8th International Congress

H T D I
HOW TO DO IT

AORTIC SURGERY
PERIPHERAL & VENOUS

GRUPPO OSPEDALIERO SAN DONATO

OSPEDALE SAN RAFFAELE

Open Conversion for Failed EVAR

Increasing Need and Different Strategies

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Disclosures

No Financial Compensation or Conflicts

Industry Relationships:

WL Gore: Aortic Scientific Advisory Board

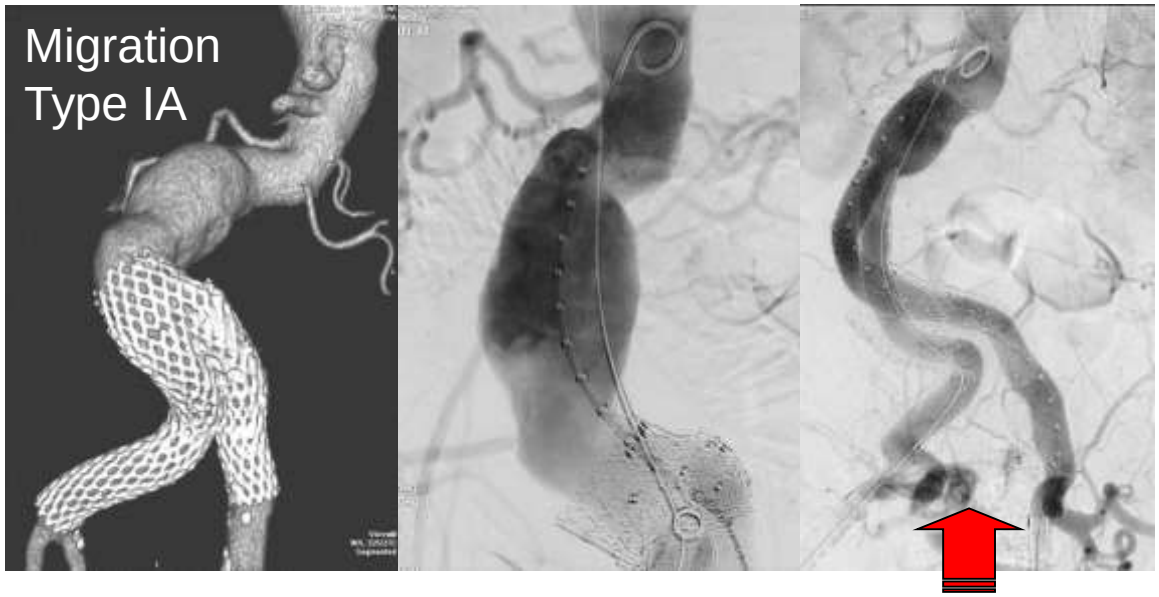
Medtronic: Aortic Scientific Advisory Board

Current Research Grants:

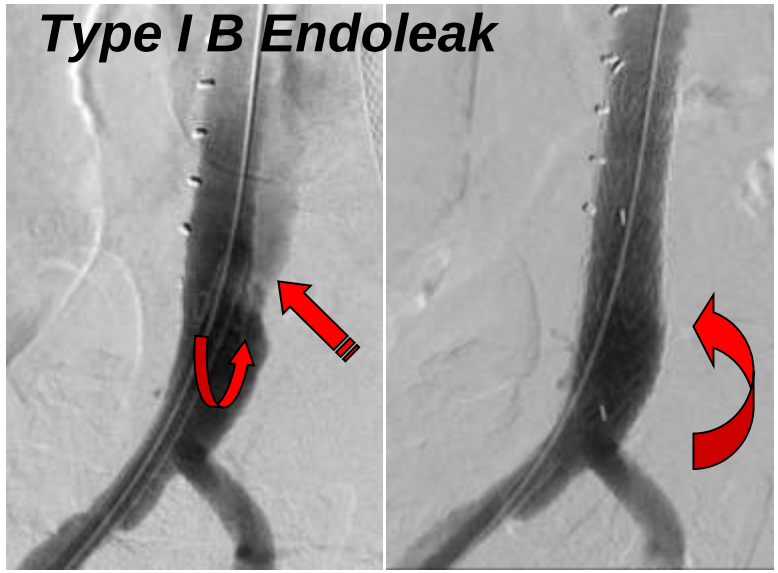
WL Gore, Cook, Medtronic

Not all Failed EVAR need Open Conversion

- ✓ Most patients do well with EVAR
- ✓ 15% still require reintervention, usually of minor intensity
  - ***Most are for endoleaks***
  - ***Most are endovascular***
  - ***Most are percutaneous***



Treated with New Endograft inside first one



Treated by Extension

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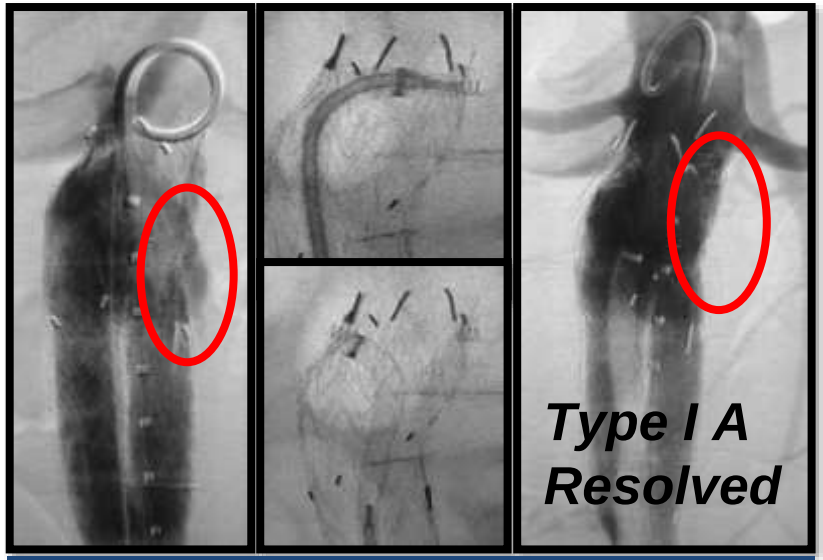
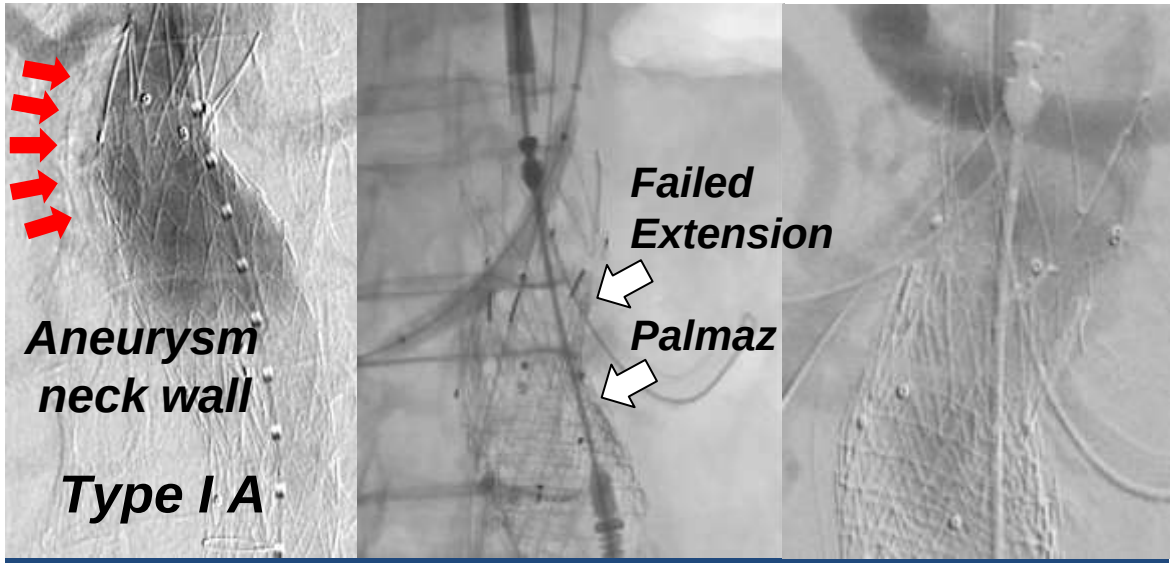


Treated with Endoanchors



Two Chimneys All Endovascular

Not all Failed EVAR need Open Conversion

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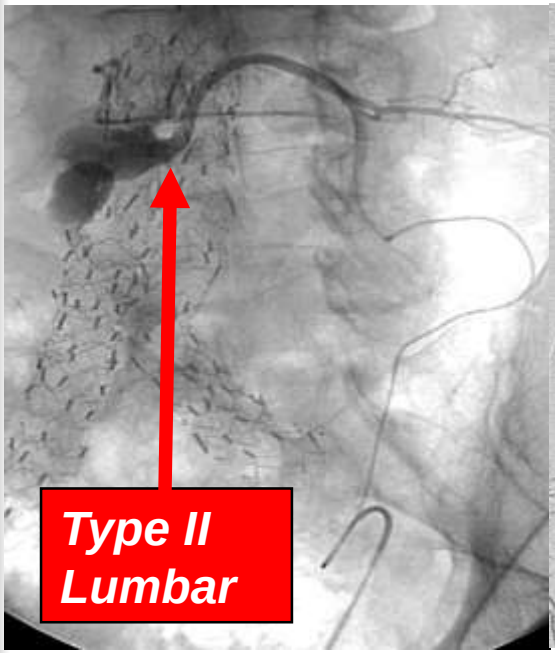
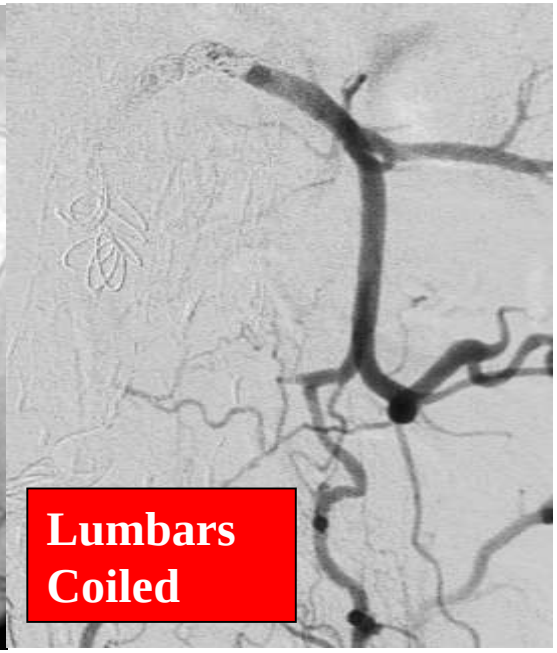
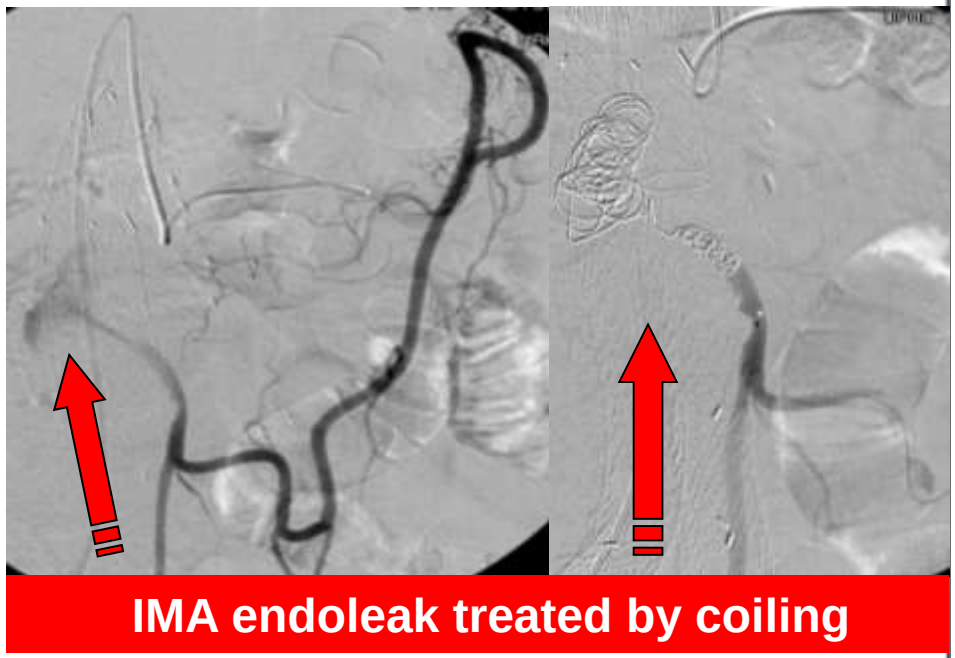
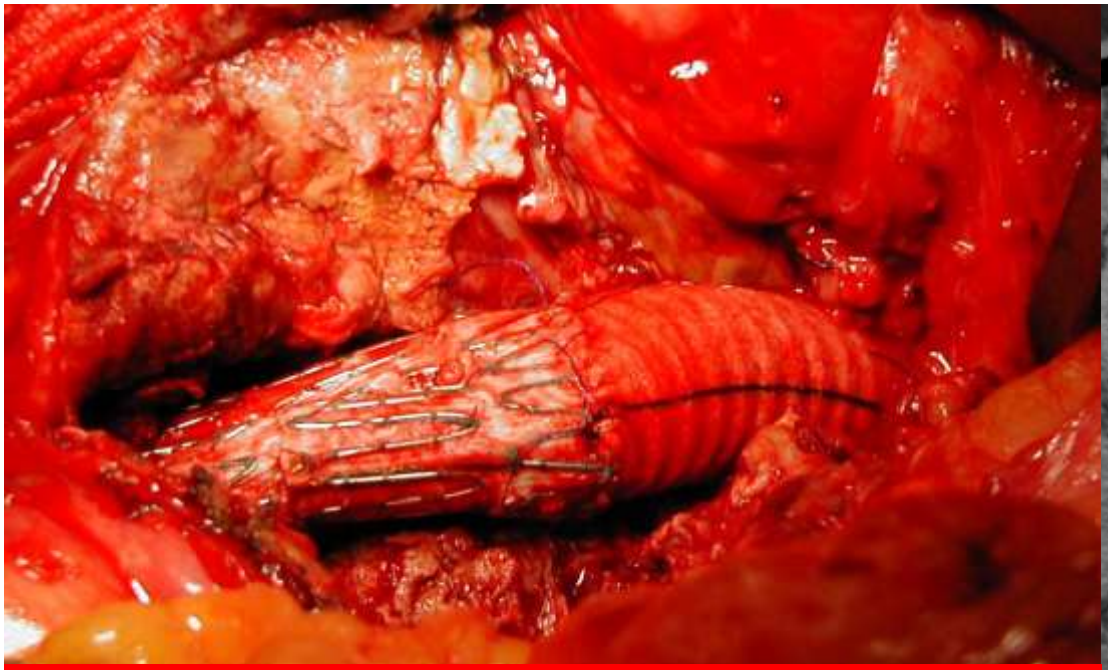






Which Failed EVAR needs Open Conversion?

- ✓However Open Conversion is still required on occasion
- ✓***Acute*** and ***Early*** conversion are rare in modern day EVAR. They are usually related to errors in technique or judgment!



Early Partial Open Conversion

Ruptured neck from Severe oversizing

Which Failed EVAR needs Open Conversion?

- ✓However Open Conversion is still required on occasion
- ✓***Acute*** and ***Early*** conversion are rare in modern day EVAR. They are usually related to errors in technique or judgment!

Coverage of 3 of 4 renal arteries
Two by intentional coiling

Graft occlusion: Emergency Ax Bifem
Elective Conversion to Aorto Bi-Iliac

Which Failed EVAR needs Open Conversion?

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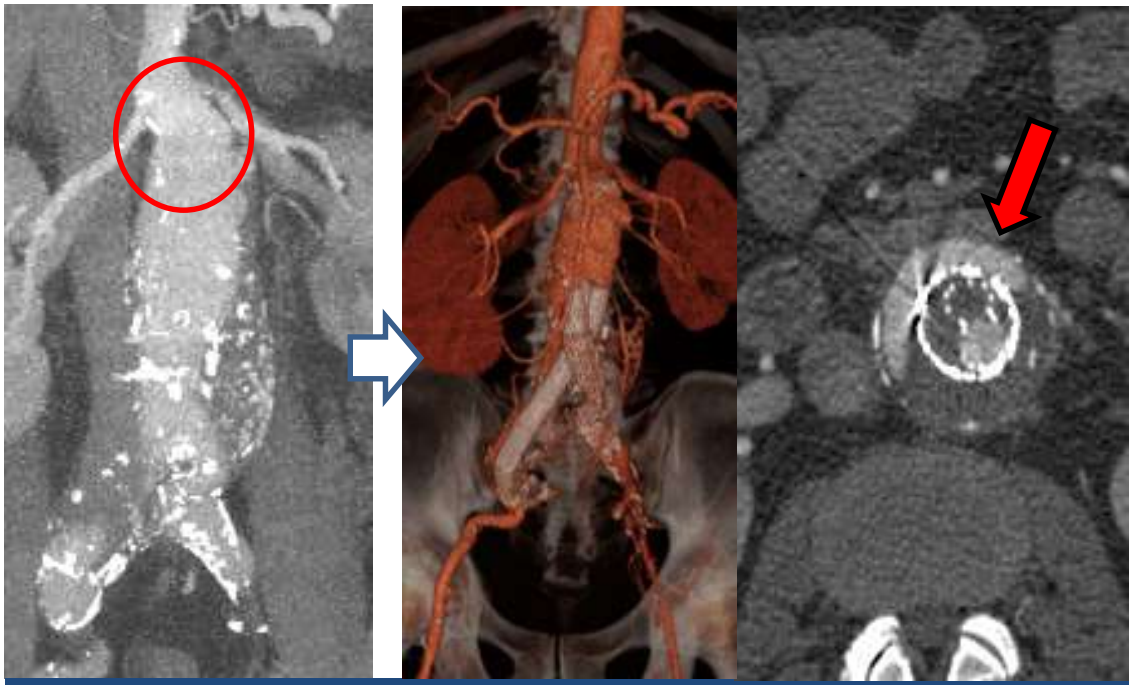
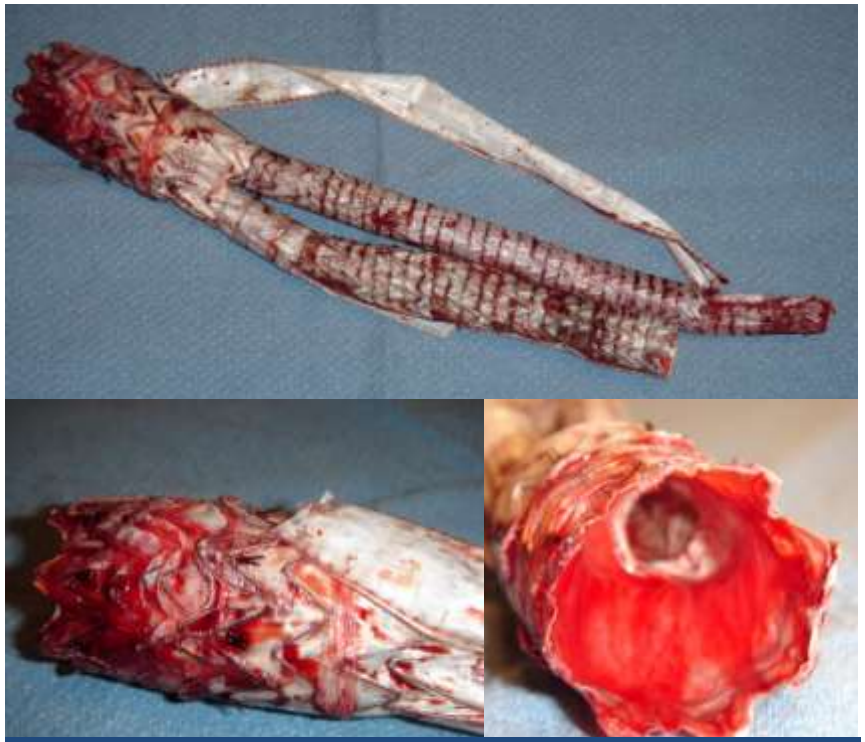


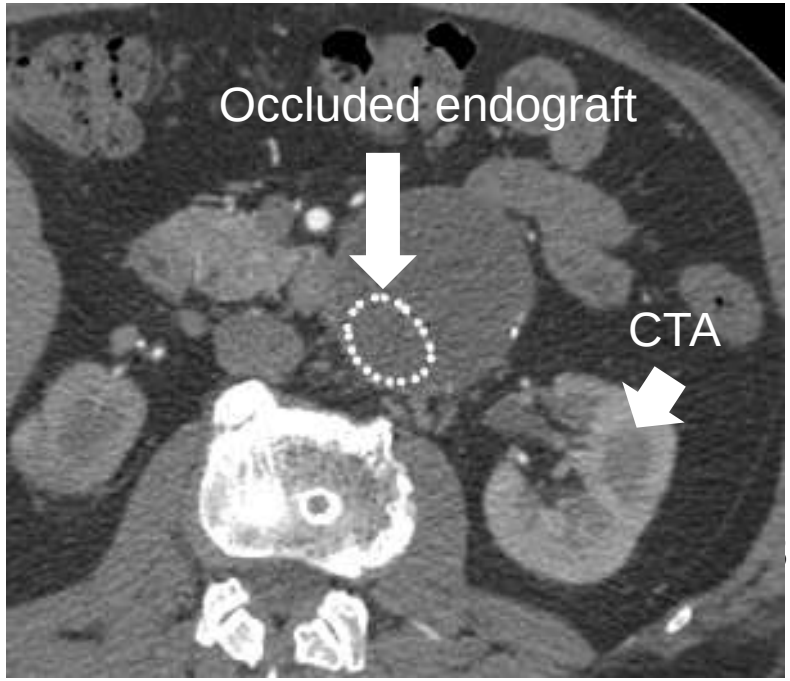
Short neck: Two bifurcated devices + Multiple cuffs
Type IA endoleak / Thrombosed limb / Ischemic leg



Urgent Open Conversion

Which Failed EVAR needs Open Conversion?

- ✓***Late*** Open Conversion is more common and mostly related to arterial degeneration and / or material fatigue
- ✓Threshold center specific.
- ✓Indications for Open Conversion:
  - ***Aortic Rupture***
  - ***Graft Infection***
  - ***Type I A or III***
  - ***Graft Thrombosis***
  - ***More and more often, Type II endoleaks with sac enlargement not responding to endovascular Interventions.***



Mounting FRUSTRATION with Rx of Type II Endoleaks

Type II endoleak is an enigmatic and unpredictable marker of worse outcome after endovascular aneurysm repair

Enrico Cieri, MD, PhD,[a] Paola De Rango, MD, PhD,[a] Giacomo Isernia, MD,[a] Gioele Simonte, MD,[a] Andrea Ciucci, MD,[a] Gianbattista Parlani, MD,[a] Fabio Verzini, MD, PhD, FEBVS,[a] and Piergiorgio Cao, MD, FRCS,[b] *Perugia and Rome, Italy*

"Type II endoleaks have more growth and lead to many interventions that seem ineffective in stopping the expansion and eliminating the endoleaks compared to those left alone".

Results of Rx of type II with *Enlarging Sacs*

We noticed that our success rate in coiling Type II Endoleaks fell from 80% to around 40% over a decade

	#	Indication for Tx	Success
Sarac 2012	95	> 5mm **sac growth**	44% no sac increase
Abularrage 2012	51	80% with **sac growth**	43% no endoleak
Aziz 2012	42	**sac growth**	28% no endoleak
Walker 2015	111	74% with **sac growth**	31.5% no endoleak

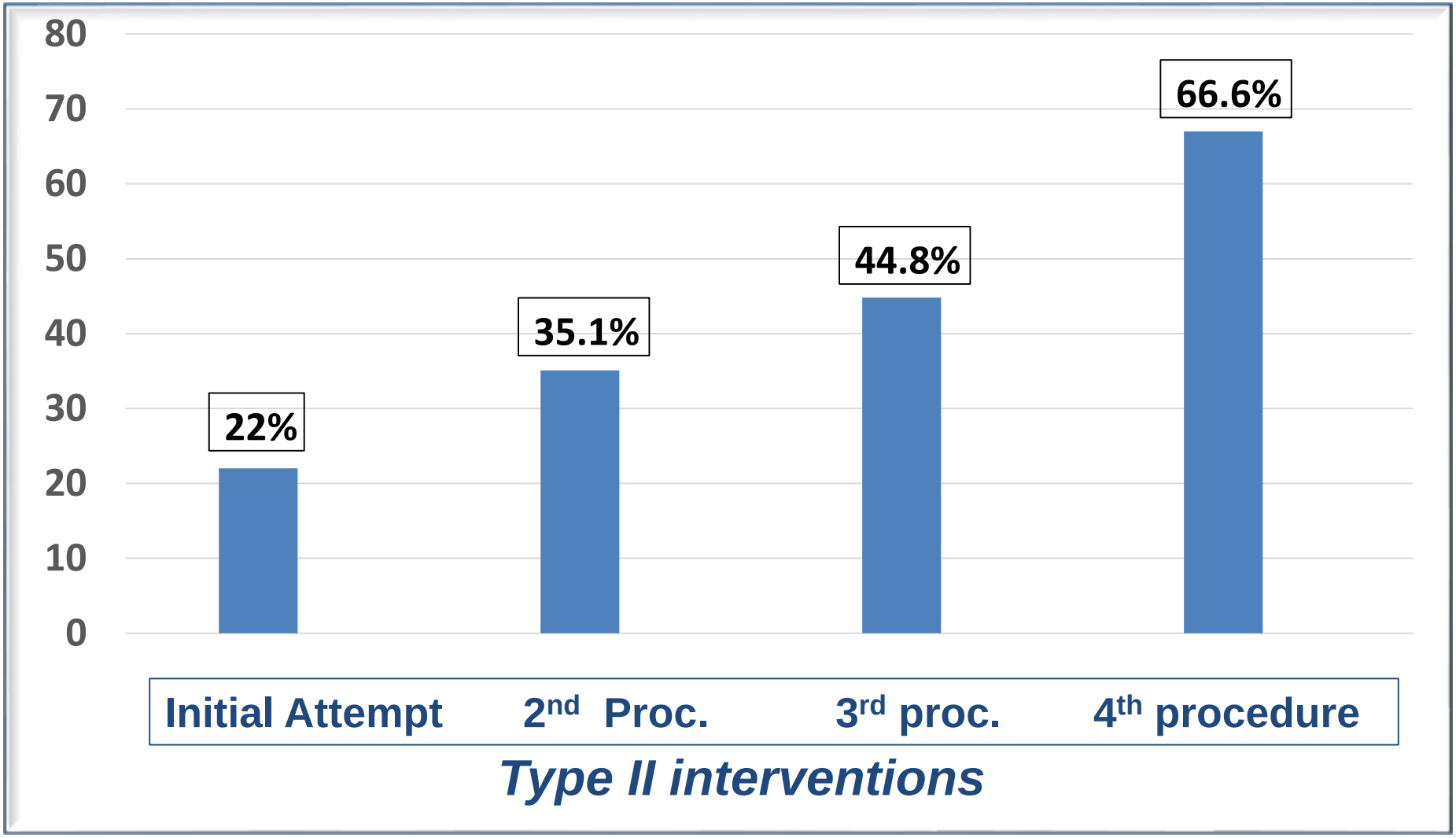
New UPMC Review

Selected Results in 279 procedures with mean FU 7.1 yrs

- **Of 130 patients with initial diagnosis of Type II**
  38 (29%) were ultimately treated for occult type I or III

- **In 118 patients treated first for a Type II**
  Rate of growth until type II treatment was significantly associated with occult Type I or III endoleak (p=.003)
  ≥ 5mm / year 47.8%
  < 5mm / year 14.1%

Likelihood of Occult Type I or III Endoleaks vs # Attempts at Type II Rx



2018 SVS Guidelines recommendations

We suggest open repair if endovascular intervention fails to treat a type II endoleak with ongoing aneurysm enlargement.	
Level of recommendation	2 (Weak)
Quality of evidence	C (Low)

What do we mean by Open Conversion?

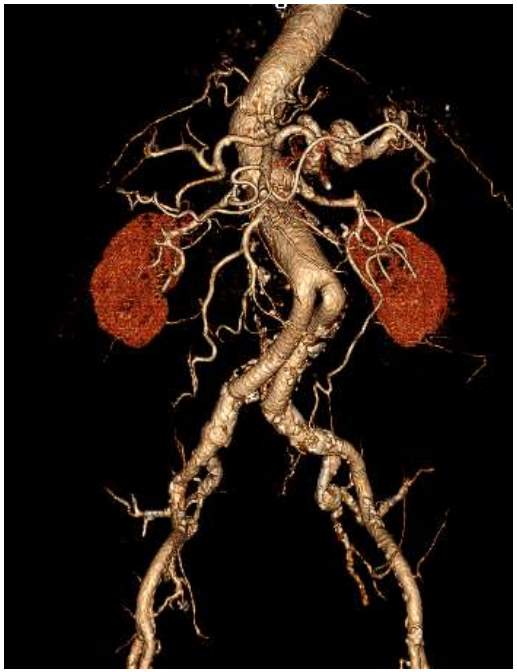
- ✓ No accepted definition. Generally refers to a laparotomy with a direct surgical intervention on the aorta or the endograft

- ✓ Three general categories:
  - ***Total Graft Explanation often leaving some hooks behind***
  - ***Partial Graft Explantation usually leaving portions of the endograft such as limbs behind***
  - ***A variety of Graft Preserving procedures of all kind:***
    - ***Ligation of Lumbars or IMA***
    - ***Improving Neck Fixation with external sutures***
    - ***External narrowing of aortic Neck (banding) for Type I A endoleak***

Total Graft Explantation

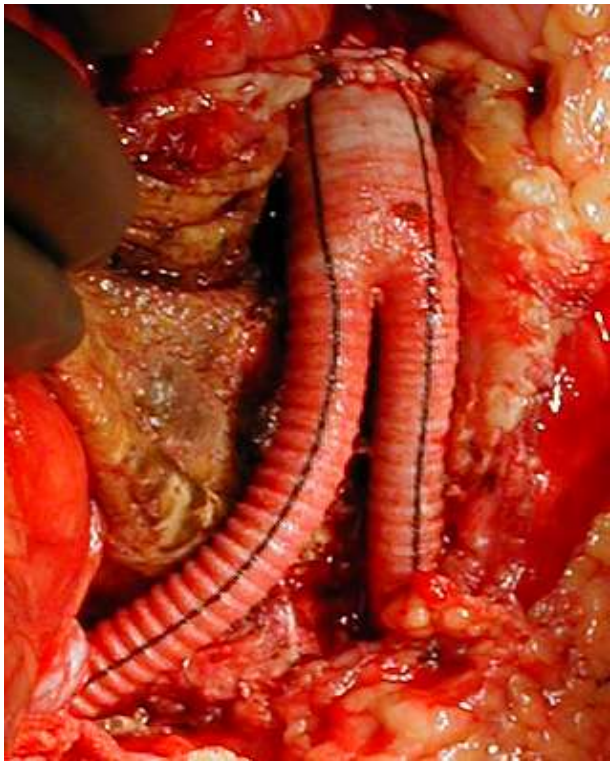
- ✓ Usually for Rupture, Graft Infection or major Graft defects
- ✓ It is actually *Required* for some endografts unsuitable for suturing, or without fixation elements allowing endograft to *"float out"* such as Endologix AFX or Nellix



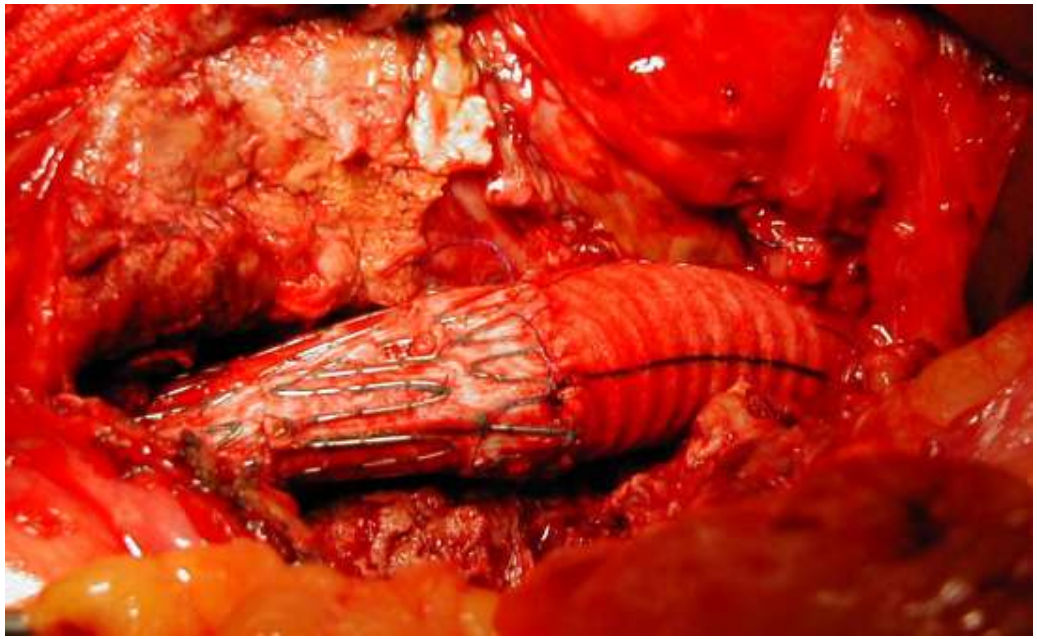
Total Graft Explantation

- ✓Clamp is often supra-celiac because of inflammation or presence of suprarenal stents *(which may or may not be left behind)*
- ✓ Neck is usually thinned out by device. Use Pledgets.



Partial Graft Explantation

- ✓ Usually for significant arterial degeneration on one end like Type IA endoleak while the other end is quite stable.
- ✓ Adherent limbs may be left behind instead of injuring iliacs
- ✓ Sutures to graft also should preferably include arterial wall

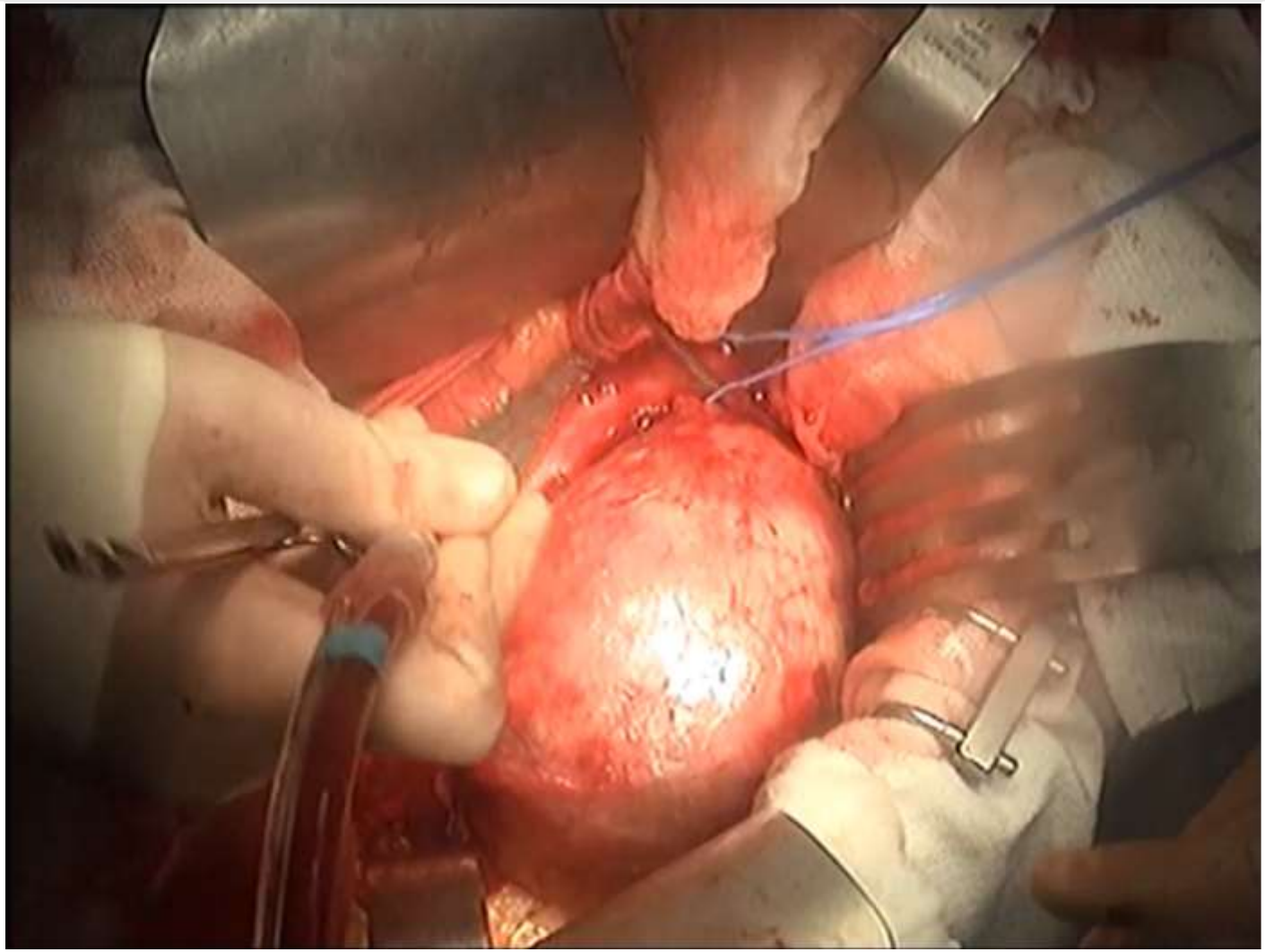


Partial Graft Explantation

Type IA and Migration Of Ancure Device

with

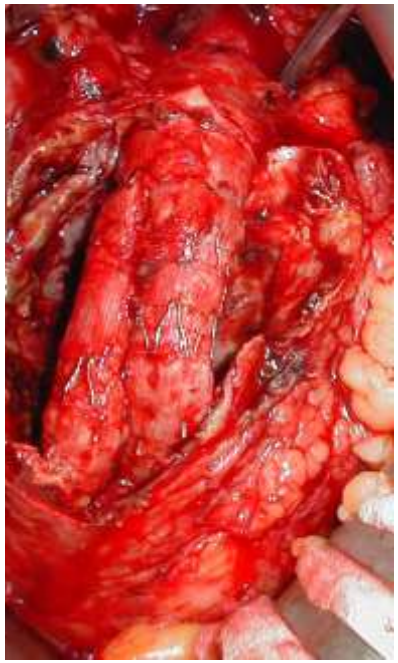
Fixed Distal Limbs

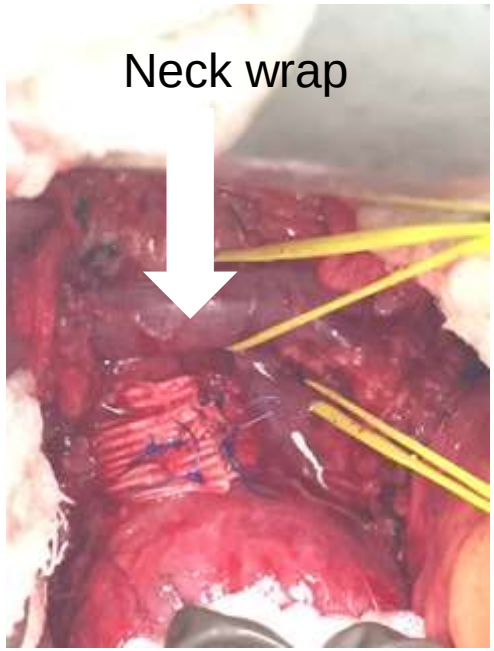


Courtesy W Jordan

Graft Sparing and Preserving Procedures

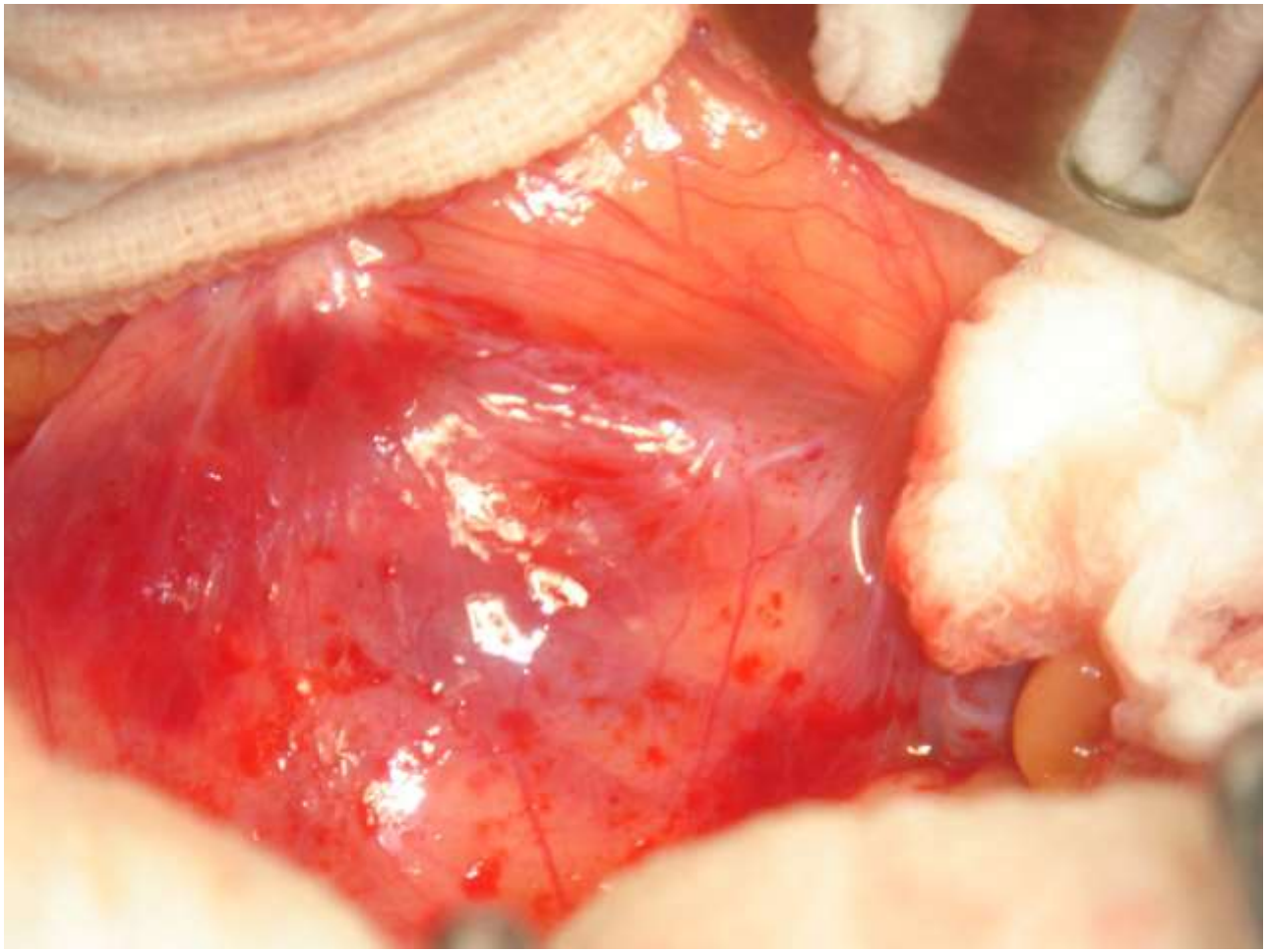
- ✓ Usually for Type II with suturing of lumbars, or difficult small Type I endoleaks with wrapping or reinforcing of neck or both
- ✓ Can be done with limited incision ***and no clamping***.
- ✓ Lumbars can be difficult if high in neck. Excessive bleeding.





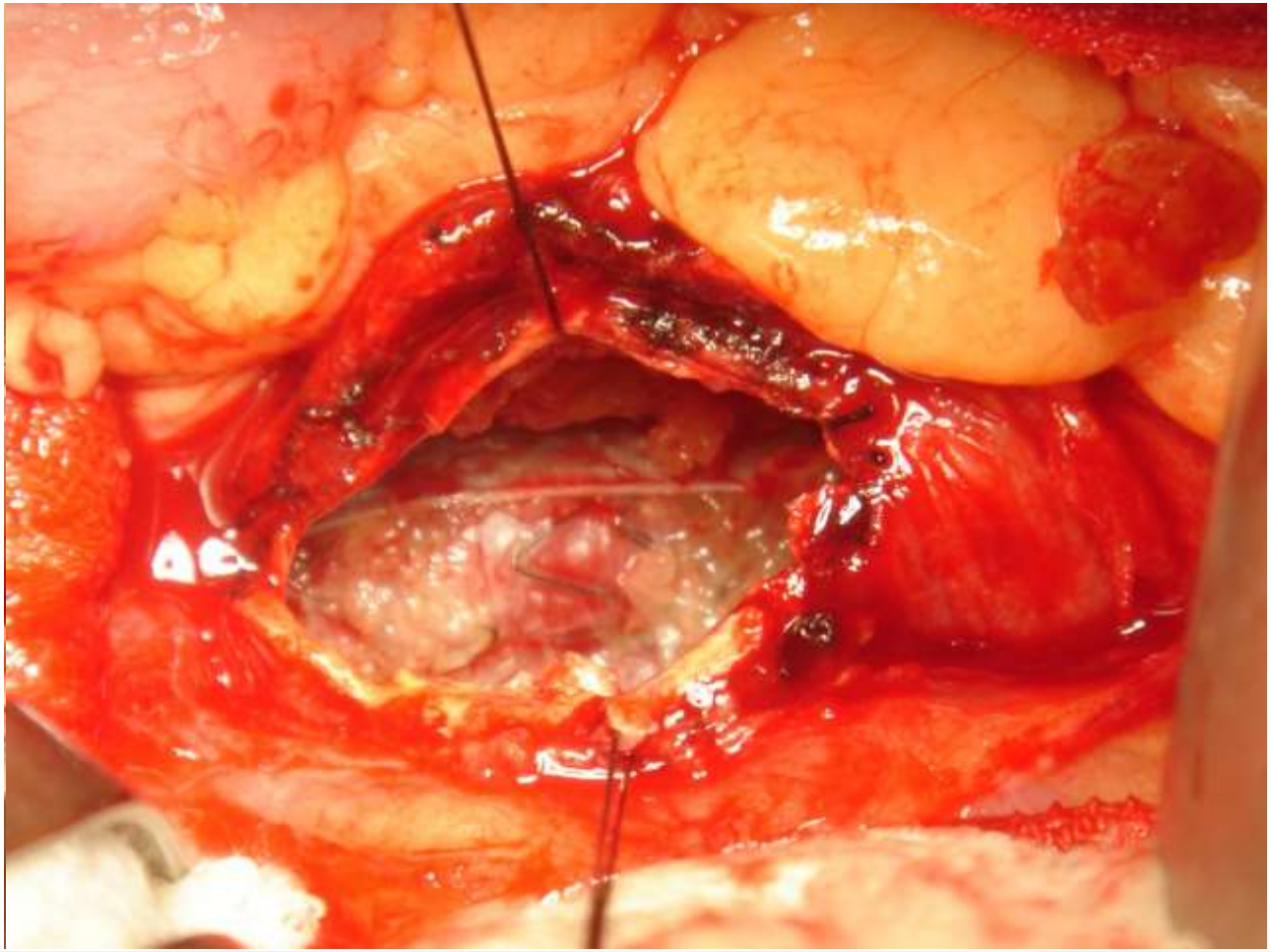
Graft Sparing and Preserving Procedures

Rupture with no obvious endoleak



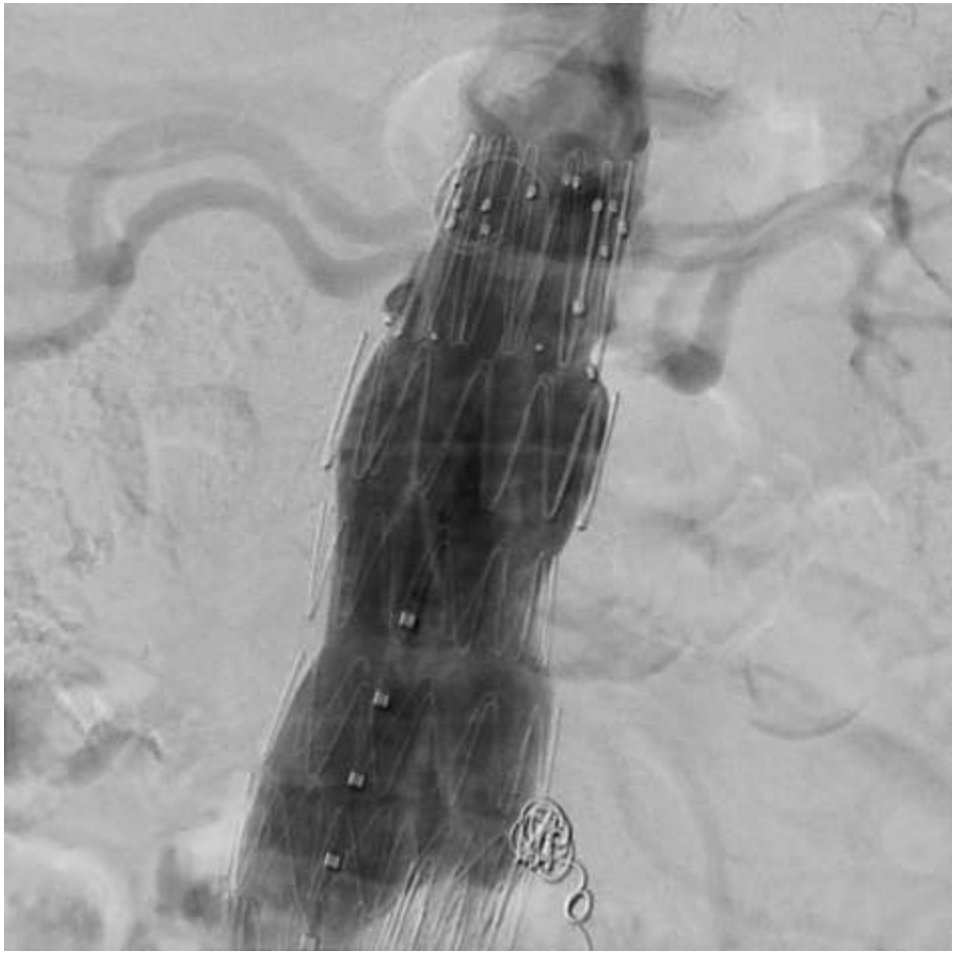
Graft Sparing and Preserving Procedures

Rupture with no obvious endoleak (IMA bleeding in wall)



Graft Sparing and Preserving Procedures

WRAP:Type IA endoleak / dilating neck, multiple Renals and CAD



Graft Sparing and Preserving Procedures

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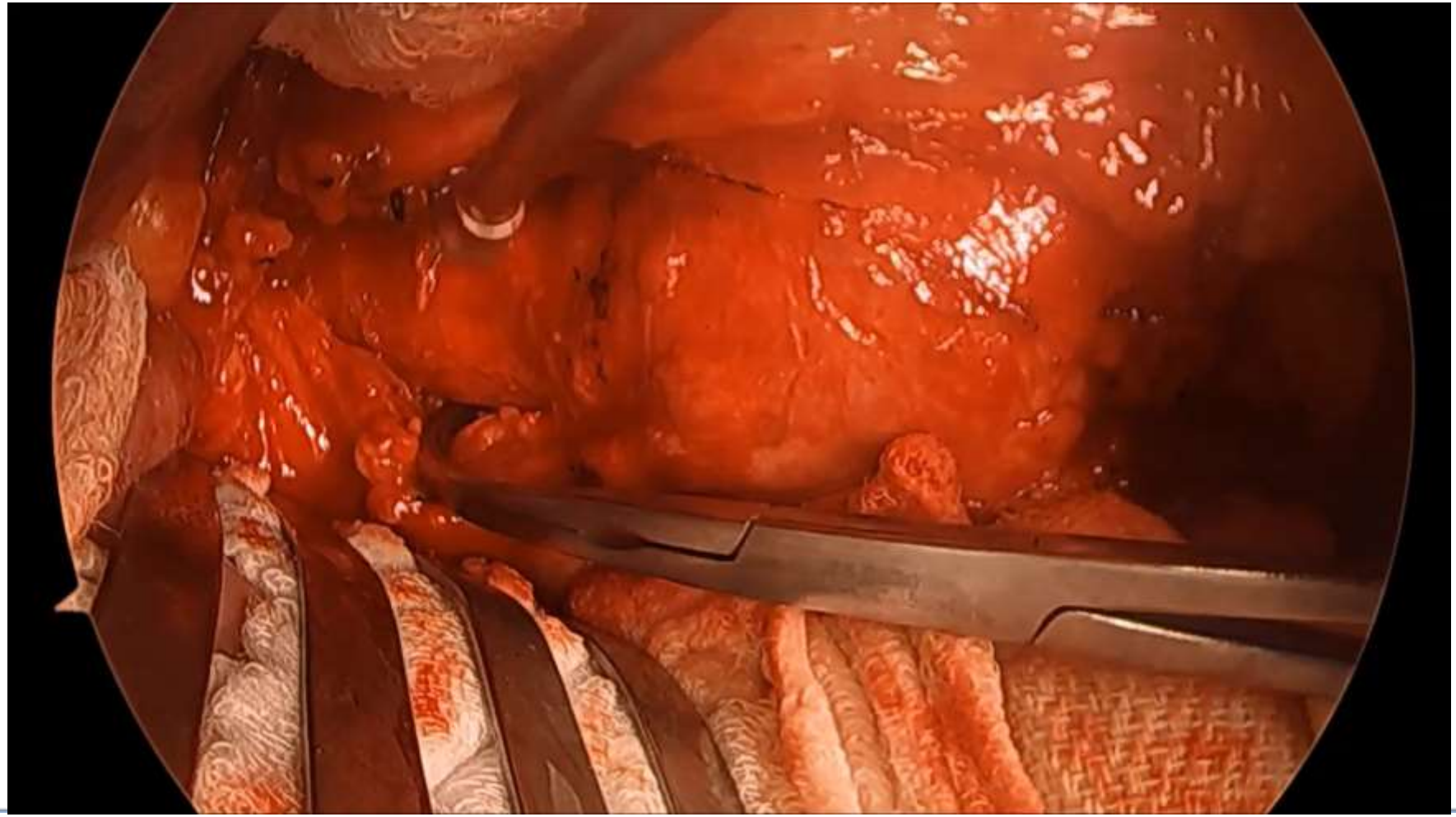
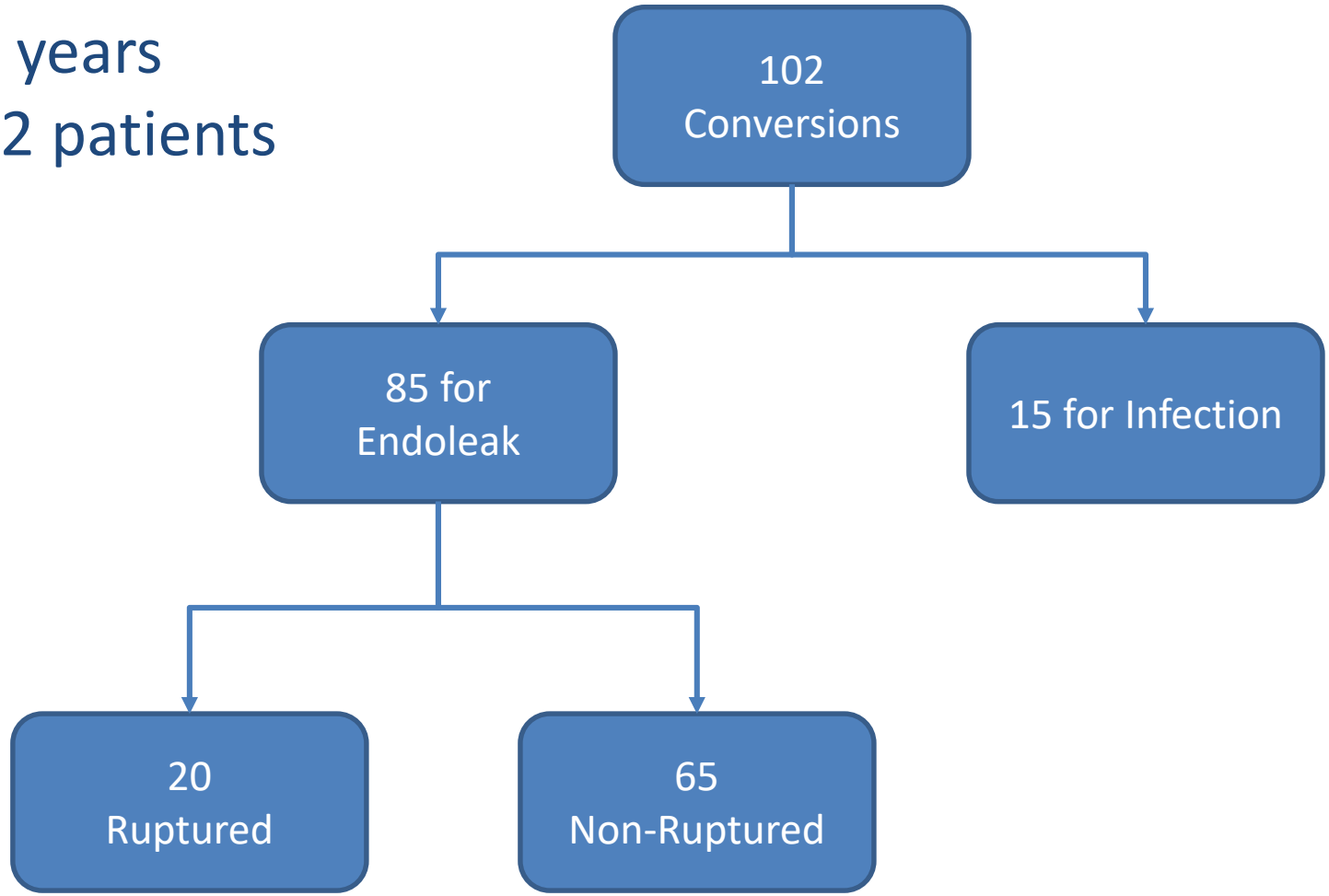


Graft Sparing and Preserving Procedures

WRAP:Type IA endoleak / dilating neck, multiple Renals and CAD

UPMC Review (accepted in JVS not published yet)

- ✓ 15 years
- ✓ 102 patients



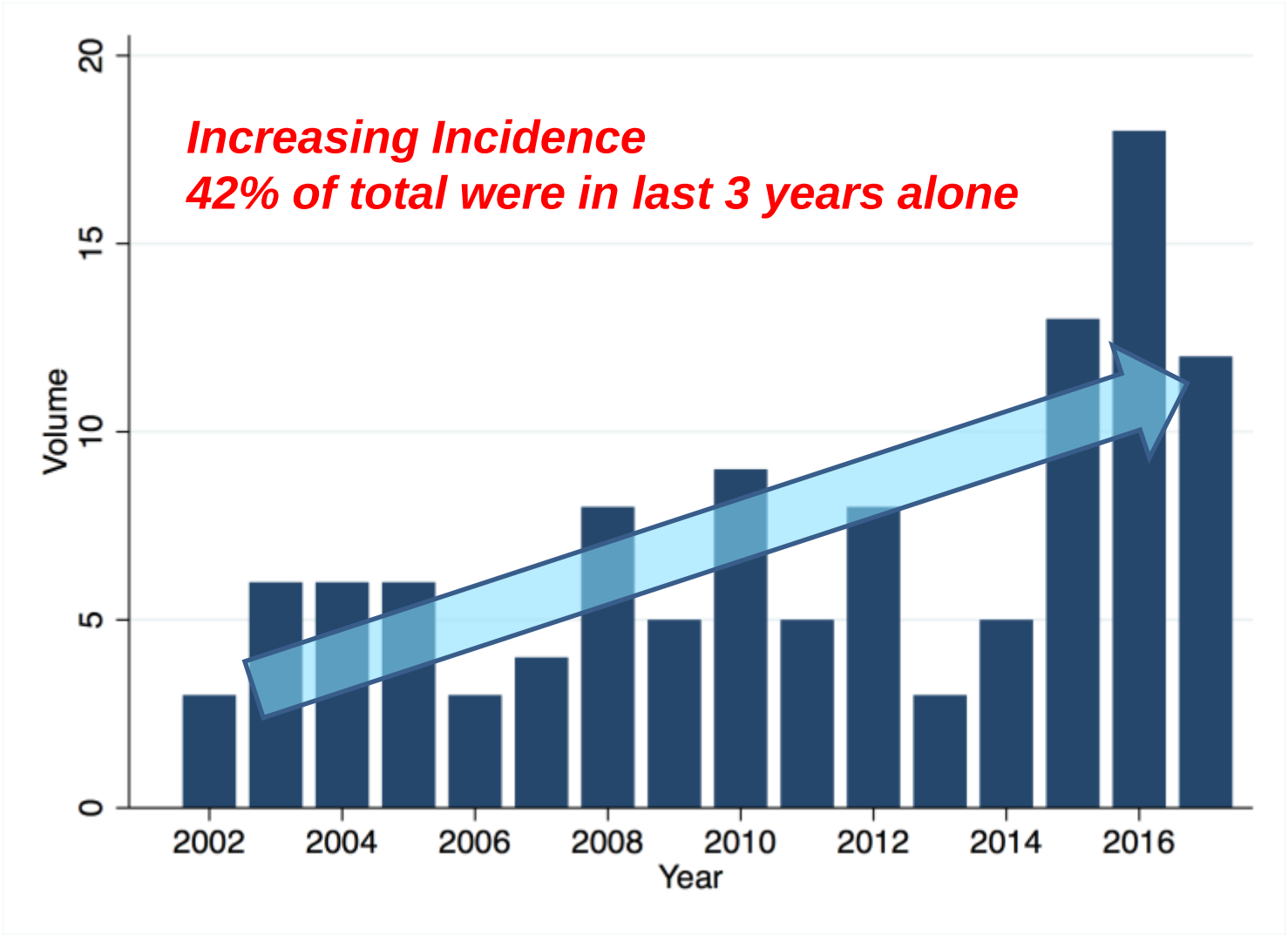
UPMC Review

EVAR graft and History	Mean ± SD or Percentage N = 102
Endograft	
Gore Excluder	28.9%
Ancure	15.7%
Medtronic AneuRx	14.5%
Endologix AFX	12.1%
Cook Zenith	10.8%
Others	18.0%
Time from EVAR to Conversion	3.8 ± 3.1 years
Endo Re-Interventions	48.5%
Number of Interventions	1.9 ± 1.0
Reasons for Intervention (more than 1)	
Type IA Endoleak	43.2%
Type IB Endoleak	22.7%
Type II Endoleak	60.0%
Type III Endoleak	6.8%

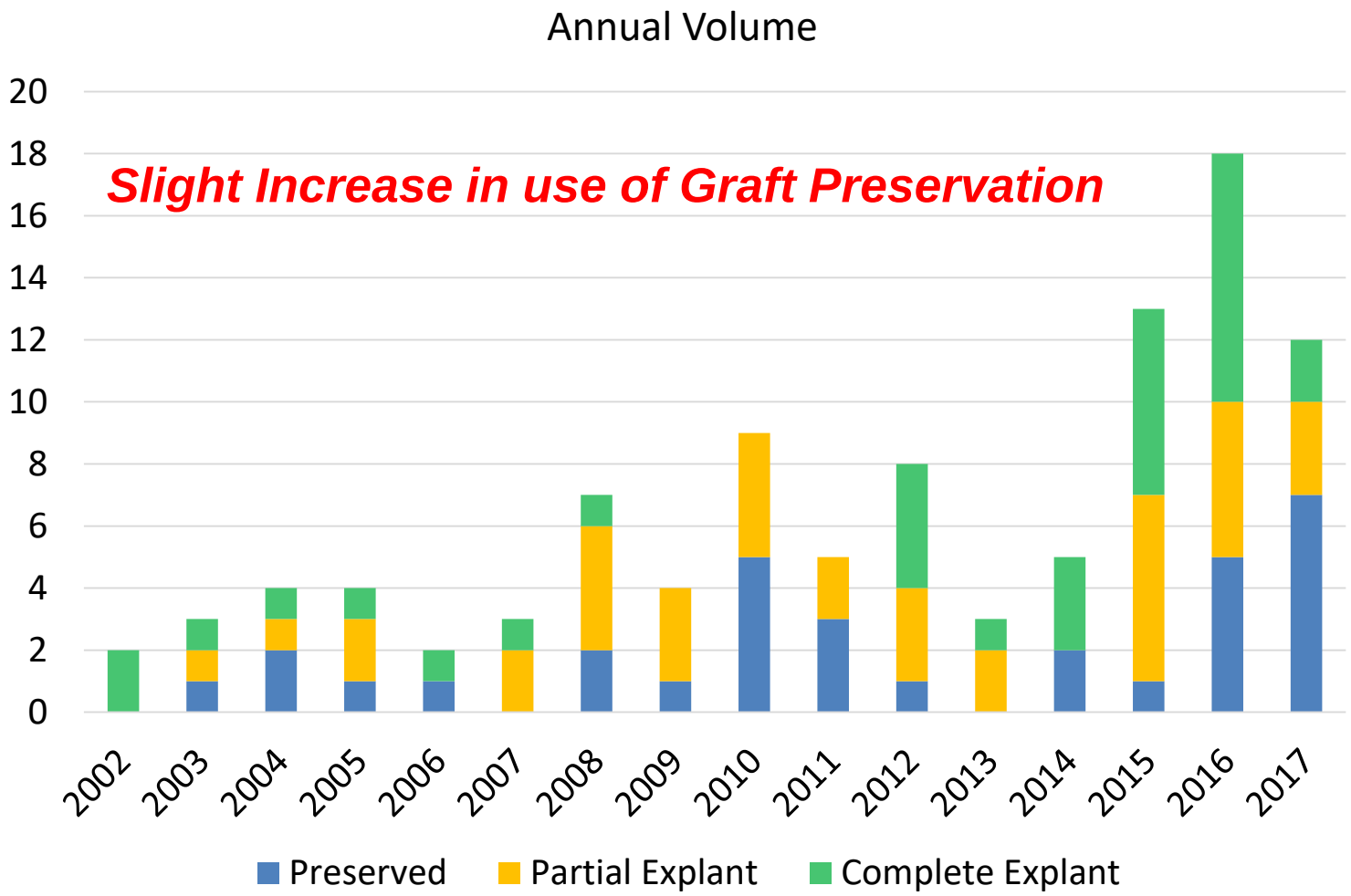
UPMC Review

Operative Details	Mean ± SD or Percentage N = 102
AAA Size at Conversion, cm	7.0 ± 2.2
Operative time, min	265.9 ± 130.0
Estimated blood loss, L	3.0 ± 3.9
Clamp Location	
Supraceliac	23.5%
Suprarenal	34.3%
Infrarenal	15.7%
None	26.5%

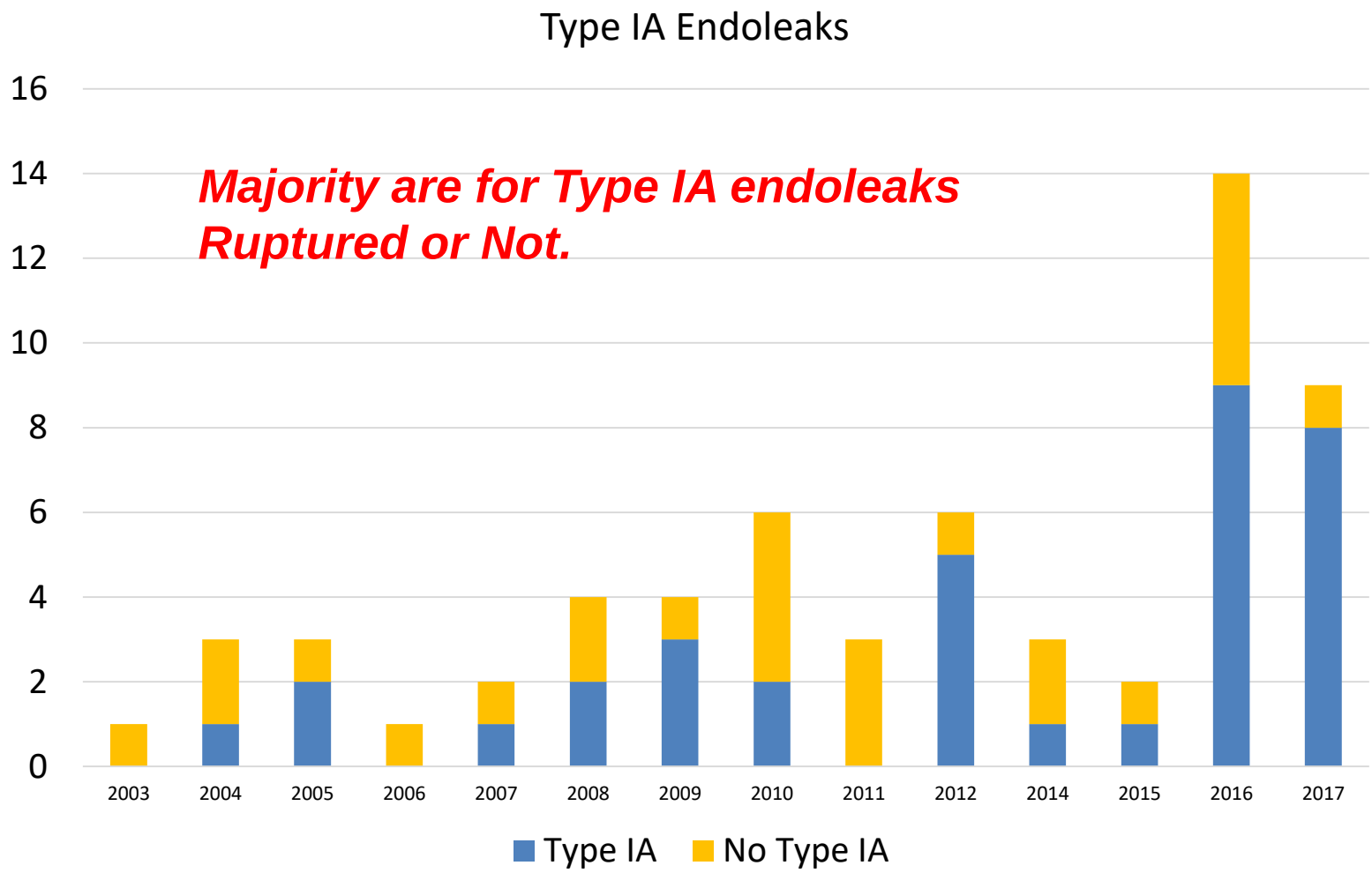
UPMC Review


Increasing Incidence
42% of total were in last 3 years alone
Volume
0
5
10
15
20
2002
2004
2006
2008
2010
2012
2014
2016
Year

UPMC Review


Annual Volume
Slight Increase in use of Graft Preservation
20
18
16
14
12
10
8
6
4
2
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Preserved
Partial Explant
Complete Explant

UPMC Review


Type IA Endoleaks
16
14
12
10
8
6
4
2
0
Majority are for Type IA endoleaks
Ruptured or Not.
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2015
2016
2017
Type IA
No Type IA

UPMC Review

Outcome	Infection N = 15	Endoleak, Ruptured N = 20	Endoleak, Non-Ruptured N = 65	P-value
Death	40.0%	40.0%	6.2%	< 0.001
LOS, median/IQR	12 [8-28]	12 [9-30]	7 [6-11.5]	0.001
Any complication	66.7%	45.0%	38.5%	0.14
AKI	33.3%	15.0%	7.7%	0.03

Predictor of mortality	Multivariate OR	95% CI	P-value
Rupture	6.70	1.75 – 25.60	0.005
Infection	8.48	1.99 – 36.20	0.004
Supraceliac clamp	4.80	1.47 – 15.66	0.009

UPMC Review

Outcome	Graft Explantation N = 37	Graft Preservation N = 28	P-value
Death	8.1%	3.6%	0.63
LOS, median/IQR	7 [6-12]	6 [5-10]	0.39

❖ *For the 65 Elective Cases for Endoleaks:*
Limited procedures with graft preservation (ligation of lumbars or neck banding…) appeared to have a reduction of operative mortality in half.

UPMC Review

Some Reinterventions have occured in survivors: We are still learning!

Mean follow-up: 3.0 years

- ✓ In Explantation group (1/37):
  - **Rupture from type IB endoleak at 1.8 years (limbs were partially explanted in the initial conversion)**
- ✓ In Graft preservation group (2/28):
  - **Type II endoleak from lumbar artery at 11.7 months, after initial isolated IMA ligation; treated by embolization**
  - **Type IA endoleak at 1.7 years, after initial isolated IMA ligation; treated with proximal cuff**

Increasing Use of Open Conversion

Late graft explants in endovascular aneurysm repair

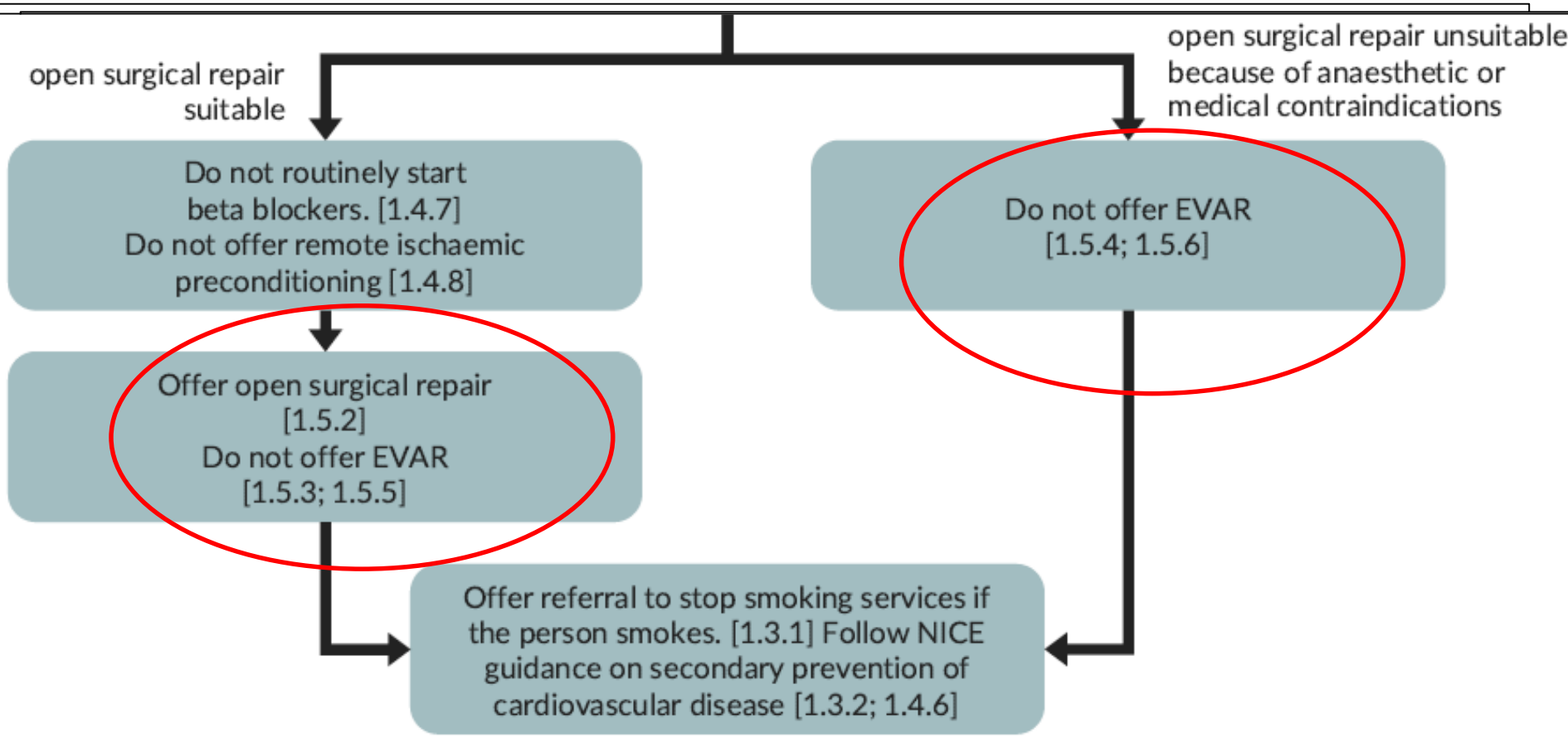
Eric J. Turney, MD, Sean P. Steenberge, MS, Sean P. Lyden, MD, Matthew J. Eagleton, MD, Sunita D. Srivastava, MD, Timur P. Sarac, MD, Rebecca L. Kelso, MD, and Daniel G. Clair, MD,
Cleveland, Ohio

- ✓1999-2012
- ✓100 patients with total or partial explantation
- ✓Median length of time from EVAR: 41 Months
- ✓ Mortality 17%
  - **Ruptures: 56%**
  - **All Non Elective cases: 37%**
  - **Elective Mortality: 10%**

Summary

- ✓ Open Conversion is still required in many EVAR failures
- ✓ Frustration with ineffective endovascular solutions is driving an increase in utilization of Open Conversion
- ✓ Conversion carries a higher mortality and morbidity than de novo repair especially in patients with ruptures or infection
- ✓ Explantation is not required in all cases. Limited interventions with suturing of lumbars and neck wrapping are effective, safe and may reduce mortality and morbidity of conversions
- ✓ Proper patient selection for graft preservation is key to success

Interest in Open Conversions Increasing: 2018



NICE National Institute for Health and Care Excellence

This is a summary of draft recommendations on diagnosis and management of abdominal aortic aneurysm.
See www.nice.org.uk/guidance/NGXX

Open Aortic Experience

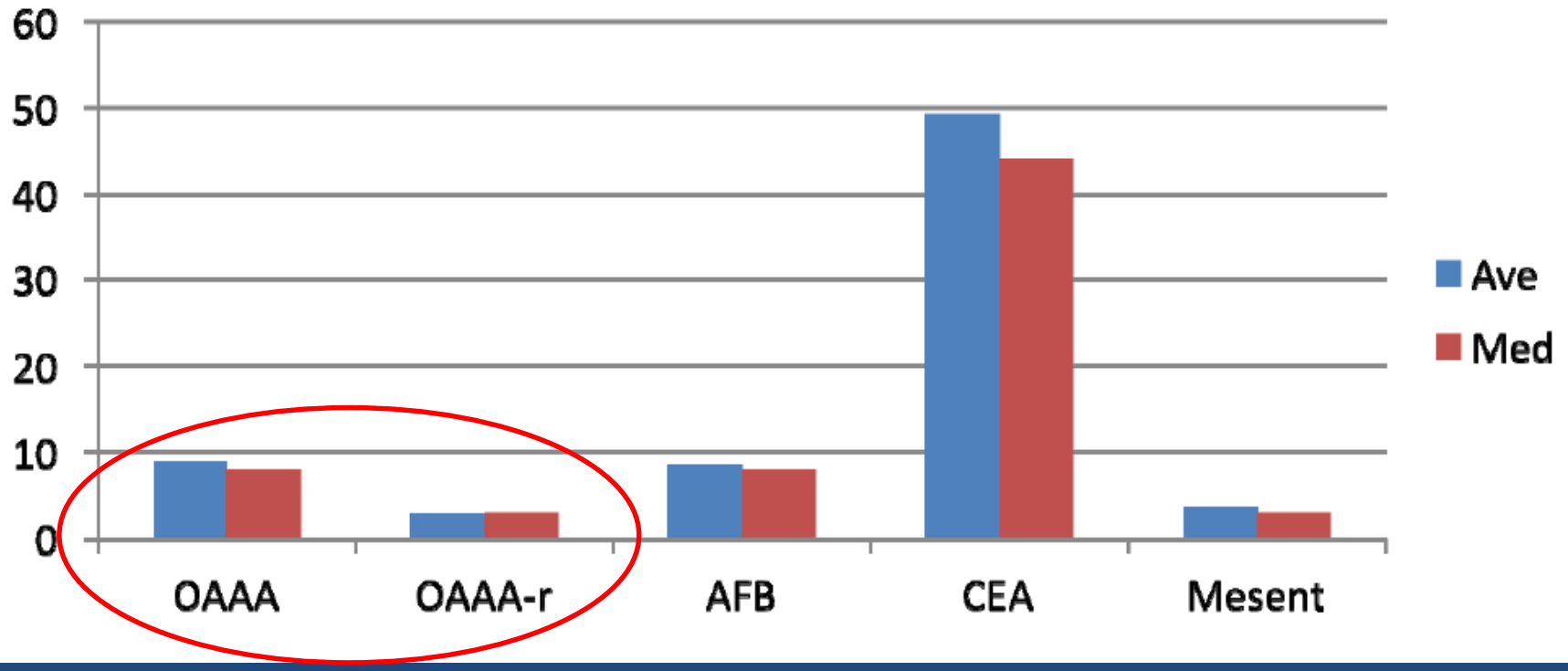
Predicted shortfall in open aneurysm experience for vascular surgery trainees

Anahita Dua, MD, MS, MBA,[a,b] Gilbert R. Upchurch Jr, MD,[c] Jason T. Lee, MD,[d] John Eidt, MD,[e] and Sapan S. Desai, MD, PhD, MBA,[f] *Houston, Tex; Milwaukee, Wisc; Charlottesville, Va; Stanford, Calif; Greenville, SC; and Durham, NC*

- **Open AAA cases 42,872 in 2000 decreased to 10,039 in 2011**
- **EVAR increased from 2,358 (5.2%) to 35,028 (76.5%)**
- **In 2011 6,055 cases in teaching institutions**
- **Vascular trainees will complete about 10 open AAA cases in 2015 and 5 in 2020**

Open Aortic Experience

2016 Board examinees
Operative Experience



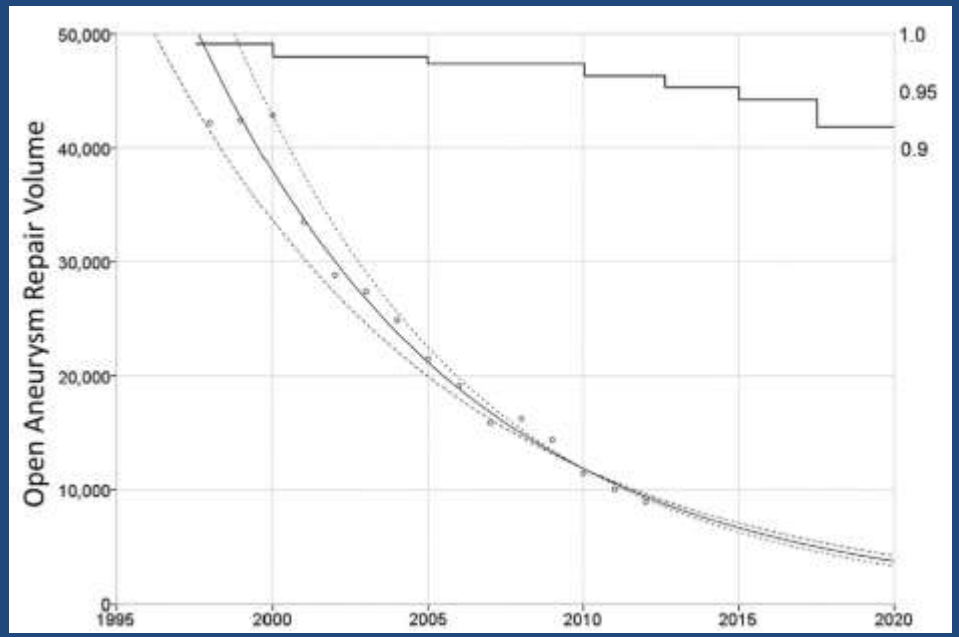
Open Aortic Experience

Progressive shortfall in open aneurysm experience for vascular surgery trainees with the impact of fenestrated and branched endovascular technology

Anahita Dua, MD, MS, MBA,[a] Steven Koprowski, BS,[a] Gilbert Upchurch, MD,[b] Cheong J. Lee, MD,[a] *and* Sapan S. Desai, MD, PhD, MBA,[c] *Milwaukee, Wisc; Charlottesville, Va; and Springfield, Ill*

Updated prediction with more recent data including FEVAR / BEVAR

Trainees will perform 2-3 open AAA by 2020



J Vasc Surg 2017;65:257-61

Take Home Message

We better maintain our Open Skills and ensure the transfer of those skills to the new generation of surgeons


UPMC