Complications After Complex Endovascular Aortic Repair:

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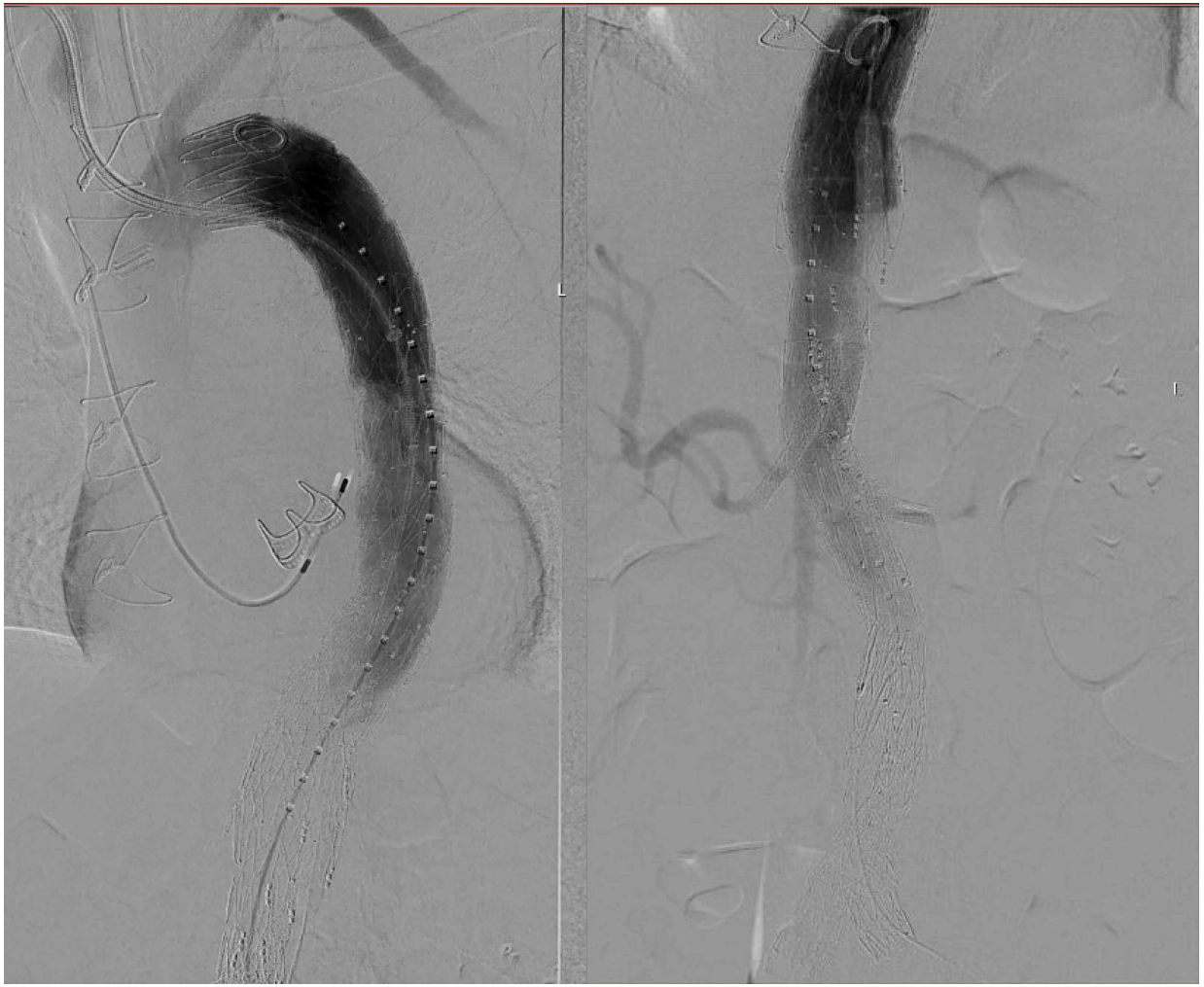
Disclosures

- I have the following relationships with commercial interests:
  - Speakers Bureau/Honoraria: (Cook Medical)
  - Consulting Fees: (Cook Medical)

Case

- 64M with 48mm Extent IV Thoraco.
- Underwent ascending repair at 62 y/o
  - Multiple complications post op – stroke (resolved), prolonged intubation, respiratory complications.
  - Known 48mm TAAA undergoing surveillance.
  - Back at work >1 year later.
- Presents with chest pain/back pain.
- No relief with anti-impulse control.

Operative plan: TEVAR/TBRANCH/EVAR



Small TII endoleak
No intraop complications

Post-op

- Back pain resolves.
- No SCI.
- MAP maintained >85
- Develops progressive thrombocytopenia -->30s.
  - HIT assay neg.
  - Often self limited.
  - Heme suggested against transfusion unless bleeding.

Thrombocytopenia is common after endovascular repair of TAAA and AD

Combination of consumption from sac thrombosis + immunogenic response Associated with negative outcomes in multiple studies

› Ann Vasc Surg. 2022 Feb:79:106-113. doi: 10.1016/j.avsg.2021.08.036. Epub 2021 Oct 21.

Platelet Depletion after Thoraco-Abdominal Aortic Aneurysm Endovascular Repair is Associated with Clinically Relevant Hemorrhagic Complications

Rodolfo Pini [1], Gianluca Faggioli [2], Enrico Gallitto [2], Chiara Mascoli [2], Cecilia Fenelli [2], Cecilia Angherà [2], Antonino Logiacco [2], Stefano Ancetti [2], Mauro Gargiulo [2]

Affiliations + expand

PMID: 34688873 DOI: 10.1016/j.avsg.2021.08.036

Association between platelet counts and morbidity and mortality after endovascular repair for type B aortic dissection

Enmin Xie, Jitao Liu, Yuanhui Liu, Yuan Liu, Ling Xue, Ruixin Fan, ...show all

Pages 73-81 | Received 31 May 2020, Accepted 03 Nov 2020, Published online: 19 Nov 2020

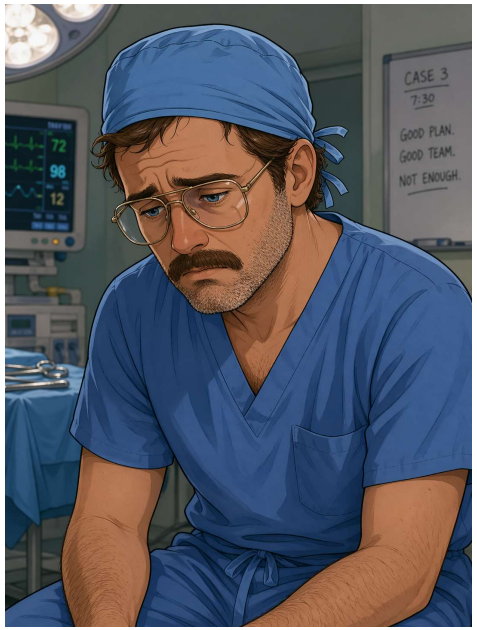
Cite this article https://doi.org/10.1080/09537104.2020.1847266 Check for updates

POD 6 – decreased LOC + right arm weakness.

Clinical course contd.

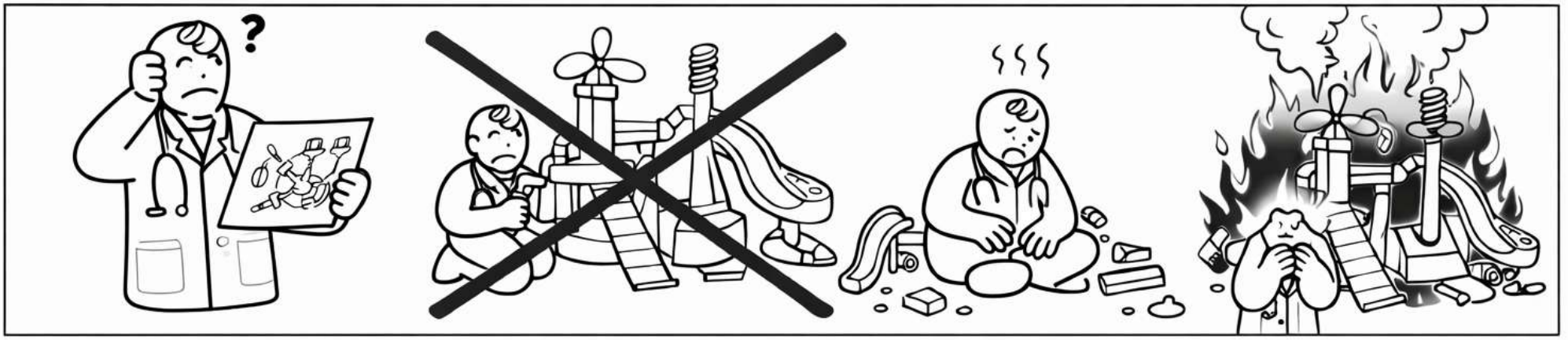
- Transferred to neurosurgery
- Reduced BP to manage ICH
- New onset paraplegia on POD 8
  - No lumber drain inserted due to active SAH
  - No indication for EVD

- Multitude of complications:
  - PEG TUBE
  - Sacral ulcer
  - Pneumonia, UTI, LGIB
  - Transfer to LTC – full care required…
  - Died 8 months post op.



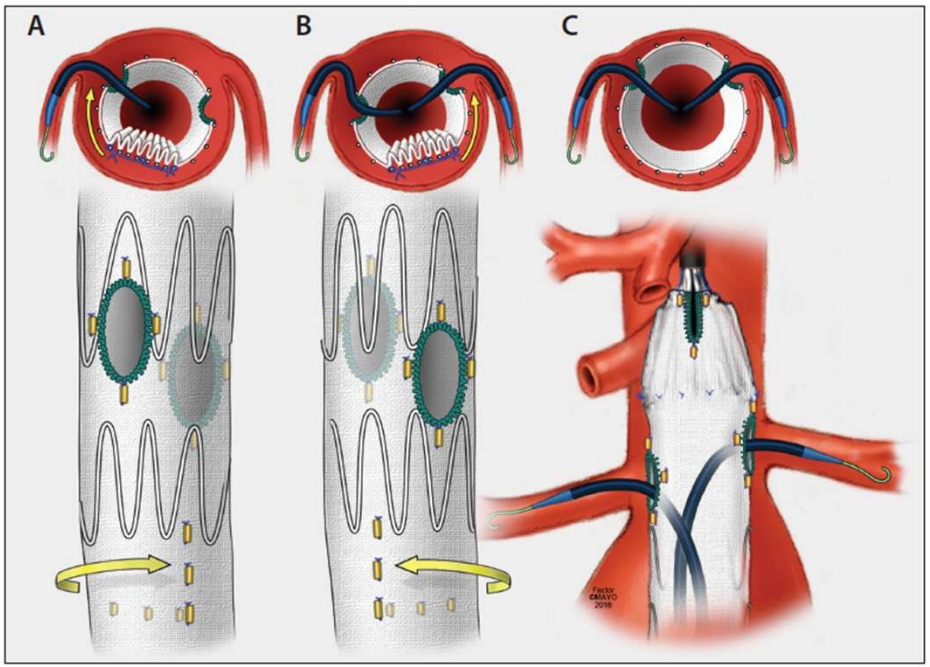
Complications with FBEVAR is a broad topic

- Planning errors.
- Intraoperative complications
- Perioperative complications
- Long term complications



Intraoperative problems

- Graft malalignment
- Target vessel occlusion/dissection/rupture
- Inability to cannulate
- Access complications



Perioperative complications

Aorta and Major Branches

Eur J Vasc Endovasc Surg (2023) 65, 828–836

Short Term and Long Term Clinical Outcomes of Endovascular *versus* Open Repair for Juxtarenal and Pararenal Abdominal Aortic Aneurysms Using Propensity Score Matching: Results from Juxta- and pararenal aortic Aneurysm Multicentre European Study (JAMES)

Petar Zlatanovic [a,*], Daniele Mascia [b], Stefano Ancetti [c], Kak Khee Yeung [d], Maarten Jaap Graumans [d], Vincent Jongkind [d,e], Herman Viitala [f], Maarit Venermo [f], and the JAMES study group [†]

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[f] Vascular Surgery at the Helsinki University Hospital, Helsinki, Finland

5 high-volume sites.
All doing >50 open juxta-renal and >50 FEVAR / Year
Prospective database with propensity matching
>800 cases total
After propensity 145 cases matched per group

Characteristic	Endovascular group (n = 145)
Duration of intensive care unit stay − d	2.1±1.1
Duration of hospital stay − d	10.1±7.9
Complications	
Spinal cord ischaemia	3 (2.1)
Acute limb ischaemia	3 (2.1)
Bleeding requiring re-intervention	4 (2.8)
Wound dehiscence	1 (0.7)
Wound infection	1 (0.7)
Colon ischaemia	1 (0.7)
Acute coronary syndrome	2 (1.4)
Stroke	1 (0.7)
Deep venous thrombosis	1 (0.7)
Prolonged intubation	1 (0.7)
Acute kidney injury	36 (24.8)
RIFLE	
Risk	17 (11.7)
Injury	11 (7.6)
Failure	3 (2.1)
Loss	2 (1.4)
End stage	3 (2.1)
Death	
In hospital	5 (3.4)
30 day	6 (4.1)

4.1% 30-day mortality
2.1% SCI
2.1% Limb ischemia
2.8% major hemorrhage
24.8% AKI – 2.1% HD

NO DIFFERENCE IN MORTALITY
LESS MINOR RENAL COMPLICATIONS
NO DIFFERNCE IN ESRD

NO SCI IN OPEN GROUP

ORIGINAL ARTICLE

Multicenter Study to Evaluate Endovascular Repair of Extent I-III Thoracoabdominal Aneurysms Without Prophylactic Cerebrospinal Fluid Drainage

Giulianna B. Marcondes, MD, Nolan C. Cirillo-Penn, MD,†*
Emanuel R. Tenorio, MD, PhD,† Donald J. Adam, MD,‡ Carlos Timaran, MD,§*
Martin J. Austermann, MD,‖ Luca Bertoglio, MD,¶ Tomasz Jakimowicz, MD,#
*Michele Piazza, MD,** Maciej T. Juszczak, MD,‡ Carla K. Scott, MD,§*
*Bärbel Berekoven,‖ Roberto Chiesa, MD,¶ Guilherme B.B. Lima, MD,**
*Katarzyna Jama, MD,# Francesco Squizzato, MD,** Martin Claridge, MD,‡*
Bernardo C. Mendes, MD,† Gustavo S. Oderich, MD,✉*
and the Trans-Atlantic Aortic Research Consortium Investigators

Annals of Surgery • Volume 278, Number 2, August 2023

	Overall
	n = 541
Early mortality	15 (3)
Any major adverse event	70 (13)
Acute kidney injury by RIFLE criteria	31 (6)
Paraplegia (grades 3a–c spinal cord injury)	22 (4)
Respiratory failure	14 (3)
Myocardial infarction	10 (1.8)
Major stroke	9 (1.7)
Bowel ischemia requiring resection	2 (0.4)
Other adverse events	
Estimate blood loss > 1 l	38 (7)
Congestive heart failure	15 (3)
Pneumonia	21 (4)
New-onset dialysis¶	7 (1.3)
Sustained hypotension	52 (11)
ICU stay (d)	3.8 ± 4 (2, 2–4)
Hospital stay (d)	9 ± 7 (7, 5–11)
Follow up (mo)	23 ± 24 (14, 3–38)

Bold values indicate statistically significant P<0.005.
†Mann-Whitney *U* test.
‡Independent samples χ^2 test.
§Fisher exact test.
¶Only 1 patient presented with permanent new-onset dialysis, for other patients, it wa
RIFLE indicates risk, injury, failure, loss, end stage renal disease.

3% Mortality
4% SCI
1.7% Stroke
6% AKI – 1.3% Dialysis

8.4% Cardiorespiratory complications

~10% life ending or life-altering complications

FBEVAR for post-dissection TAAA

From the Society for Vascular Surgery

Check for u

Multicenter trans-Atlantic experience with fenestrated-branched endovascular aortic repair of chronic post-dissection thoracoabdominal aortic aneurysms

Journal of Vascular Surgery
October 2023

246 patients
Multiple high-volume programs in USA and Europe
Prospectively collected database

Perioperative outcomes:

- **Mortality 3%**
- **SCI: 7%**
  - **3% paraparesis**
  - **4% paraplegia – 2% permanent**
- **Other Major complications: 26%**
  - **8% severe Kidney injury**
  - **1% dialysis**
  - **1% stroke**

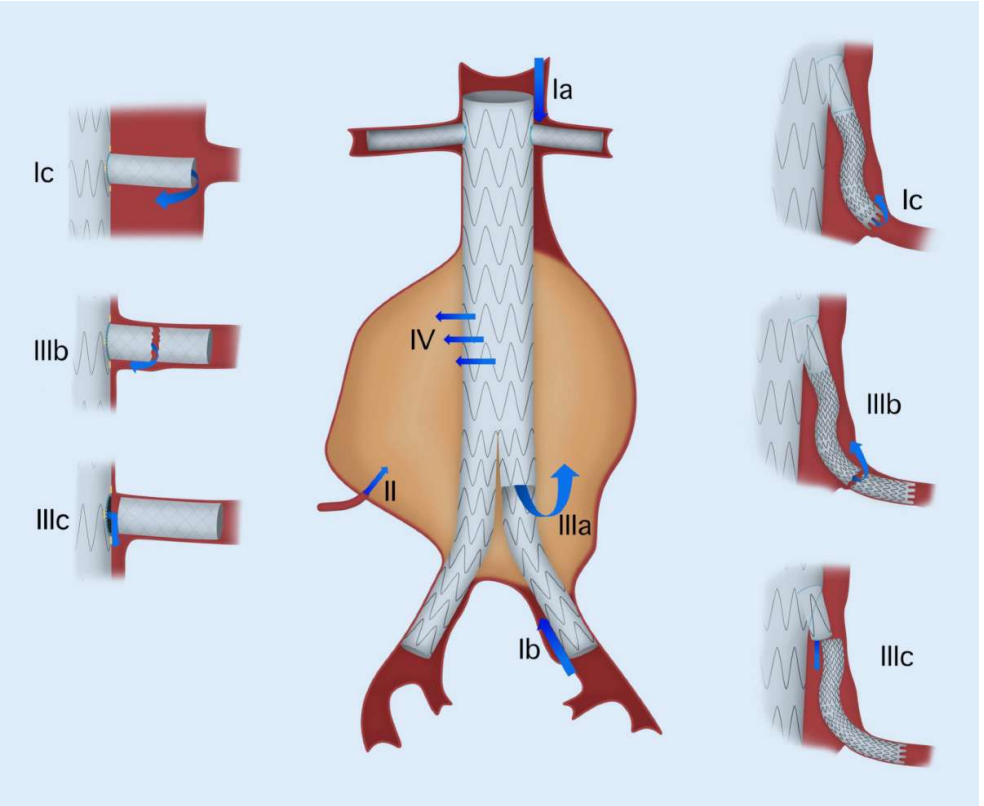
Variable	Overall (n = 246)
General anesthesia	246 (100)
Cerebrospinal fluid drainage	174 (71)
Brachial access	124 (53)
Left side	57 (24)
Right side	68 (29)
Device design	
Patient specific device	209 (85)
t-Branch	37 (15)
Iliac branch device	45 (18)
Bilateral percutaneous femoral access	153 (62)

Average procedure time:
6.05 Hours
Air Kerma (Gy) 3
Fluro time 91 minutes

Mid/Long Term

- Endoleaks
- Bridging stent instability
- In-stent stenosis
- Target vessel stenosis

<u>A substantial % of patients will require re-intervention.</u>



Characteristic	Endovascular group (n = 145)	Open repair group (n = 145)
Cause of death		
Cardiovascular	16 (11.0)	21 (14.5)
Cancer	25 (17.2)	16 (11.0)
Aortic related death	7 (4.8)	2 (1.4)
Other	17 (11.7)	17 (11.7)
Cause of aortic related re-intervention		
Endovascular group	35 (24.1)	
Type Ia endoleak	3 (8.6)	–
Type Ib endoleak	6 (17.1)	–
Type III endoleak	12 (34.3)	–
Iliac limb thrombosis	2 (5.7)	–
Renal stent stenosis or thrombosis	6 (17.1)	–
Superior mesenteric artery stent stenosis or thrombosis	3 (8.6)	–
Coeliac trunk stent stenosis or thrombosis	3 (8.6)	–

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[e] Department of Vascular Surgery, Dijklander Hospital, Hoorn, The Netherlands
[f] Vascular Surgery at the Helsinki University Hospital, Helsinki, Finland

Late aortic related mortality is 4x higher in FEVAR.
24% patients needed a re-intervention.
21/145 = Type I/III endoleak
6/145 Renal stent stenosis/thrombosis.
3/145 SMA stenosis/thrombosis.

Outcomes of endovascular repair of chronic postdissection compared with degenerative thoracoabdominal aortic aneurysms using fenestrated-branched stent grafts

Emanuel R. Tenorio, MD, PhD,[a] Gustavo S. Oderich, MD,[a] Mark A. Farber, MD,[b] Darren B. Schneider, MD,[c] Carlos H. Timaran, MD,[d] Andres Schanzer, MD,[e] Adam W. Beck, MD,[f] Fernando Motta, MD,[b] *and* Matthew P. Sweet, MD,[g] on behalf of the U.S. Fenestrated and Branched Aortic Research Consortium Investigators, *Rochester, Minn; Chapel Hill, NC; New York, NY; Dallas, Tex; Worcester, Mass; Birmingham, Ala; and Seattle, Wash*

Similar outcomes except *MUCH* higher endoleak rate in the dissection group

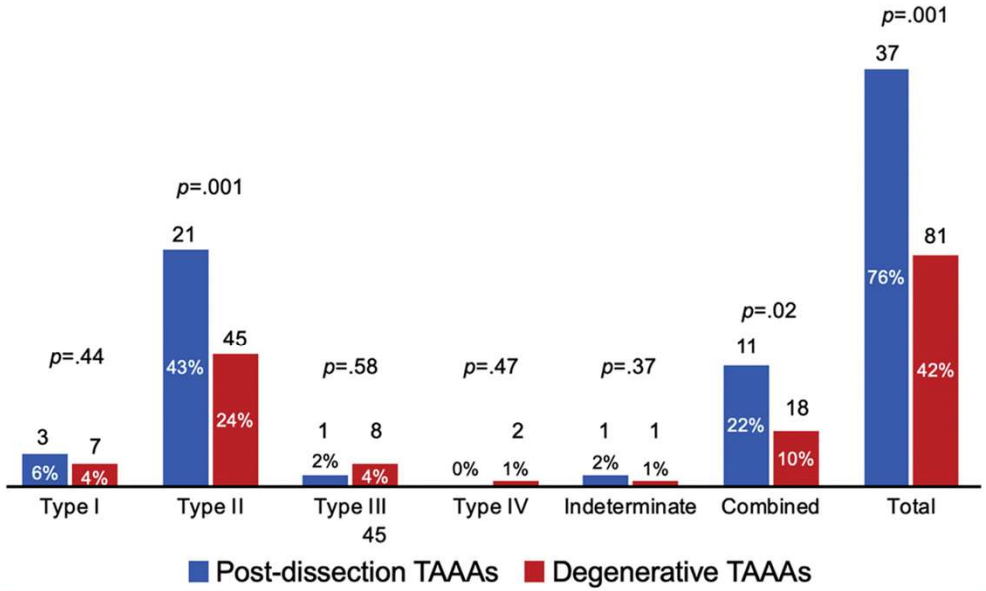
42% TAAA

76% dissection TAAA

Type I/III = 8%

Type II: 43% dissection

24% TAAA



Supplementary Fig 2 (online only). Incidence and classification of endoleaks in 236 patients treated by fenestrated and branched endovascular aneurysm repair (F/BEVAR) for postdissection thoracoabdominal aortic aneurysms (*TAAAs*) and degenerative TAAAs.

Post Dissection: Mid-term outcomes:

- Minimal aortic related mortality.
- **High** reintervention rates:
- *129 reinterventions in 94 patients (38%).*
  - **Minor= 64 patients**
  - **Major= 30 patients**

From the Society for Vascular Surgery

Multicenter trans-Atlantic experience with fenestrated-branched endovascular aortic repair of chronic post-dissection thoracoabdominal aortic aneurysms

246 patients
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What about PMEG?

JVS Journal of Vascular Surgery | SVS Society for Vascular Surgery

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CLINICAL RESEARCH STUDY | AORTA AND MAJOR BRANCHES · Volume 83, Issue 2, P382-393.E2, February 2026 Download Full Issue

Low-profile endografts are associated with increased risk of type I/III endoleaks at midterm follow-up of 1220 physician-modified fenestrated, branched endovascular repairs for complex abdominal and thoracoabdominal aortic aneurysms

Sukgu M. Han, MD, MS [a] · Ryan Gouveia Melo, MD [b] · Adam Beck, MD [c] · ... · Gustavo Oderich, MD [k] · Nikolaos Tsilimparis, MD, PhD [l] on behalf of the International Multicenter PMEG Study Group ... Show more

LOW Profile fabric: 23% Type I/III Endoleaks

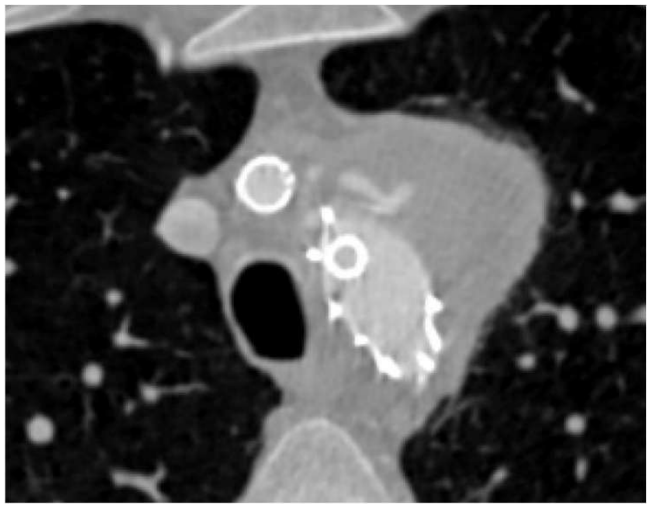
NON-Low Profile 13% Type I/III Endoleaks

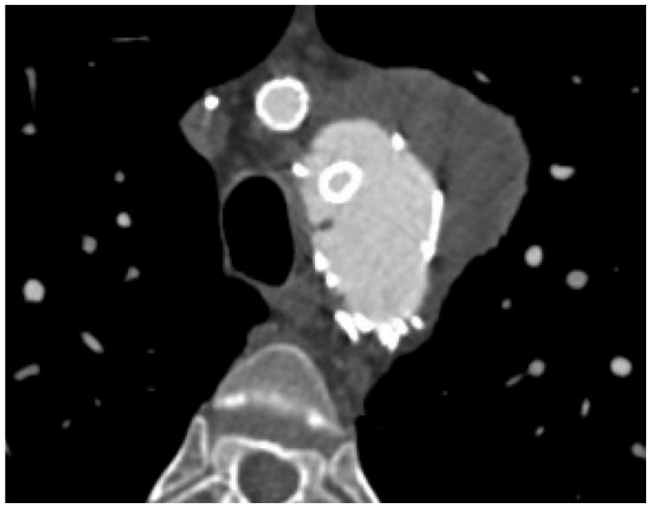
Plan

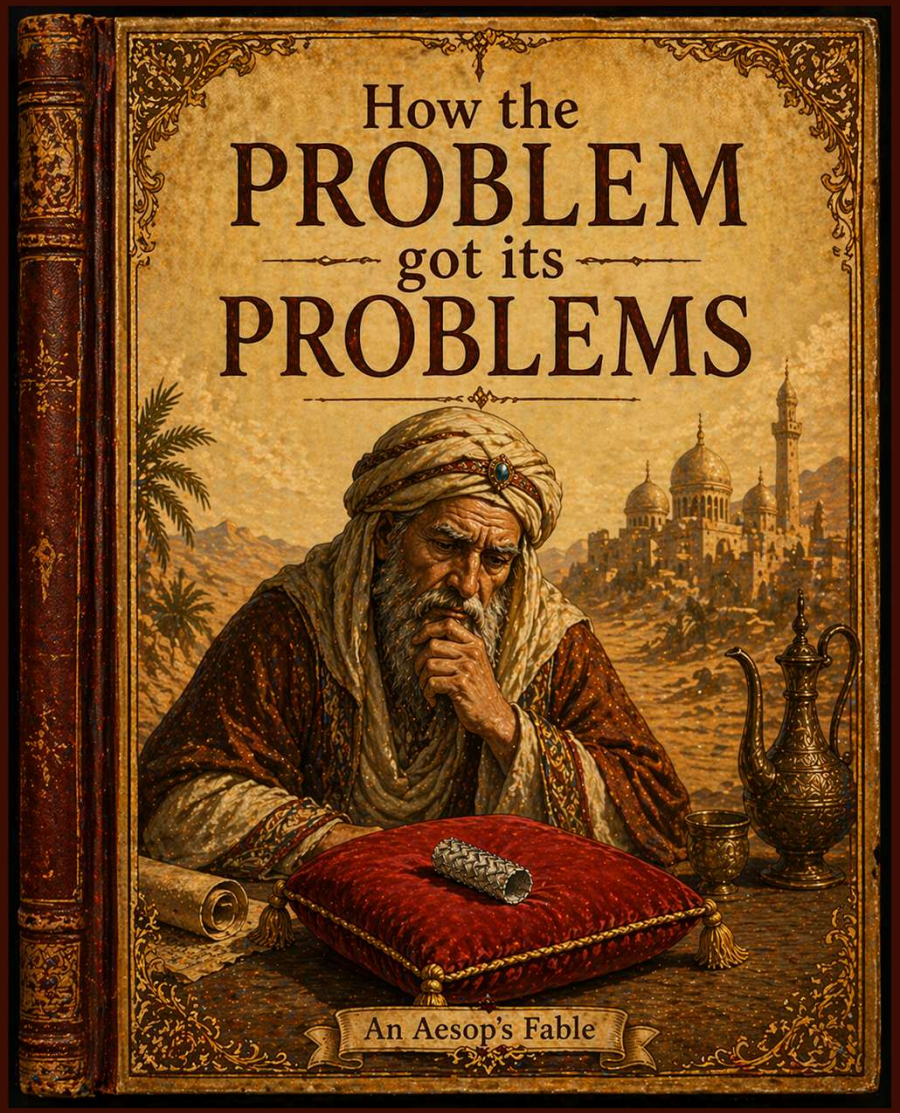
- Left subclavian to carotid bypass
- Zone 0 TEVAR with in-situ fenestration for LSA and IA

Post op CT

- Initially Type III from IA fenestration.
- Stopped 1 week later with aneurysm regression.
- If it had NOT stopped – zero endo options for rescue.






How the
PROBLEM
got its
PROBLEMS
An Aesop's Fable

The intraoperative problem will haunt you

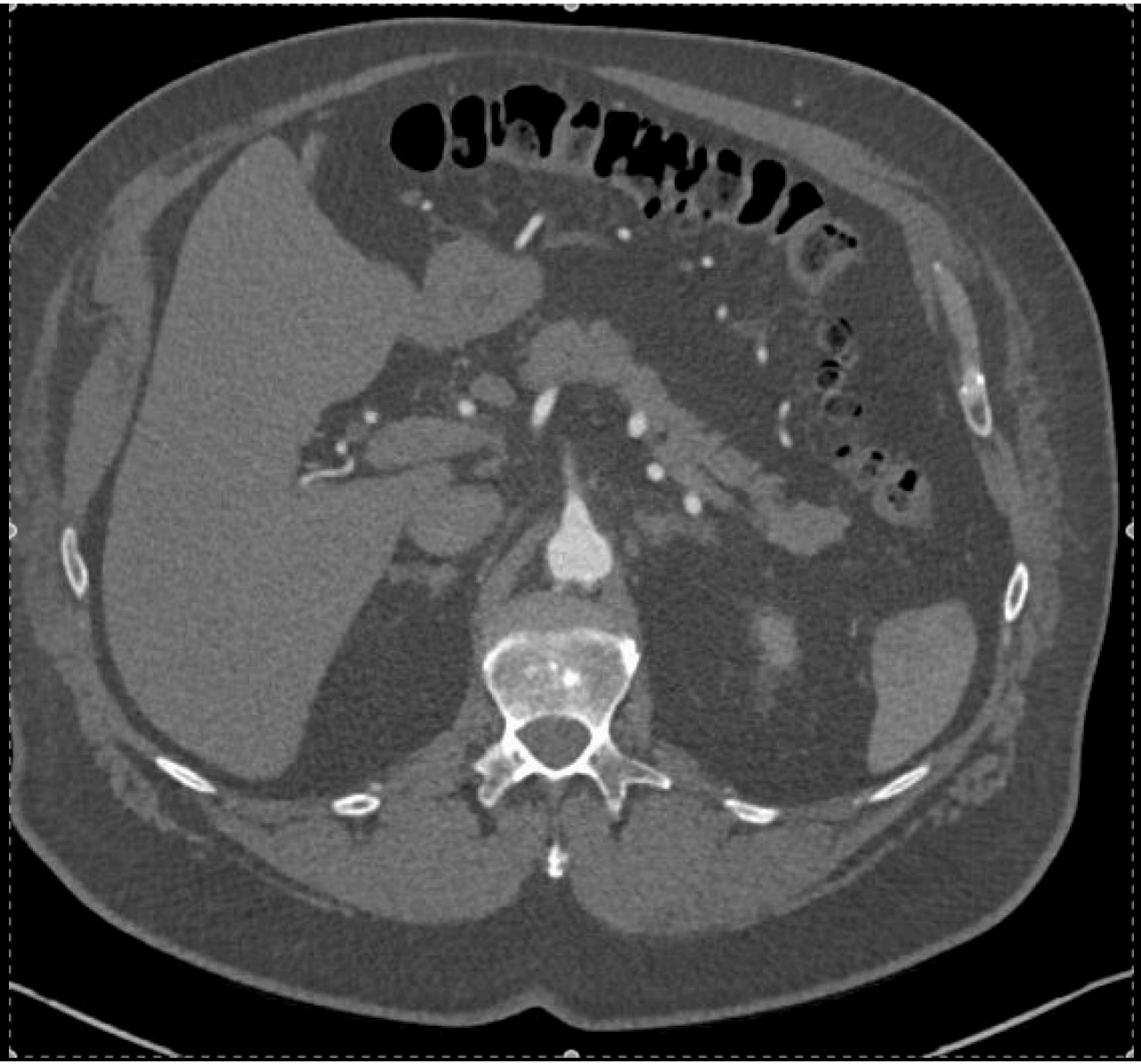
- Main body malalignment:
  - Rotated in FEVAR – stent kink/stenosis
  - Too high/rotated in BEVAR – stent instability, Type I/III endoleaks, occlusion

- Target vessel rupture/dissection:
  - Stenosis/occlusion

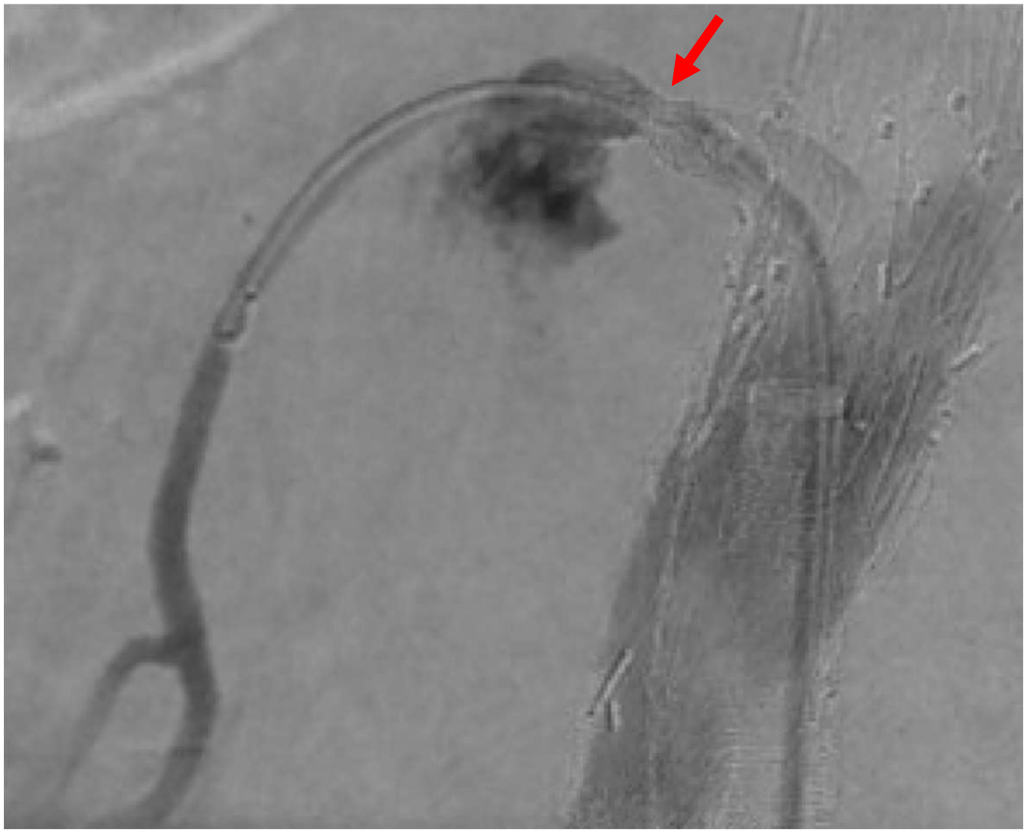
- Main body over-sizing:
  - Retrograde dissection

Case II

- 69M
- BMI 38, COPD, CAD, EF 40%
- Prior EVAR
- Progressive enlargement of pararenal saccular aneurysm above EVAR
- Not candidate for open repair.
- Reviewed at rounds:
  - Advanced for 4-fen FEVAR cuff.

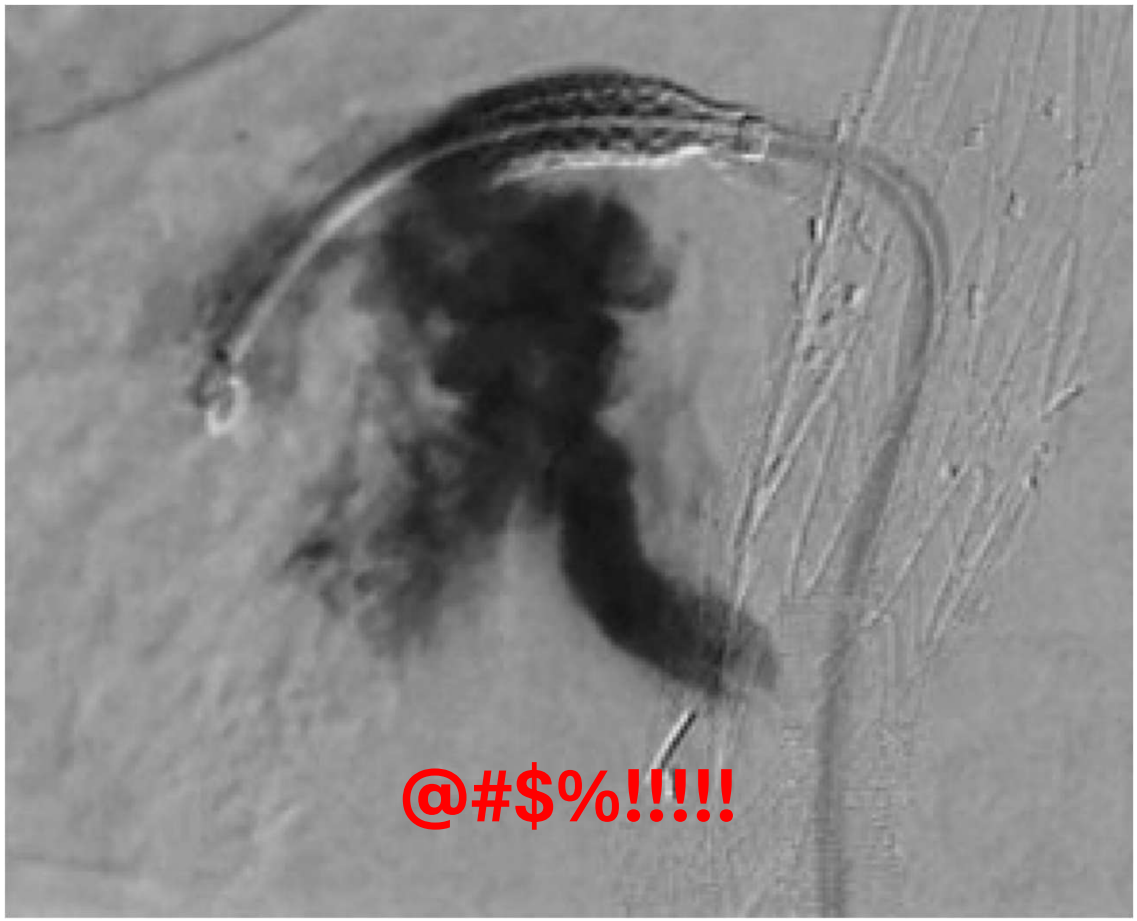


Intra-op: Right Renal Artery Rupture AND in-stent stenosis

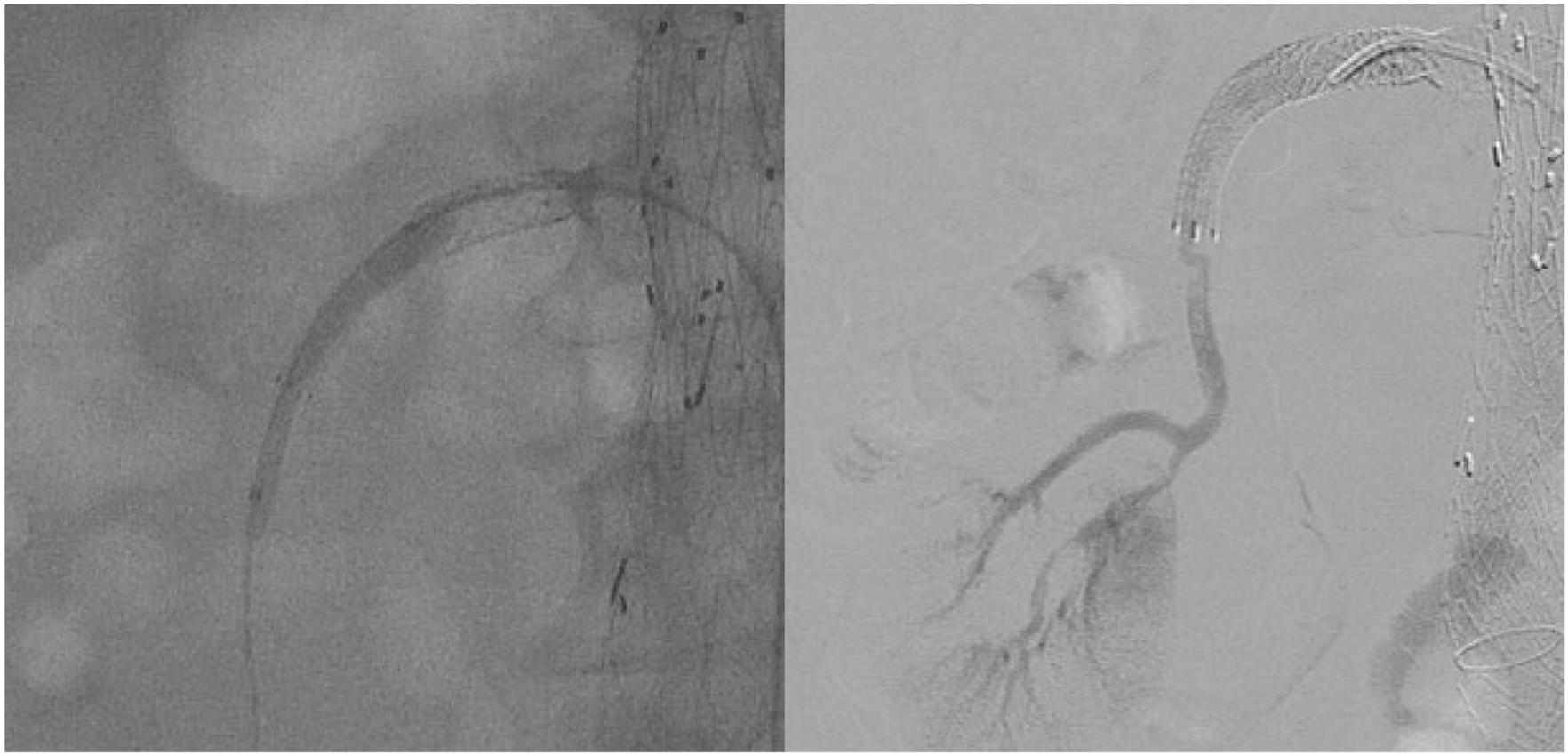


BeFlared Stent
Sized 1:1 with RA

Stent extended with BeGraft Peripheral (still sized 1:1)



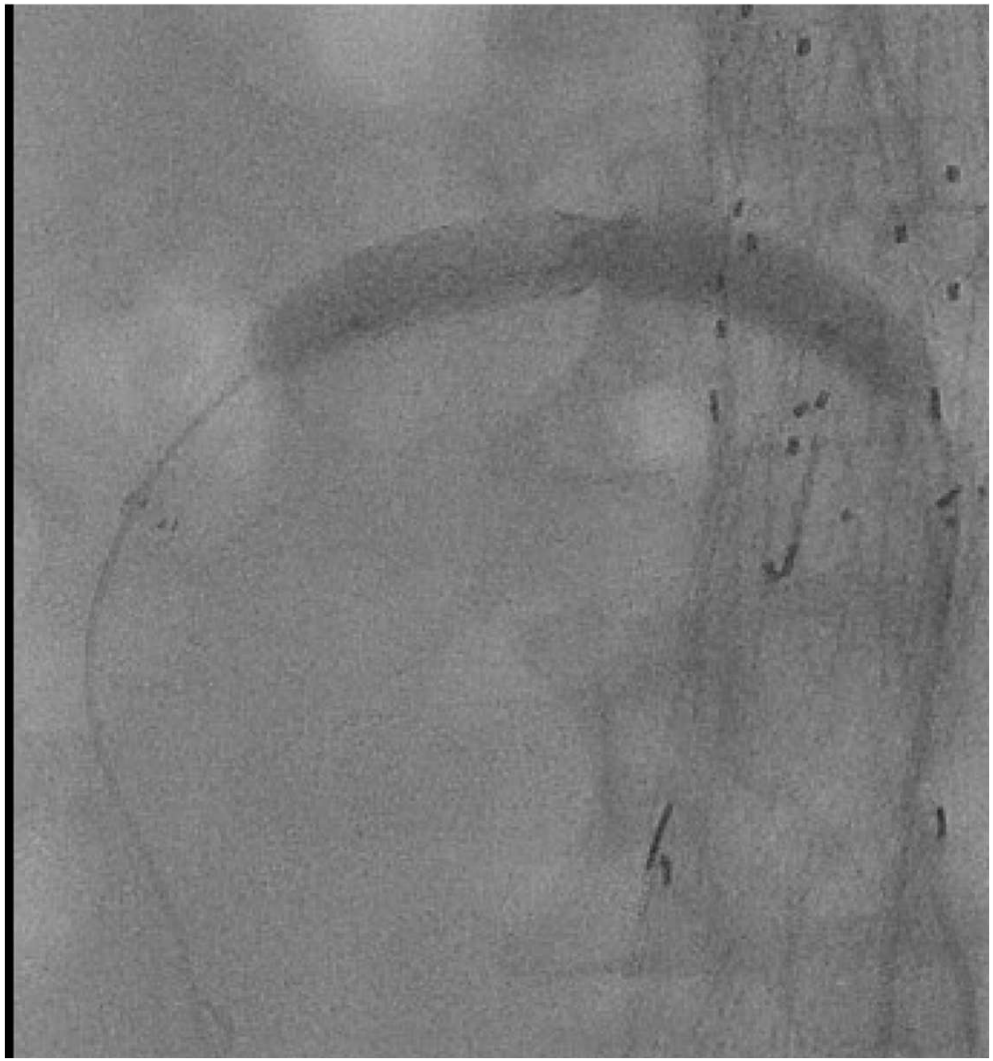
Extend with viaban. Doesn't look great – size mismatch. Essential given sizes available. In-sent stenosis better

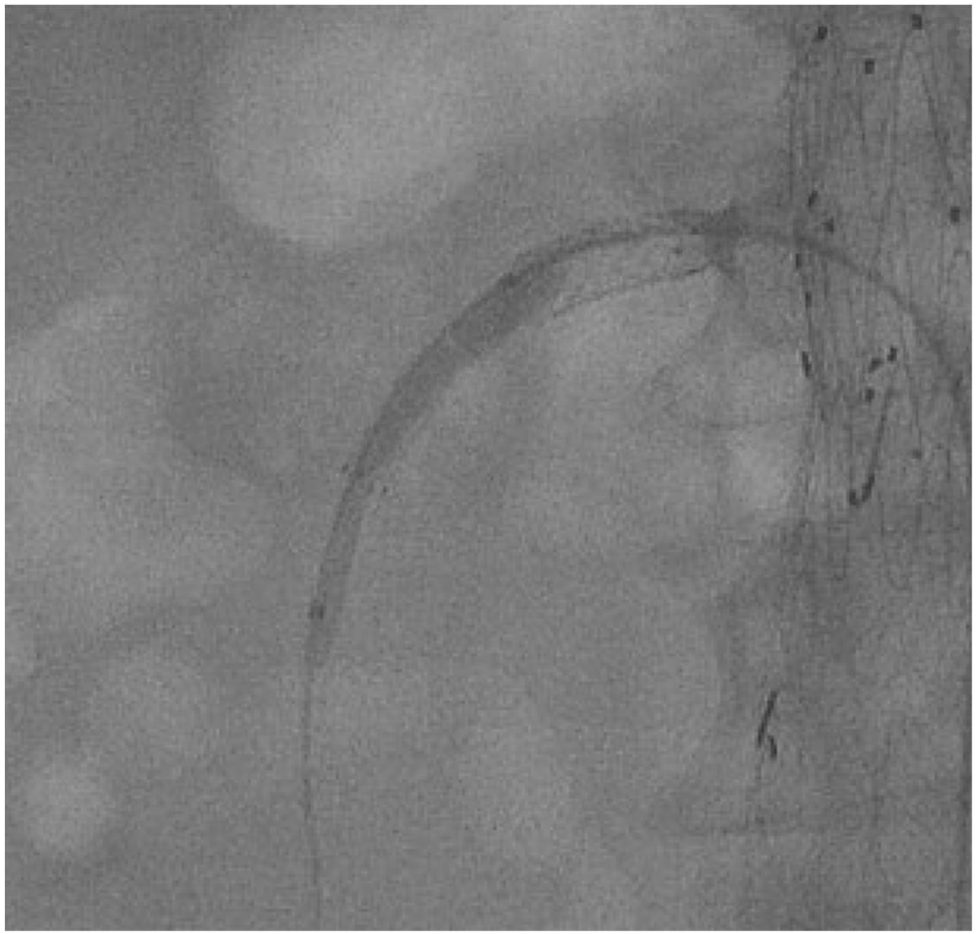


No early post-op CTA due to AKI

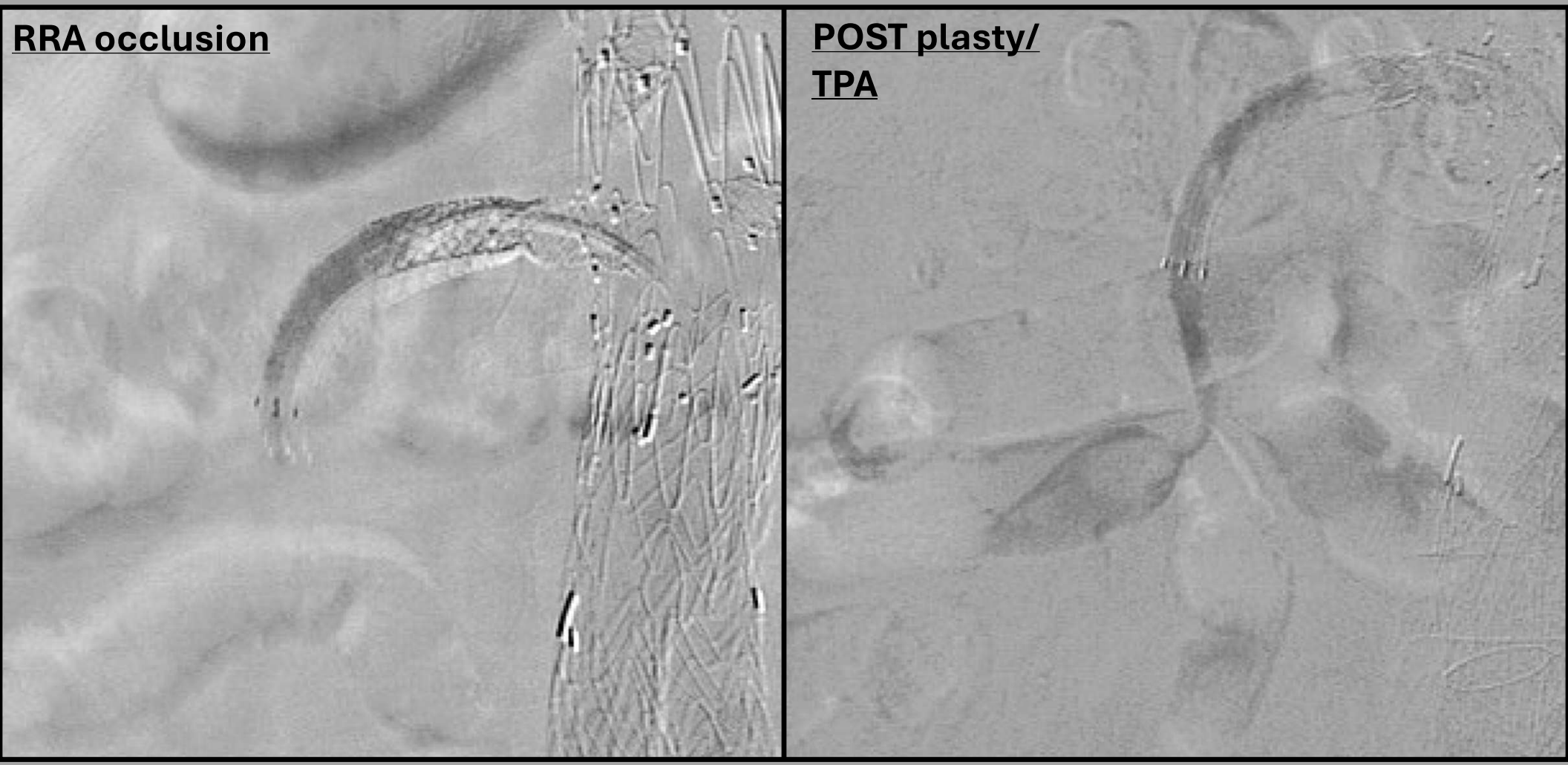
@ 6 weeks eGFR 46
CTA showed two issues:
Stenosis at bend of RRA
Stenosis in Viabahn.

Ask our friendly IR to angioplasty






I'm
Baaaaaaaaaaack



eGFR now in high 20's low 30's.

Mid/long-term outcomes of target vessels

- Data regarding technical completion at index OR demonstrates high rate of technical success.
  - This case would be considered technically successful.
- All studies have high reintervention rate after F/BEVAR for target vessel stenosis/instability.
- Almost no data regarding post-intervention outcomes for patients with target vessel reintervention.
  - Technically stent is open = assisted 1ary patency.
  - Realty: poor outcome.

Summary:

- FBEVAR for ALL aortic pathology has a high rate of perioperative complications.
- **6-10% rate of life ending and life altering complications.**

Summary cont'd

- Juxtarenal/Pararenal:
  - no propensity matched studies show mortality benefit over open.
  - No risk of SCI with open
  - All studies show 20-30% rate of reintervention.
  - $$$
  - Should be reserved for patients with high cardiorespiratory and renal comorbidities.

- Endovascular TAAA repair has a lower morbidity and mortality profile vs. open.
  - High rate of complications.
  - High rate of reintervention.

- **Complications can occur at every step of the treatment process.**
- **Even if the case goes well, the patient may not do well.**
- **Intra-operative complications often translate to long term problems.**

Thank you

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