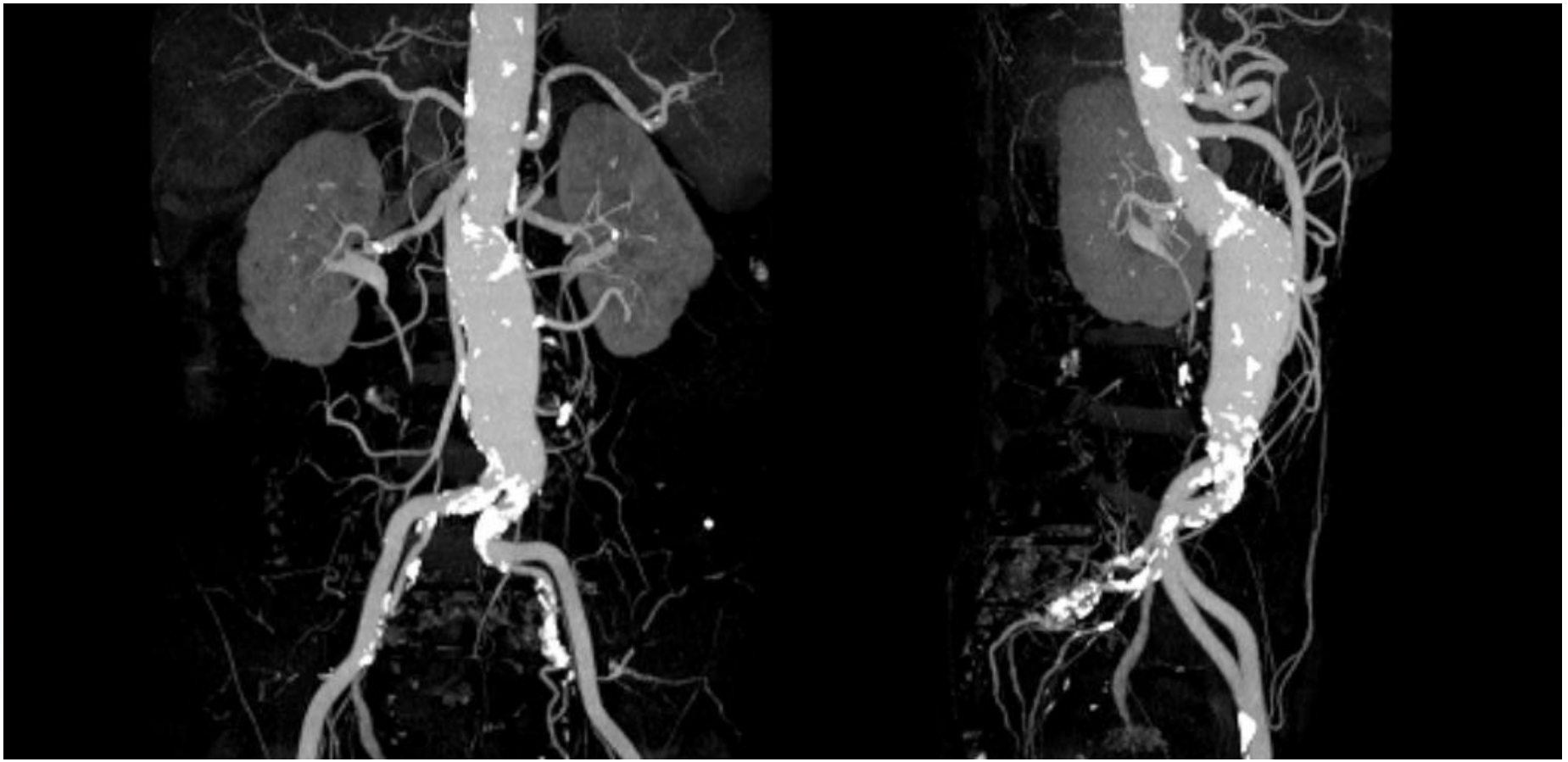




Type I Endoleak
: Self Exapandable Stent Case



Type I Endoleak
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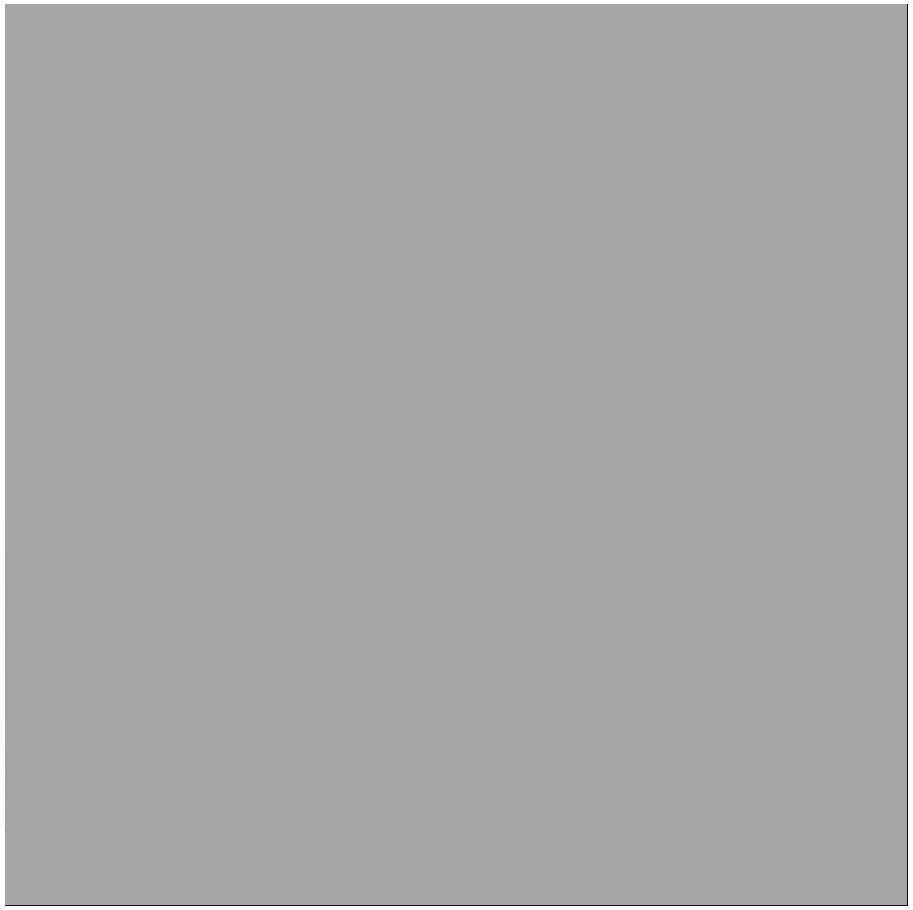

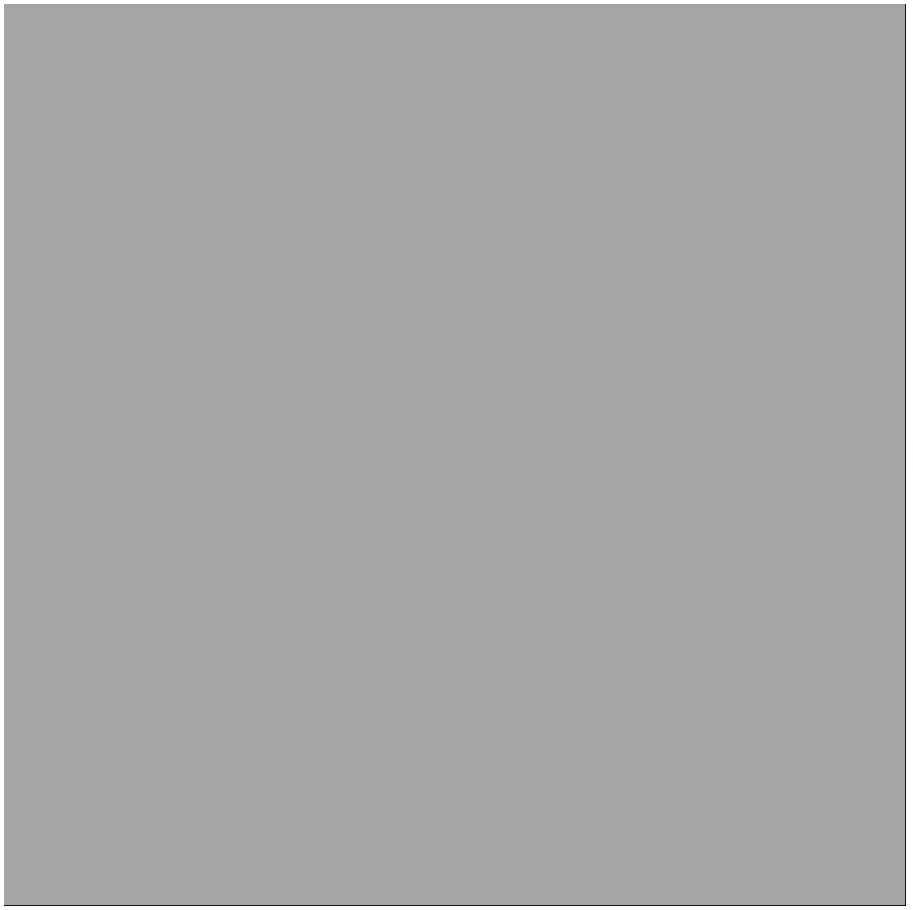

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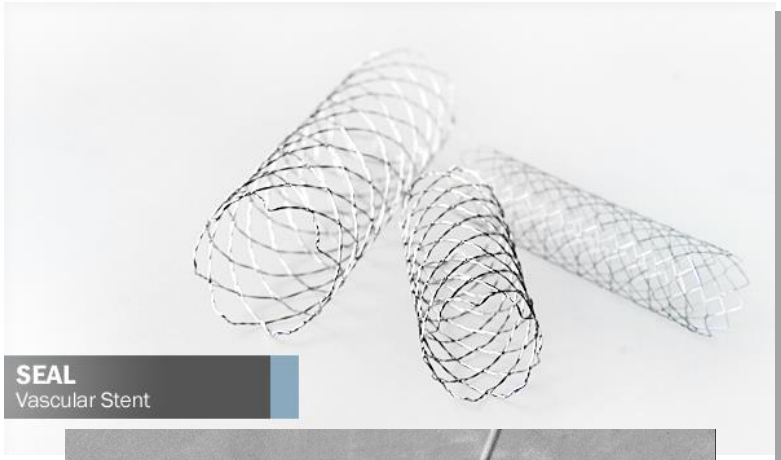

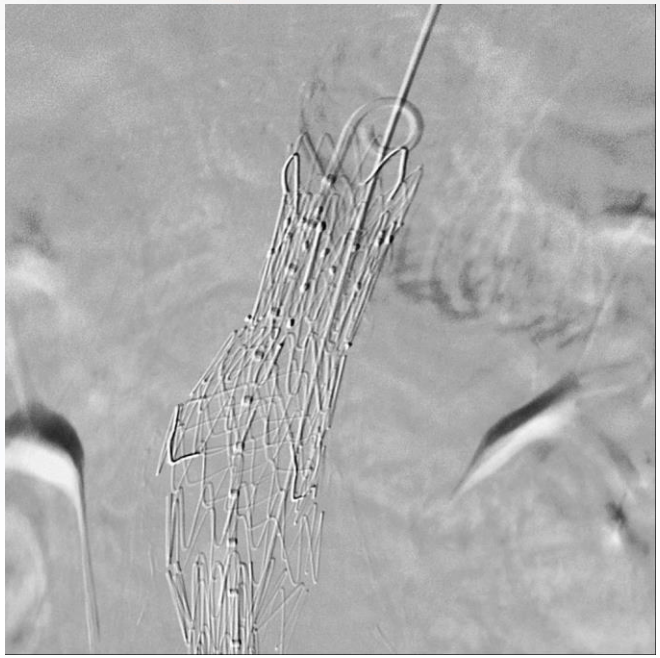

Type I Endoleak
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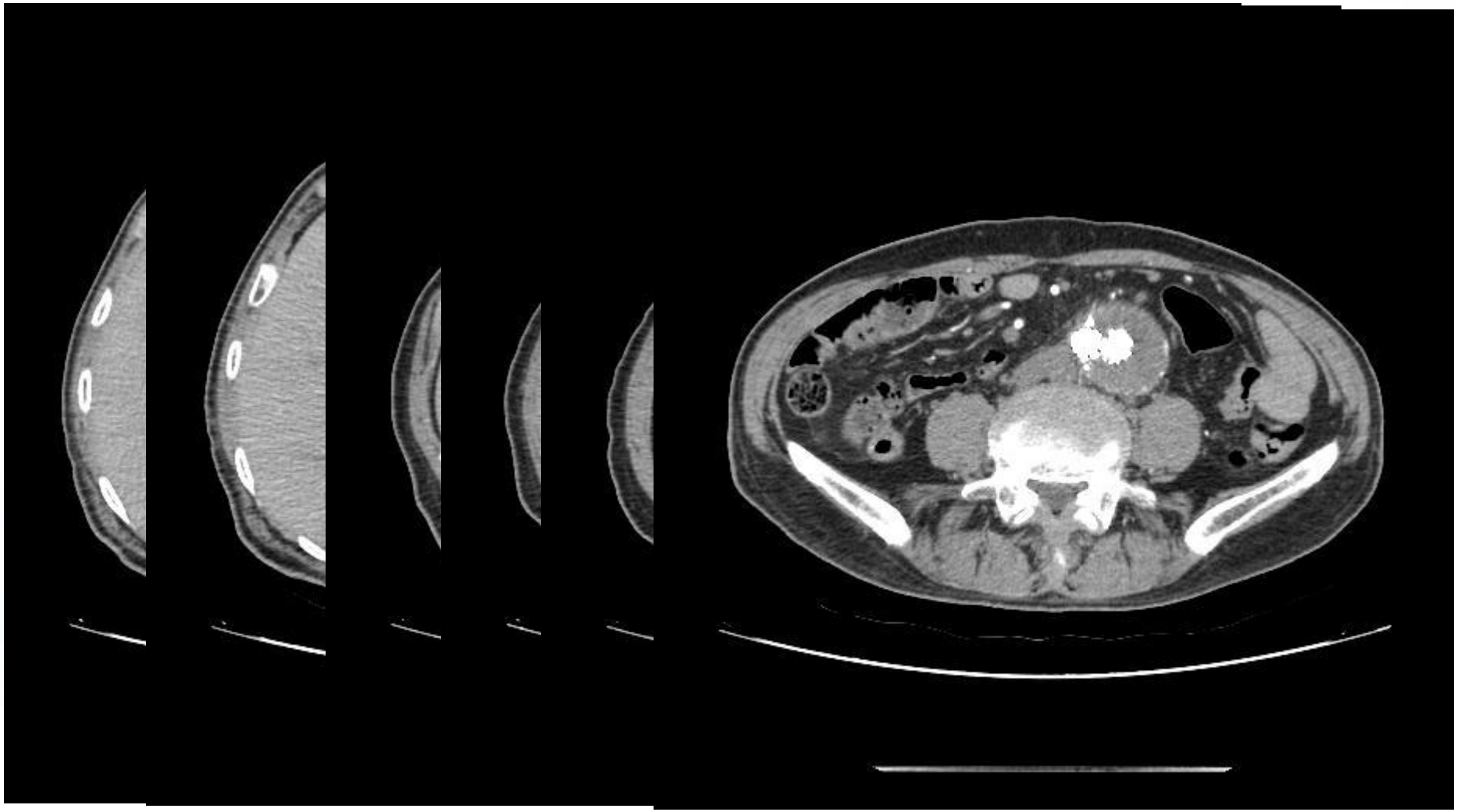
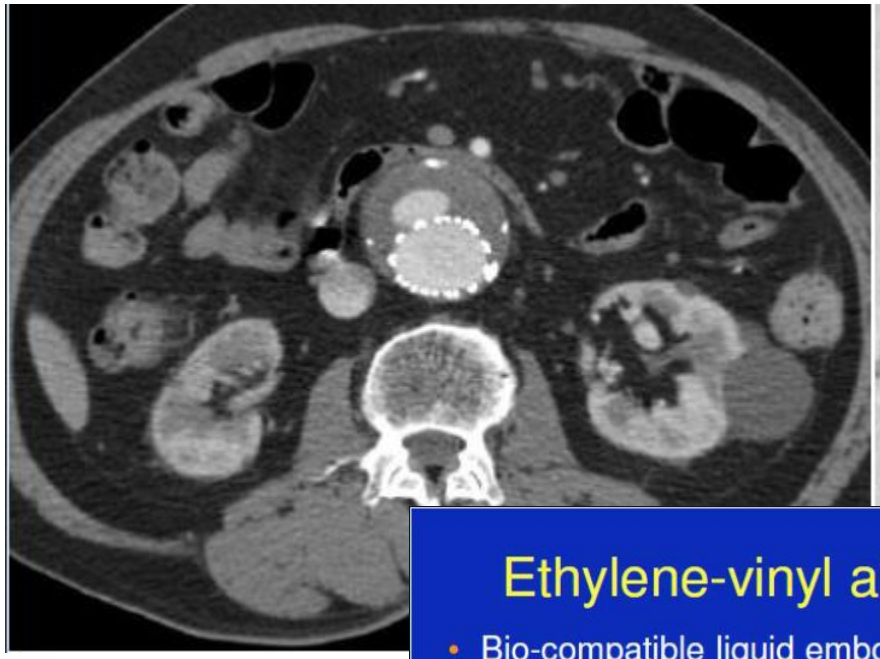
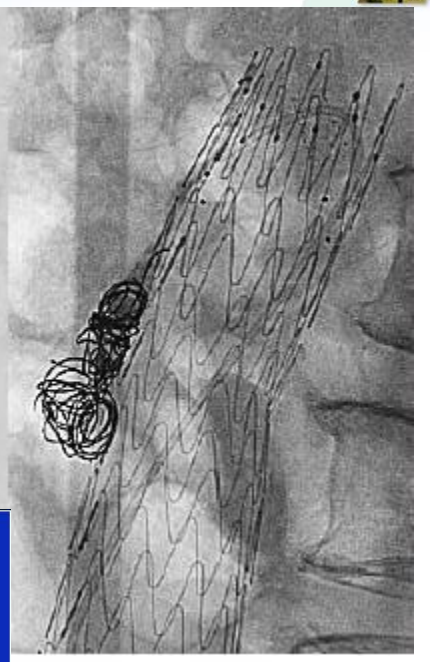


Type I Endoleak : Coil Embolization, Glue





Ethylene-vinyl alcohol - Onyx

- Bio-compatible liquid embolic agent approved for use in the treatment of brain AVMs
- Has been used in an off-label fashion with success in the Rx of Type I & II endoleaks
- Composition:
  - 4%
    - Ethylene-vinyl alcohol copolymer
    - Tantalum powder (added for radiopacity)
  - 96%
    - Dimethyl sulfoxide (DMSO)

Data of Chimney Technique on Thoracic Aorta

J Vasc Surg. 2013 Aug;58(2):502-11. doi: 10.1016/j.jvs.2013.03.043. Epub 2013 May 19.

Thoracic endovascular aortic repair with the chimney graft technique.

Hogendoorn W, Schlösser FJ, Moll FL, Sumpio BE, Muhs BE.

Section of Vascular Surgery, Department of Surgery, Yale University School of Medicine, New Haven, CT 06510, USA.

Abstract

OBJECTIVE: This study was conducted to provide insight into the safety, applicability, and outcomes of thoracic endovascular aortic repair (TEVAR) with the chimney graft technique.

METHODS: Original data regarding the chimney technique in TEVAR in the emergent and elective setting were collected from MEDLINE, Embase, and Scopus databases. All variables were systematically extracted and included in a database. Patient and procedural characteristics, details, and outcomes were analyzed.

RESULTS: In total, 94 patients with 101 chimney-stented aortic arch branches were analyzed, consisting of the brachiocephalic artery in 20, the left common carotid artery in 48, and the left subclavian artery in 33. Balloon-expandable stents were used in 36% and self-expandable stents in 64% for the aortic side branch. The interventions were elective in 72% and emergent in 28%. Technical success was achieved in 98% in elective and emergent settings combined. Endoleaks were described in 18%; with type Ia being most frequently reported in 6.4% overall and in 6.5% in the elective setting. Stroke was reported in 5.3% of the patients, of which 40% were fatal. The overall perioperative mortality was 3.2%. Median follow-up time was 11 months, and chimney stents remained patent in all patients.

CONCLUSIONS: TEVAR with the chimney technique is a viable treatment option and may expand treatment strategies for patients with challenging thoracic aortic pathology and anatomy in the emergent and elective setting. Patency of the thoracic chimney stents appears to be good during short-term follow-up. Other complications, such as endoleak and stroke, deserve attention by future research to further improve treatment strategies and the prognosis of these patients.

Data of Chimney Technique on Thoracic Aorta

- Meta analysis:

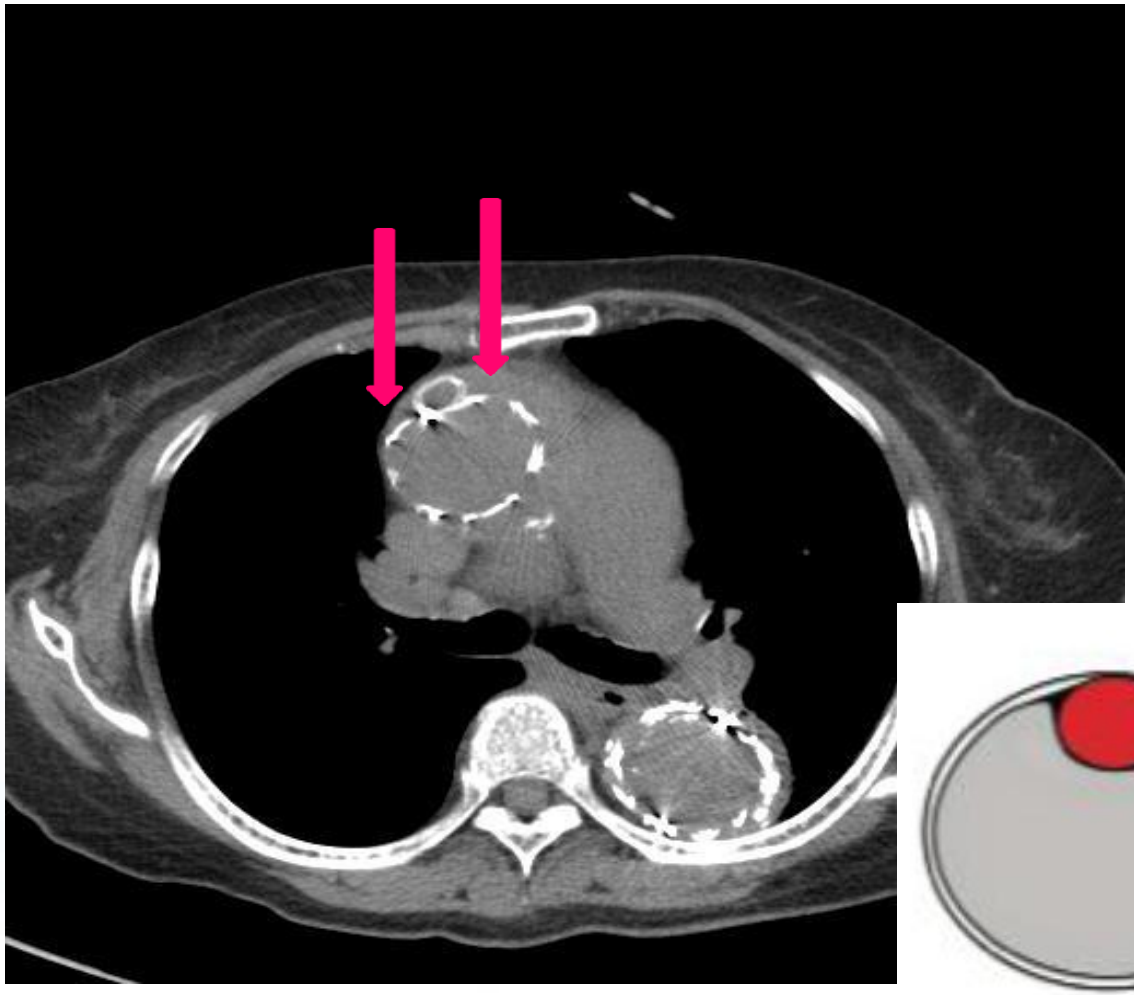
11 publications (on 373 patients and 387 CGs)

technical success:	91.3%	(95%CI: 87.4%-94.0%)
30-day mortality rate	7.9%	(4.6%-13.2%)
early type Ia endoleak	9.4%	(6.5%-13.4%)
reintervention rate	10.6%	(5%-21%)
retrograde type A	1.8%	(0.8%-4.0%)
major stroke	2.6%	(1.3%-5.0%)
late patency	92.9%	(87.3%-96%)

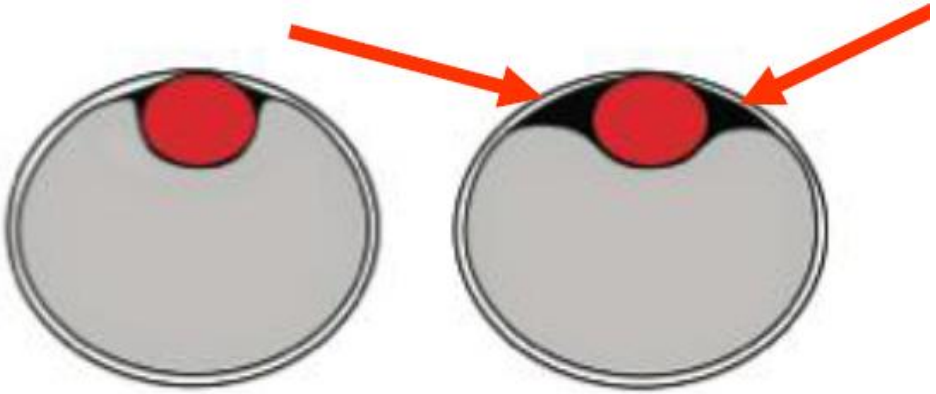
Endoleak is the problem !

Ahmed et al. J Vasc Surg 2017;66:1602-10

C T : Chimney Technique



Chimney시에는
SG사이로 공간이 생겨서
Type 1 endoleak이 많음



Chimney Technique on AAA

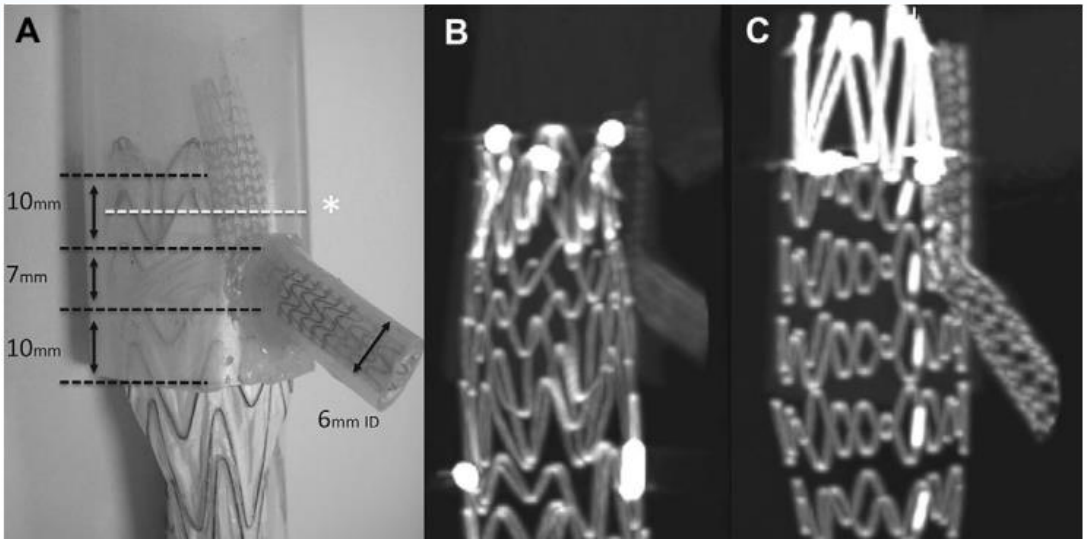
N=41

Patient	Original indication	MAE Description	Time(m)	Outcome
1	Type 1a endoleak	≥25% ↓ eGFR	12.3	No dialysis
2	Juxtarenal AAA	≥25% ↓ eGFR	12.9	No dialysis
3	Suprarenal AAA	30-death	0.4	Death
4	Juxtarenal AAA	≥25% ↓ eGFR	30.8	No dialysis
5	Type 1a endoleak	Type 1a endoleak	34.4	Pending revision
6	Type 1a endoleak	SMA chimney thrombosis	7.5	Asymptomatic
7	Juxtarenal AAA	In-hospital death	1.5	Death
8	Juxtarenal AAA	Bilateral renal chimney thrombosis	40.4	Dialysis, renal bypass
9	Juxtarenal AAA	Bilateral renal chimney thrombosis	2.1, 10.8	Dialysis
10	Pseudoaneurysm	Celiac stent thrombosis	22.2	Celiac bypass
11	Dissection with aneurysm	Type 1a endoleak	14.2	Conversion
12	Pseudoaneurysm	L renal chimney thrombosis	0.5	No dialysis
13	Suprarenal AAA	L renal chimney thrombosis	11.5	No dialysis

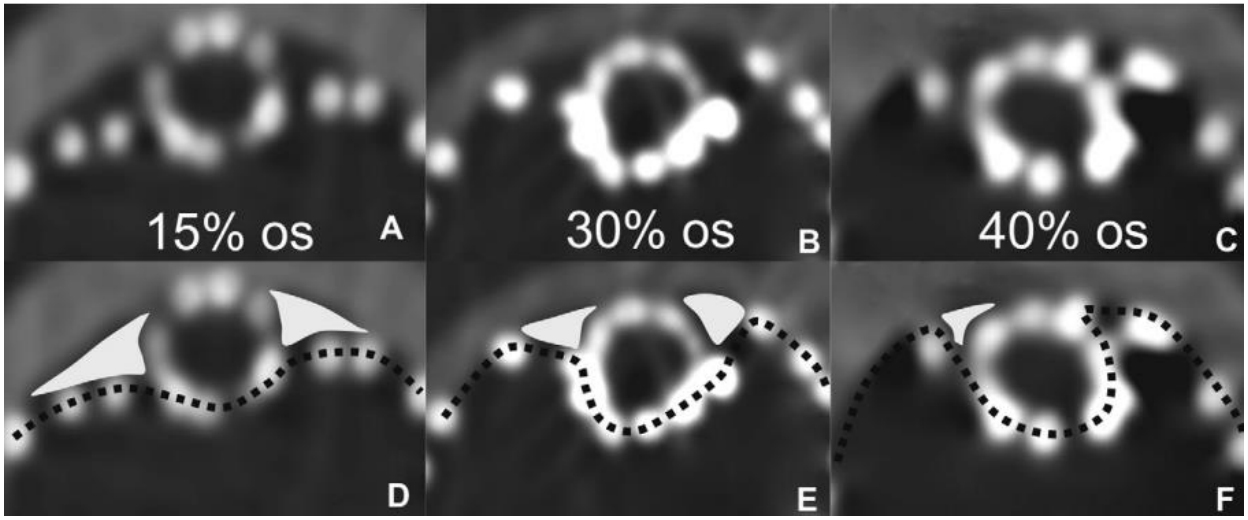
ch-EVAR : Early: good but, Long term: poor

J Vasc Surg. 2014 Oct;60(4):865-73

Chimney Technique



30% Oversizing SG
: reduced gutter
in vitro exam.



European J of Vascular and Endovascular Surg 44 (2012) 468-73

Data of Chimney Technique Complications

MAE	Rate n = 78
Type 1a Endoleak	17.95%
Snorkel Compromise	18%
AAA growth	22.06%
30 d Mortality	6 %
Secondary Intervention	5.13%

From Datas of Florida university

Data of Chimney Technique

According to Side Branch SG

PG Type	Number	PG complication	P value
Viabahn(Gore)	61 (42.1%)	18.0%	NS
iCast (Atrium)	76 (52.4%)	14.5%	NS
Bare metal	8 (5.5%)	0	NS

From Datas of Florida university

Data of Chimney Technique

Oversizing rate

EVAR Oversize (n)	Endoleak	PG Compromise	AAA growth	AAA MAE
0-15% (15)	33.3%	40% * (p < 0.05)	33.3%	73.3%*
15-20% (24)	20.59%	17.65%	20.59%	26.5%
> 20% (34)	8.33%	8.3%	16.67%	16.7%

< 20% Oversizing SG : increased MAEs

From Datas of Florida university

Zenith Cook Fenestrated AAA Stent Graft

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April 4, 2012

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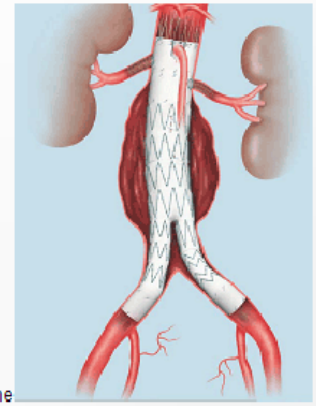
Zenith® Fenestrated AAA Endovascular Graft (with the adjunctive Zenith Alignment Stent) - P020018/S040

This is a brief overview of information related to FDA's approval to market this product. See the links below to the Summary of Safety and Effectiveness Data (SSED) and product labeling for more complete information on this product, its indications for use, and the basis for FDA's approval.



Product Name: Zenith® Fenestrated AAA Endovascular Graft (with the adjunctive Zenith Alignment Stent)
Manufacturer: Cook Incorporated
Address: 750 Daniels Way, PO Box 489, Bloomington, IN 47402
Approval Date: April 4, 2012
Approval Letter: http://www.accessdata.fda.gov/cdrh_docs/pdf2/p020018s040a.pdf

What is it? The Zenith® Fenestrated AAA Endovascular Graft (with the adjunctive Zenith Alignment Stent) is an endovascular stent graft used to repair abdominal aortic aneurysms or aneurysms that involve both the abdominal aorta and iliac arteries (the large arteries that supply blood to the pelvis and legs).

An abdominal aortic aneurysm (AAA) is a bulge that occurs in the body's largest artery (the aorta) as it passes through the abdomen. The bulge is caused by a weakening or thinning in the wall of the artery. A synthetic tube-like device (a graft) is used within the blood vessel (endovascular) to treat the AAA by sealing it off.

Zenith Cook Fenestrated AAA Stent Graft

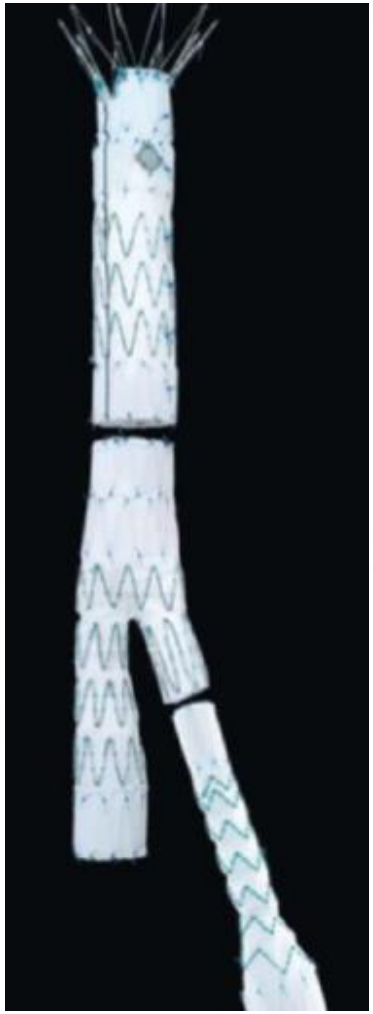
Scallop
Scallops along the graft's proximal edge are 10 mm wide and 6–12 mm high.

Small Fenestration
Small fenestrations are 6 mm wide and 6 or 8 mm high.

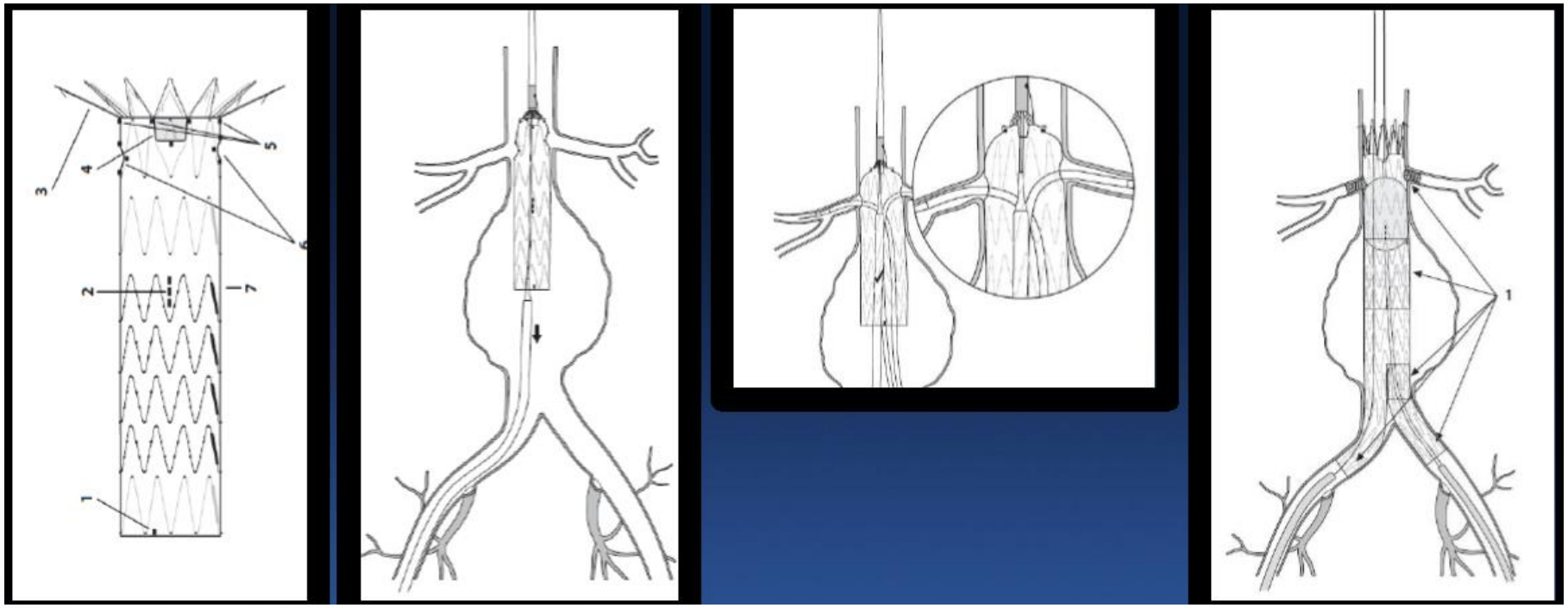
Large Fenestration
Large fenestrations range from 8–12 mm in diameter.

Zenith Cook Fenestrated AAA Stent Graft

- 2 proximal sealing stents
- Fenestrations and scallops with reinforced nitinol rings
- Custom made **(4-6 weeks)**
- IFU requires **4 mm infrarenal neck**



Zenith Cook Fenestrated AAA Stent Graft



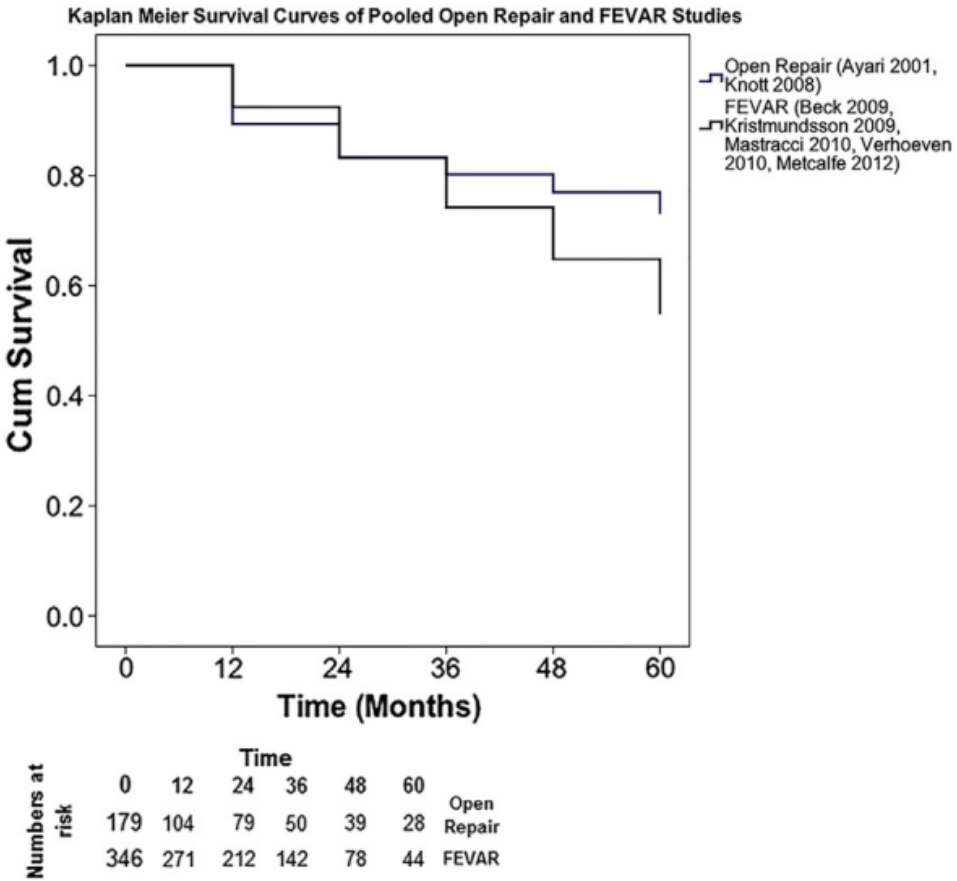
Meta-Analysis : Open Repair vs.F-EVAR

- Meta-analysis of 35 case series, 2326 patients
- Perioperative mortality 4.1% for both open and FEVAR
- Re-intervention rate 4.9% (open) vs. 12.7% (F-EVAR), p<0.0001
- Major complications 25% (open) vs. 15.7% (F-EVAR), p=0.001
- **Long-term survival higher in open surgery vs. FEVAR**

J VascSurg2015; 61:242-55

Meta-Analysis : Open Repair vs.F-EVAR

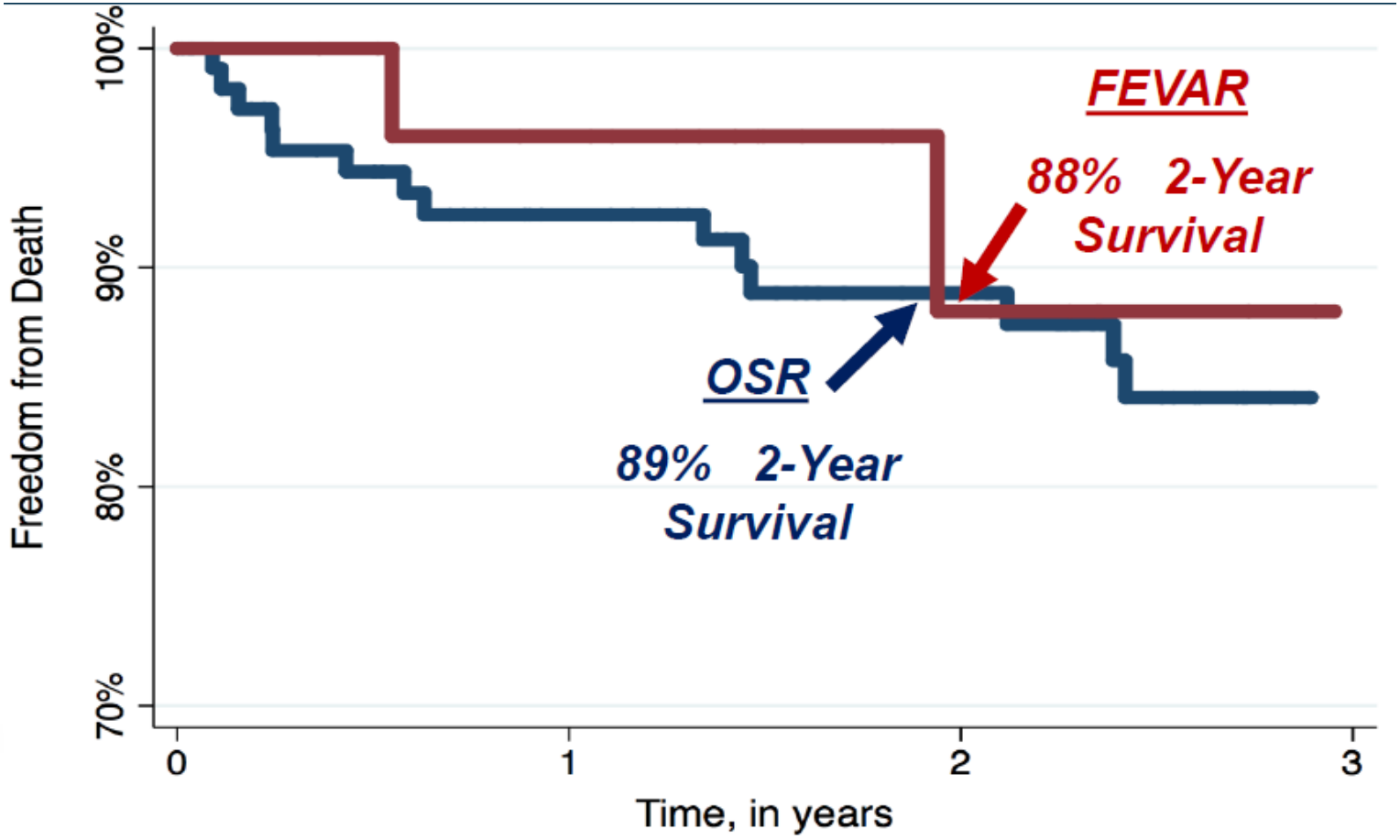
- **Long-term survival higher in open surgery vs. FEVAR**



J VascSurg2015; 61:242-55

Single Center Registry 2010-2015

Open Repair(n=114) vs.F-EVAR(n=27)



Single Center Registry 2010-2015

Open Repair(n=114) vs.F-EVAR(n=27)

Variable	FEVAR	OSR	P Value
Graft Complications	7 (26%)	9 (7.9%)	< .001
Reinterventions	5 (19%)	7 (6.1%)	.05

Single Center Registry 2010-2015

Open Repair(n=114) vs.F-EVAR(n=27)

Variable	ANY Graft Complications HR [95% CI]	P Value
FEVAR	11 [3.0 – 44]	< .001
Female Sex	4.8 [1.5 – 15]	< .01

** Also adjusts for age, diameter, urgency, and clamp*

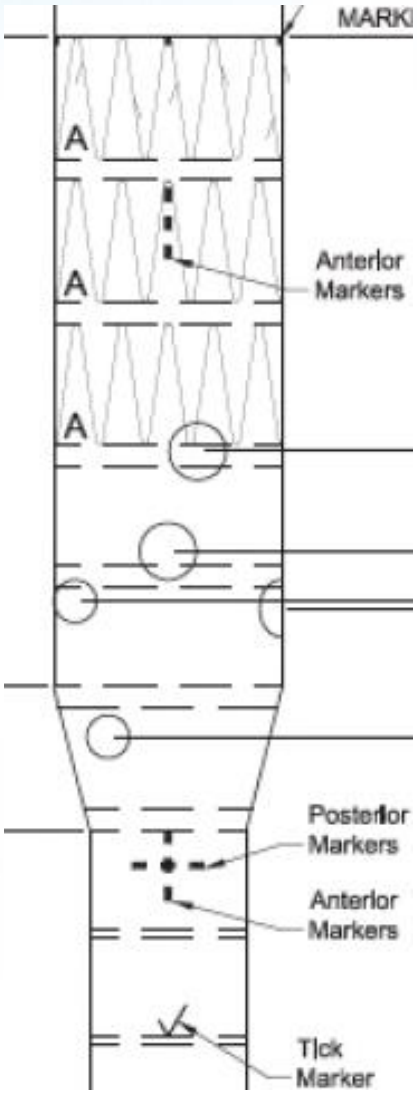
Summary : F-EVAR

- FEVAR appears safe in carefully selected patients with suitable anatomy
- FEVAR increased graft-related complications and reinterventions
- Further study warranted

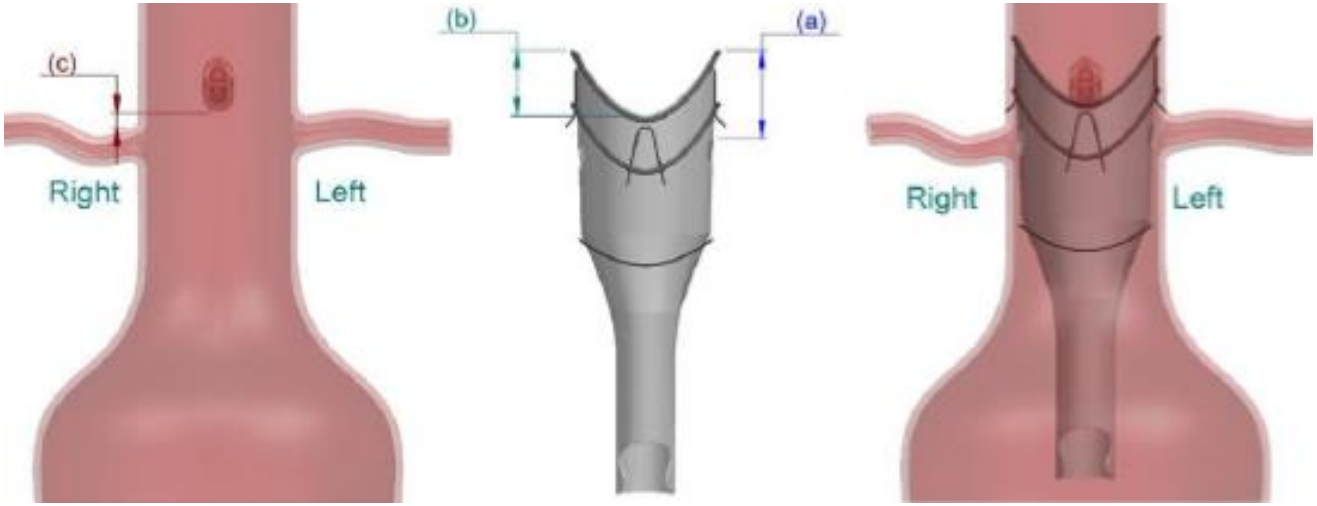
P-branch EVAR

- Currently in US Trial
- 50 patients enrolled
- Renal pivot fenestrations
- 70% of anatomy
- Pre-cannulated
- iCast bridging stents

Z-Fenestrated EVAR



Anaconda-Fenestrated EVAR



J Vasc Surg 2011;54:1832-8

Ventana : Endologix

GORE : TAMBE

COOK : T Branch

Disadvantage of Fenestrated Aortic Stent Graft

- **Long procedure time and complicated method**
- **Cardiac and renal complication**
- **Patient selection is critical**
- **Only 40% are treatable with “of the shelf” devices**

Conclusion

- **Chimney EVAR : Very old age, high risk patient**

  due to poor long term datas

- **Fenesterated EVAR :**

  1. One commercially available device

  2. Many F-EVAR devices in pipeline

  3. Significant benefit in high risk patients

  4. Durability may be lower than open repair

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Thank you from my heart