With Failed EVAR, When Is F/BEVAR The Best Treatment: Tips And Tricks For Performing It Successfully

Andres Schanzer, MD

November 21st, 2024
Veith Symposium, New York, NY

Disclosures

- Cook Medical, Phillips Imaging, Cryolife
  - Research grants
  - Case proctor
  - Consultant

All compensation goes to UMass Memorial Foundation and none to me personally.

Background: EVAR Failure is Common

Predictors of Abdominal Aortic Aneurysm Sac Enlargement After Endovascular Repair

Andres Schanzer, MD; Roy K. Greenberg, MD; Nathanael Hevelone, MPH; William P. Robinson, MD; Mohammad H. Eslami, MD; Robert J. Goldberg, PhD; Louis Messina, MD

10,228 EVAR patients (2002-2008)

5-year post-EVAR AAA sac enlargement 41%

31% of patients outside "most liberal" IFU

AAA sac enlargement more common in cases outside of IFU

Schanzer et al, Circulation, 2011.

Background: EVAR Failure is Common

Long-Term Outcomes of Abdominal Aortic Aneurysm in the Medicare Population

39,996 EVAR patients.
"Aneurysm rupture occurred in 5.4% of patients after EVAR…."

	Total n=3453	Complex AAA n=1096
Age at index procedure, mean (std)	73.5 (8.3)	75.1 (7.5)
Male sex	2423 (70)	877 (80)
Race (can select more than one		
American Indian or A		
Native Hawaiian or Pa		
Ot		
Hispanic ethnicity		
Comorbidities		
Renal failure requ		
Hypertension	3169 (92)	993 (91)
Current tobacco use	933 (27)	309 (28)
Prior EVAR	531 (16)	227 (24)
Technical success	3327 (97)	1068 (98)
ICU LOS days, mean (std)	3.3 (5.4)	2.0 (3.4)
Total LOS days, mean (std)	6.4 (9.4)	4.8 (9.4)

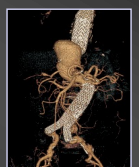
US-ARC
United States Aortic Research Consortium
PS-IDE x 10

Background: FEVAR Conversion

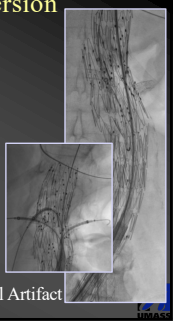
Technical Challenges

Suprarenal Stents
+/- Stents/Snorkels

Short Main Body
Infrarenal Devices



Angulation
Stiff Limbs



Metal Artifact

Background: FEVAR Conversion

Fenestrated Stent-Grafts for Salvage of Prior Endovascular Abdominal Aortic Aneurysm Repair

A. Katsargyris [a], D. Yazar [a,b], K. Oikonomou [a], F. Bekkema [c], I. Tielliu [c], E.L.G. Verhoeven [a,c]

Eur J Vasc Endovasc Surg 2013

- Technical success in 24/26 (92%) patients
- 30 day mortality 0%
- Successful target vessel stenting 95% (70/74)

Late rescue of proximal endograft failure using fenestrated and branched devices

Zenia Martin, MD,[a] Roy K. Greenberg, MD,[a,b] Tara M. Mastracci, MD,[a] Matthew J. Eagleton, MD,[a] Adrian O'Callaghan, MD,[a] and James Benn, MS,[a] *Cleveland, Ohio*

JVS 2014

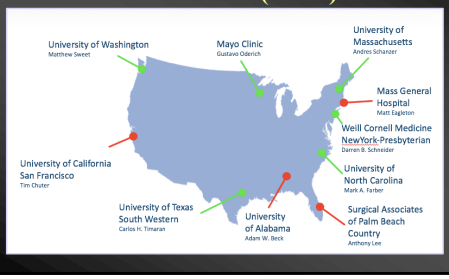
- Technical success in 44/52 (85%) patients
- 30 day mortality 3.8%
- Successful target vessel stenting 92% (71/77)

Aims:

1. **Evaluate the use of fenestrated branched endovascular aortic repair (F/BEVAR) for the treatment of patients with prior EVAR failure.**

2. **Compare outcomes of F/BEVAR after failed EVAR to outcomes of F/BEVAR without prior EVAR.**

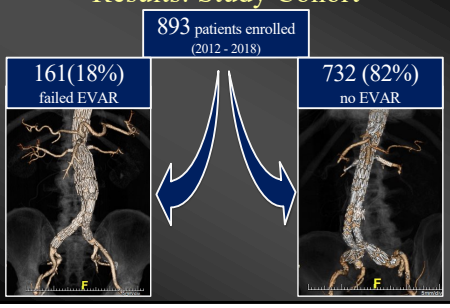
United States Aortic Research Consortium (ARC)



Methods

- Prospectively collected data from 6 Physician-Sponsored Investigational Device Exemption studies (2012-2018)
  - All consecutive procedures at each participating site
  - Juxtarenal, pararenal, and thoracoabdominal aneurysms
  - All repairs included >1 fenestration and/or branch
- Cohort was stratified according to whether the F/BEVAR procedure was performed after EVAR failure
  - Failed EVAR vs No EVAR

Results: Study Cohort



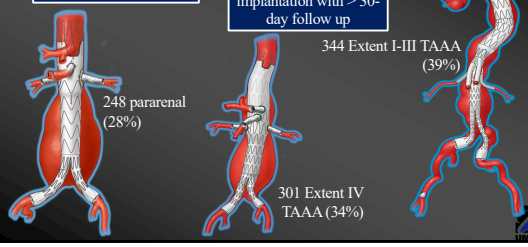
Results: Study Cohort

	Total (n=893)	No EVAR (n=732)	Failed EVAR (n=161)	P-value
Men	622 (70)	486 (66)	136 (84)	<0.0001
Mean (SD) Age	71 (14)	71 (14)	70 (17)	0.27
Comorbidities				
Coronary artery disease	441 (49)	355 (49)	86 (53)	0.26
Cerebrovascular disease	306 (91)	243 (33)	63 (39)	0.15
Hypertension	809 (91)	657 (90)	152 (94)	0.07
Hyperlipidemia	655 (73)	531 (73)	124 (77)	0.24
Diabetes mellitus	126 (14)	103 (14)	23 (14)	0.94
Chronic obstructive pulmonary disease	355 (40)	291 (40)	64 (40)	0.99
Renal failure requiring dialysis	10 (1.1)	8 (1.1)	2 (1.2)	0.70
Cancer	109 (12)	94 (13)	15 (9.3)	0.22
Aneurysm size (max diameter, mm) (mean (SD))	65 (13)	64 (11)	69 (17)	<0.001

Results: Aneurysm Extent

893 patients enrolled (2012 - 2018)

All patients had implantation with > 30-day follow up

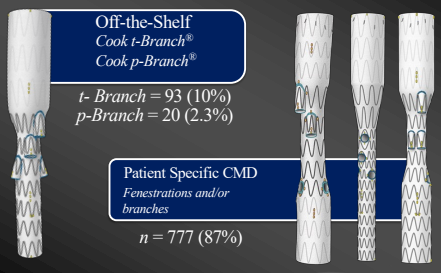


248 pararenal (28%)

344 Extent I-III TAAA (39%)

301 Extent IV TAAA (34%)

Results: Devices Used



Off-the-Shelf
Cook t-Branch®
Cook p-Branch®

t- Branch = 93 (10%)
p-Branch = 20 (2.3%)

Patient Specific CMD
Fenestrations and/or branches

n = 777 (87%)

Results: Target Vessels

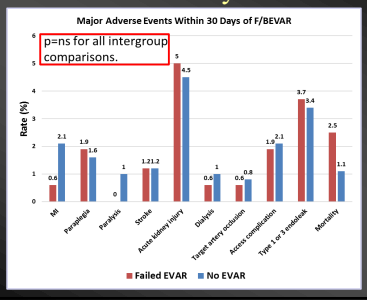
3209 target visceral arteries (3.6/patient)

	Overall n = 3209	No EVAR n = 732	Failed EVAR n = 161	P value
	n (Percent) or Mean ± Standard Deviation			
Vessels per patient	3.6 (0.7)	3.6 (0.7)	3.6 (0.7)	0.74
Fenestrations	2.4 (1.6)	2.4 (1.6)	2.4 (1.7)	0.99
Branches	1.1 (1.5)	1.0 (1.5)	1.2 (1.7)	0.15
Scallops	0.2 (0.4)	0.2 (0.4)	0.1 (0.3)	0.003

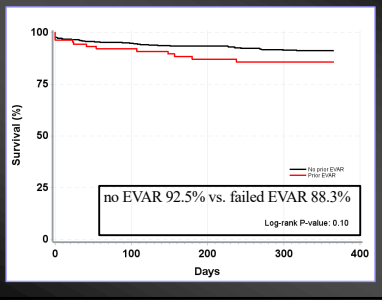
Results: Operative Characteristics

	No EVAR n = 732	Failed EVAR n = 161	P value
Number of target vessels	3.6 (0.6)	3.6 (0.7)	0.77
Dose area product (mGy·cm²)	82842 (158925)	154572 (218543)	<0.001
Exam dose (mGy)	2924 (2987)	4753 (18304)	0.01
Volume of contrast used (mL)	111 (59)	97 (55)	0.01
Operative times (hours)			
In OR to incision	1.8 (1.3)	1.9 (1.0)	0.63
Incision to surgery end	4.6 (1.7)	5.2 (2.6)	0.002
In OR to out of room	6.7 (2.1)	6.9 (1.9)	0.30
Technical success	579 (97)	132 (99)	0.15
ICU length of stay (mean, SD)	2.9 (4.1)	2.9 (3.4)	0.88
Hospital length of stay (mean, SD)	6.1 (15)	6.8 (10)	0.57

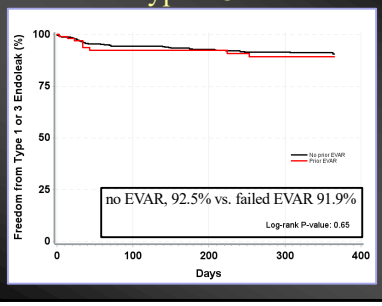
Results: 30-Day Events



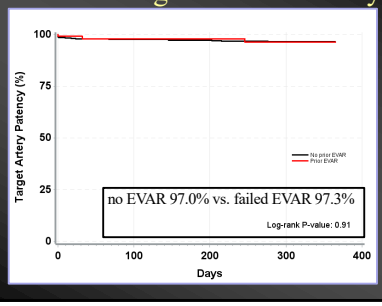
Results: Survival



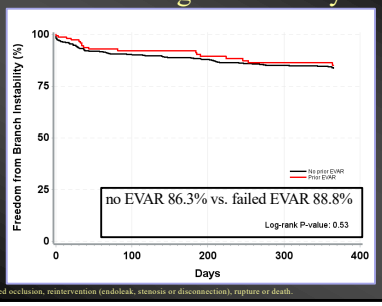
Results: Type 1/3 Endoleak



Results: Target Vessel Patency

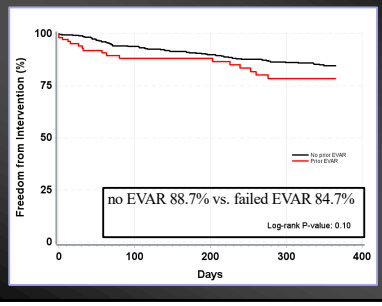


Results: Target Instability*



*Target vessel-related occlusion, reintervention (endoleak, stenosis or disconnection), rupture or death.

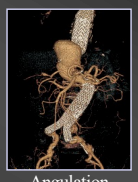
Results: Reinterventions



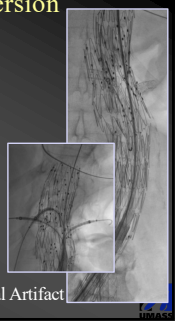
Background: FEVAR Conversion

Technical Challenges

Suprarenal Stents
+/- Stents/Snorkels



Angulation
Stiff Limbs



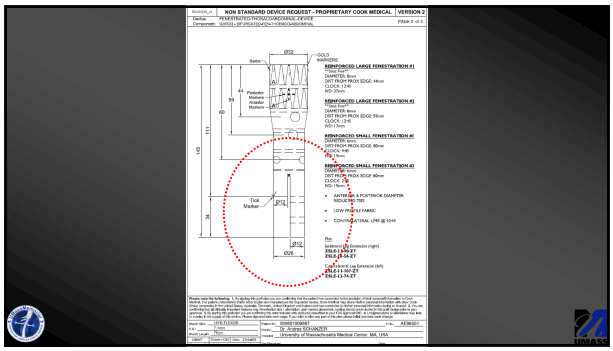
Metal Artifact

Short Main Body
Infrarenal Devices

Background: FEVAR Conversion

Technical Tips

- Preloaded systems help deal with metal artifact and it is significantly advantageous to start with sheath/catheter outside of the fenestration/branch
- All commercially available suprarenal stents can be traversed and allow for briding stent graft placement
- Palmaz stents across visceral arteries can be traversed but difficult (or impossible) to get bridging stent graft to fully expand
- Prior endoanchors do not complicate the procedure
- Through and through wire can help navigate stiff angulated limbs
- Worthwhile to reline entire graft
- Seal must be obtained above an EVAR bare stent


NON STANDARD DEVICE REQUEST - PROPRIETARY COOK MEDICAL

In Summary

F/BEVAR is safe and effective in patients with prior failed EVAR, with nearly identical outcomes as compared to patients without prior EVAR.

Differences in procedural metrics indicate higher level of technical challenge when performing F/BEVAR in patients with prior failed EVAR.

Conclusion

F/BEVAR, at high volume centers, is a viable option for the treatment of EVAR failure that compares favorably to historical reports of open conversion.

Thank You.