EVAR EXPLANT: HOW I DO IT

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DISCLOSURES

- No financial disclosures relevant to this presentation

EVAR EXPLANT: HOW I DO IT

Open Conversion after EVAR

How I do it?

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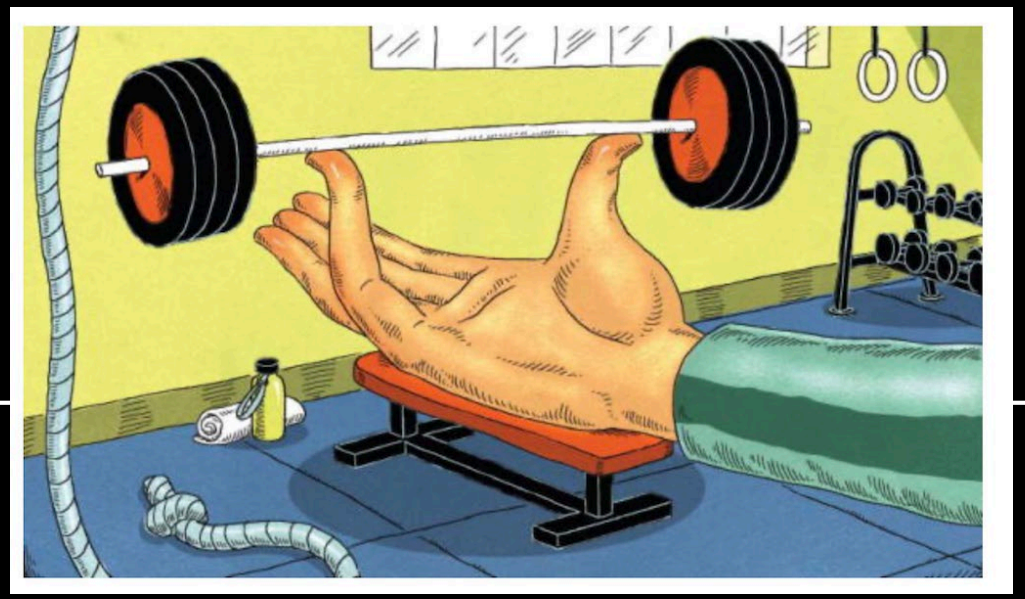
OPEN CONVERSION AFTER EVAR

How do WE do it?

Hopefully with skill and dexterity



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ABSOLUTE INDICATIONS FOR EVAR EXPLANT

- Persistent ‘untreatable’ endoleak with either:
  - Progressive sac expansion
  - Pain
  - Rupture
  - Infection

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WHAT IS THE USUAL CLINIC SCENARIO?

- Non-correctable type 1a endoleak
- Type 2 endoleak not manageable with embolization
- Expanding aneurysm without identifiable endoleak
- Endograft thrombosis
- Infection

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WHEN DO WE MAYBE NOT CONSIDER?

- Most isolated type 1b endoleaks
- Most type 3 endoleaks
- Some type 4 depending on the location and anatomic options

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WHEN DO WE NEED TO CONSIDER THIS?

- Non-correctable type 1a endoleak
  - Embolization
  - FEVAR
  - PMEG
  - Chimneys
  - Palmaz stent

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WHEN DO WE NEED TO CONSIDER THIS?

- Type 2 endoleak not manageable with embolization
  - Multiple embolizations (>3) for lumbar leaks which either never resolve completely or quickly return with continued aneurysm growth

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WHEN DO WE NEED TO CONSIDER THIS?

- Expanding aneurysm without identifiable endoleak
  - Endotension, fabric porosity or tear
  - ? unvisualized type 1 endoleak
  - ? unvisualized type 2 endoleak

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WHEN DO WE NEED TO CONSIDER THIS?

- Infection
  - Endograft infection/mycotic aneurysm
  - Aortoenteric fistula

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OPEN CONVERSION AFTER EVAR

- Is the need to consider open conversion even a thing?

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OPEN CONVERSION AFTER EVAR

- Is the need for open conversion even a thing?

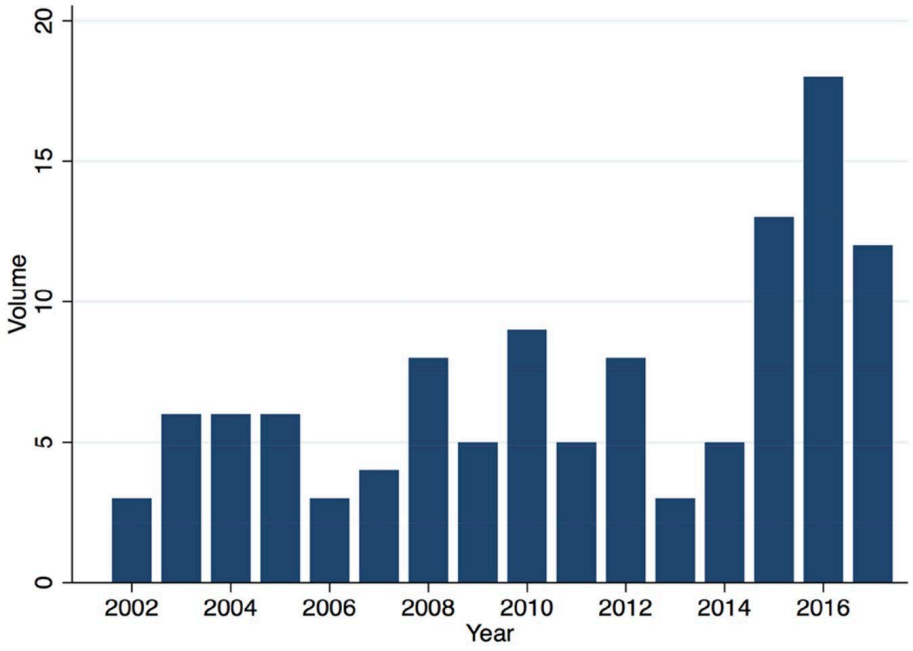

Figure 1:
Annual volume of open conversions.

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Increasing Use of Open Conversion for Late Complications After Endovascular Aortic Aneurysm Repair

Abhisekh Mohapatra, MD, **Darve Robinson, BA**, **Othman Malak, MD**, **Michael C. Madigan, MD**, **Efthimios D. Avgerinos, MD**, **Rabih A. Chaer, MD**, **Michael J. Singh, MD**, and **Michel S. Makaroun, MD**
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OPEN CONVERSION AFTER EVAR

EJVES Vascular Forum (2020) 49, 4–10

ORIGINAL RESEARCH

The Impact of EndoAnchor Penetration on Endograft Structure: First Report of Explant Analysis

Jonathan Grandhomme [a,b], Nabil Chakfe [a,b], Arindam Chaudhuri [a,c], Thomas R. Wyss [d], Roberto Chiesa [e], Julien Chakfe [a], Delphine Dion [a], Frédéric Heim [f], Anne Lejay [a,b,g,*]

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Review Article

Surgical Treatment of Sac Enlargement Due to Type II Endoleaks Following Endovascular Aneurysm Repair

Seiji Onitsuka, MD, PhD[1] and Hiroyuki Ito, MD, PhD[2]

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Any postoperative surveillance improves survival after endovascular repair of ruptured abdominal aortic aneurysms

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Abstract

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Two decades of experience in explantation and graft preserving endovascular aneurysm repair and lessons learned

Sherif Sultan[1,2,3]*†, Yogesh Acharya[1,2]†, Mohieldin Hezima[1], Keegan Chua Vi Long[1], Osama Soliman[3], Juan Parodi[4,5] and Niamh Hynes[3]†

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onversion of endovascular to open repair
inal aortic aneurysms

Thomas L. Forbes, MD
David M. Harrington, MD
Jeremy R. Harris, MD
Guy DeRose, MD

From the Division of Vascular Surgery, London Health Sciences Centre and the University of Western Ontario, London, Ont.

Presented at the Annual Meeting of the Canadian Society for Vascular Surgery, Sept. 24–25, 2010, in Vancouver, BC

Background: Failure of endovascular repair (EVAR) of an abdominal aneurysm can result in significant risk of morbidity and mortality. We revi
experience with late conversions to open repair.

Methods: We conducted a retrospective database review to identify all EVA
cedures performed between 1997 and 2010 and the number converted to oper
at our university-affiliated medical centre. Late conversion was defined as those
ring at least 30 days after initial EVAR.

Results: In all, 892 EVARs took place during the study period. Six patients (0.7%)
required late conversion to open repair. Their mean age was 71 (range 58–83) years,
and half were women. Half of the initial EVARs were for ruptured aneurysms. The
median time to conversion was 15.6 (range 1.7–61.3) months. Indications for sec-
ondary conversion (50% urgent, 50% elective) included persistent type I endoleak
(*n* = 3), combined type II and III endoleak (*n* = 1), graft thrombosis (*n* = 1) and
was required in most patients (67%),
2.6 units. Total endograft explantation
or total endograft preservation occurred
after conversion was 7 (range 6–73) days.
1 mortality following conversion.
s a low rate of late conversion to open
: of persistent aneurysm perfusion. Al-
n can be safe. Our experience supports

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Outcomes after endovascular aneurysm repair conversion and primary aortic repair for urgent and emergency indications in the Society for Vascular Surgery Vascular Quality Initiative

Salvatore T. Scali, MD, Sara J. Runge, MD, Robert J. Feezor, MD, Kristina A. Giles, MD, Javairiah Fatima, MD, Scott A. Berceli, MD, PhD, Thomas S. Huber, MD, PhD, and **Adam W. Beck, MD**
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Contemporary Incidence, Outcomes and Survival Associated with EVAR Conversion to Open Repair Among Medicare Beneficiaries R1WC: 348/3535

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Partial open conversion with proximal aortic banding and endograft preservation is a safe option for the treatment of persistent type II endoleaks

Thomas Staniszewski, BS, Reagan Beyer, BS, Jon Matsumura, MD, *and* Courtney Morgan, MD, *Madison, Wisc*

ABSTRACT
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Keywords: Aneurysm; Endoleak; Endograft preservation; Endograft explant

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From the Midwestern Vascular Surgical Society

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Two decades of experience in explantation and graft preserving strategies following primary endovascular aneurysm repair and lessons learned

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1–679.e2. doi:10.1016/j.jvs.2022.02.036.

, Outcomes and Survival Associated Open Repair Among Medicare /3535

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Elective EVAR conversion for type 1a endoleak is not associated with increased morbidity or mortality compared to primary juxtarenal aneurysm repair

Salvatore T. Scali, MD, Michael M. McNally, MD, Robert J. Feezor, MD, Catherine K. Chang, MD, Alyson L. Waterman, MD, MPH, Scott A. Berceli, MD, PhD, Thomas S. Huber, MD, PhD, and **Adam W. Beck, MD**
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and endograft preservation is a safe option for the treatment of persistent type II endoleaks

Thomas Staniszewski, BS, Reagan Beyer, BS, Jon Matsumura, MD, *and* Courtney Morgan, MD, *Madison, Wisc*

ABSTRACT
We have described our technique of open partial conversion (OPC; n = 5) with aortic banding and endograft preservation for the treatment of type II endoleaks. OPC significantly reduced the aortic clamping time (5.0 vs 32.5 minutes; *P* = .01) relative to endograft explantation (n = 2). Cross-clamping was avoided entirely in three of the procedures. The patients treated with OPC showed a trend toward a decreased operative time (4.8 vs 5.9 hours) and shorter hospital stay (5.7 vs 7.4 days). Follow-up computed tomography scans were available for three of the five OPC patients, which showed resolution of the type II endoleak. The findings from the present study have further demonstrated the safety of OPC for the treatment of type II endoleaks. (J Vasc Surg Cases Innov Tech 2021;7:649-53.)

Keywords: Aneurysm; Endoleak; Endograft preservation; Endograft explant

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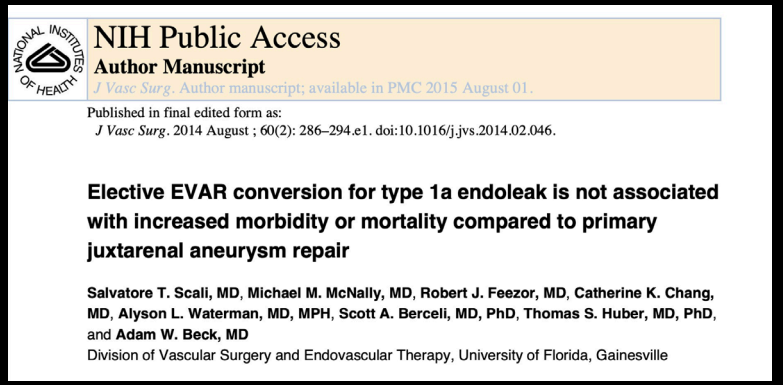
WHAT DOES THE LITERATURE TELL US?

- Overall volume of cases have increased
- Open conversion rates 2-16%
- Open conversion after EVAR has a higher mortality risk than planned open AAA repair (2-3X)
- Overall operative mortality for open conversion after EVAR has declined over the past 30 years



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Elective EVAR conversion for type 1a endoleak is not associated with increased morbidity or mortality compared to primary juxtarenal aneurysm repair

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WHAT DOES THE LITERATURE TELL US?

- 'elective' open conversion has significantly less early operative morbidity and mortality than emergent conversion for rupture
  - Open conversion prior to rupture: 5-year survival of 60%
  - Open conversion for rupture: 5-year survival of 33%
- While open conversion may necessitate complete endograft excision, a large proportion of cases can be managed with partial explantation or even graft preservation

WHAT DOES THE LITERATURE TELL US?

- While we should avoid the pitfalls in clinical decision-making that may increase the likelihood of eventual EVAR failure, the need for open conversion after EVAR will occur despite our best patient and device selections.
- Failure to identify those patients who should undergo open conversion will result in overall excess mortality in our AAA patients

OPEN CONVERSIONS AFTER EVAR

- Planning an open conversion is a gift to a vascular surgeon!
- Unavoidable opportunity to review your original clinical decision-making, judgement and surgical conduct with the patient's initial EVAR
- Opportunity to critically assess the performance of the miriad of devices we may have used in the management of the patient's aneurysm and/or endoleak(s)

OPEN CONVERSIONS AFTER EVAR

The need to offer a patient an open conversion is a path to a greater understanding of the nature of aortic aneurysm as well as the nature of vascular surgeons

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FACTORS TO CONSIDER

- Review your initial indication for EVAR over open repair
- Look at preop CT scans done prior to index intervention
- Look at your intraop angiograms from index case
- Read the operative report and compare the proximal graft and iliac limb device diameters to the current vessel diameters
- Did you do an IFU-compliant procedure and if no, where were you non-compliant?
- Look at the immediate postoperative CTA imaging

FACTORS TO CONSIDER

- Look at all endoleak-management procedures/images done for the patient prior to your operative procedure
- Look at all imaging that was done immediately post endoleak management
- Examine the patient!
- Surgical scars abdomen and groins

IN SUMMARY

Understand and know your patient

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PRIOR TO SURGERY

- Based on the endoleak and aortic/iliac anatomy:

  - Complete graft explant

  vs

  - Partial graft explant

  vs

  - Complete graft preservation

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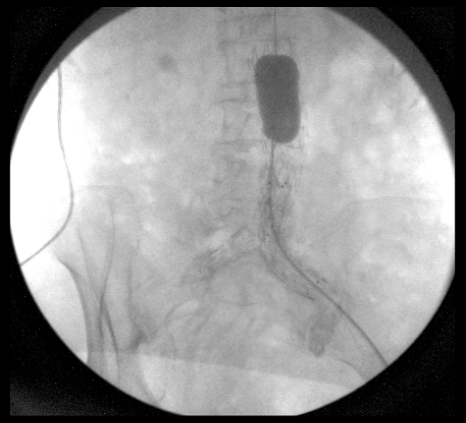
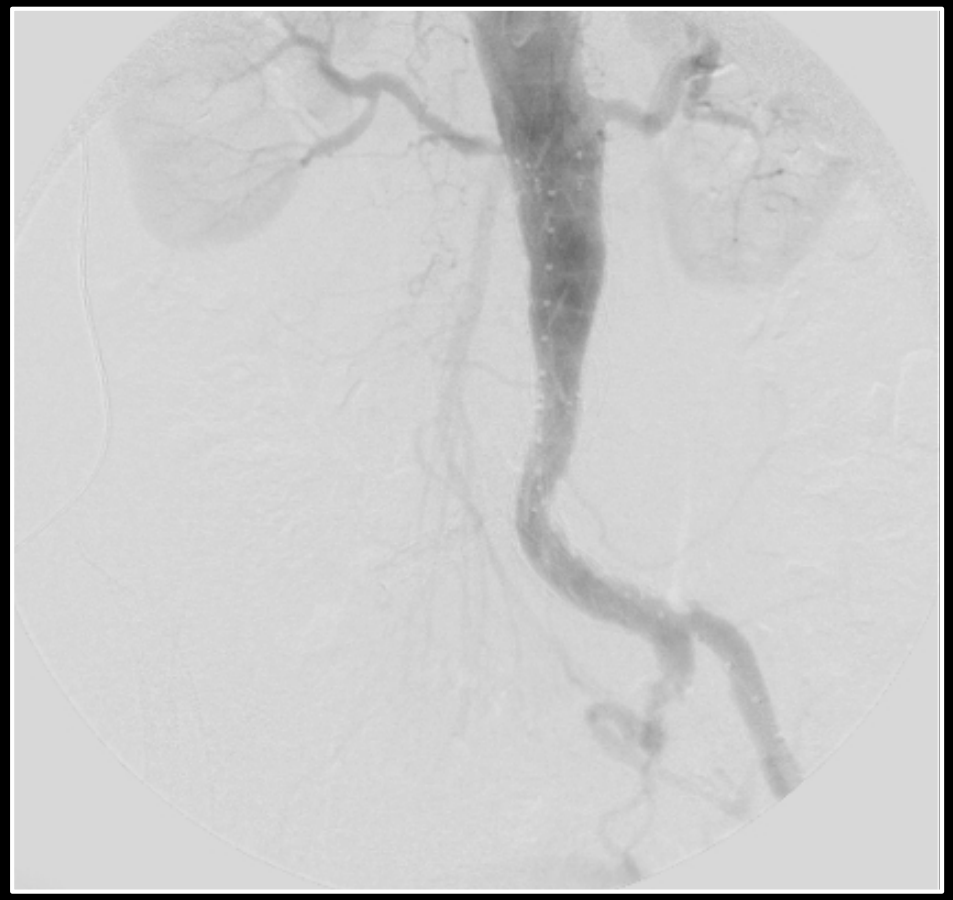
ASK YOURSELF THE QUESTION:

- Are there any endovascular interventions to consider or avoid prior to open conversion as a means of decreasing the complexity and risk of your open conversion?
- Examples to avoid: FEVAR with unfavourable anatomy, Palmaz stent if likelihood of success is low

ENDO PRIOR TO OPEN CONVERSION





EVAR AUI in 2001 at age of 81
Multiple embolization procedures for Type 2 leaks
Over years eventual progressive sac expansion
2009 at age 89, abdominal pain and sac enlargement
due to multiple lumbars and possible fabric tear
Graft relining and then laparotomy with direct ligation lumbars

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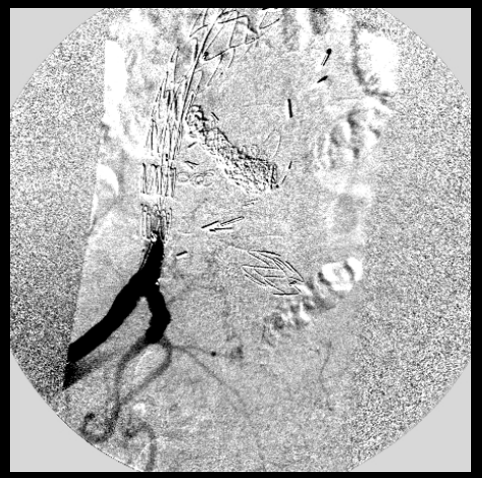
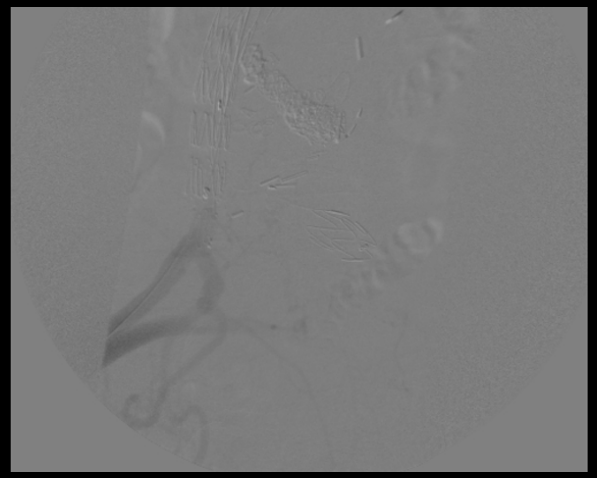
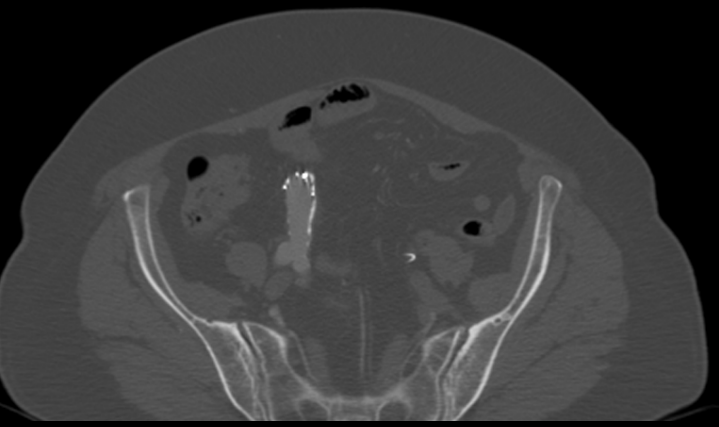
ENDO PRIOR TO OPEN CONVERSION







- EVAR AUI in 2001 at age of 82
- Multiple embolization procedures for Type 2 leaks
- Over years eventual progressive sac expansion due to multiple lumbars
- 2008 at age 89 abdominal pain and sac enlargement
- Iliac extension and then laparotomy with direct ligation 2 lumbar arteries and middle sacral artery

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OPERATIVE PLANNING

- Incision and approach:
  - midline or supraumbilical transverse transperitoneal
  - retroperitoneal
- Aortic clamp site
  - Supraceliac
  - Suprarenal
  - Infrarenal
- Balloon occlusion – proximal or distal
- Iliac clamping or not

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WHAT DO I FAVOUR

- Aortic clamp site
  - Supraceliac
  - ***Suprarenal***
  - Infrarenal

- Dependent on health of the suprarenal aorta and whether or not a type 1a endoleak
- Infrarenal clamp or no aortic clamp may be ok if confident not a 1a leak and the plan is a partial endograft explant

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FACTORS TO CONSIDER

- Balloon occlusion aorta ??
  - Primary control, probably a good idea if rupture
  - Or use as a back-up in cases without 1a and when graft preservation is planned

- Iliac artery clamping vs balloon occlusion from within the open sac
  - Iliac clamping if plan is to remove the iliac limb
  - Iliac clamp if plan is to sew surgical graft limb to the iliac endograft limb and native iliac artery
  - Balloon control iliacs can be considered in some situations as an alternative to clamping

FACTORS TO CONSIDER

- Clamping aorta before opening sac or not…??
- ‘Always’ dissect out the aorta at your clamp site regardless
- Clamping prior to opening AAA is dependent on your confidence in the absence or presence of 1a leak or if you intend on complete graft explant

WHAT ARE SOME FUNDAMENTALS IN MY PRACTICE

- GA, epidural, cell saver, ICU postop
- Renal protection strategy
- Transperitoneal approach
- Sterile wire cutters on the table, padded Fogerty clamps
- If planning on primarily using ballon control of iliacs have them on the table
  - If not at least have them in the room
- Pick all the grafts I think you might need

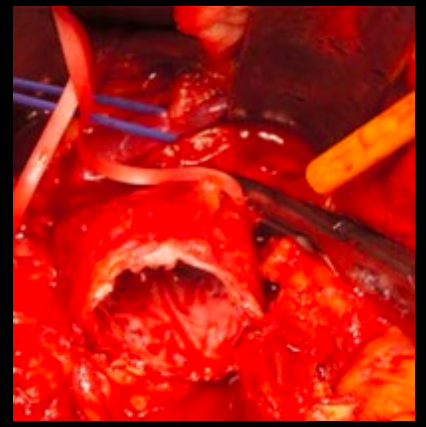
WHAT ARE SOME FUNDAMENTALS IN MY PRACTICE

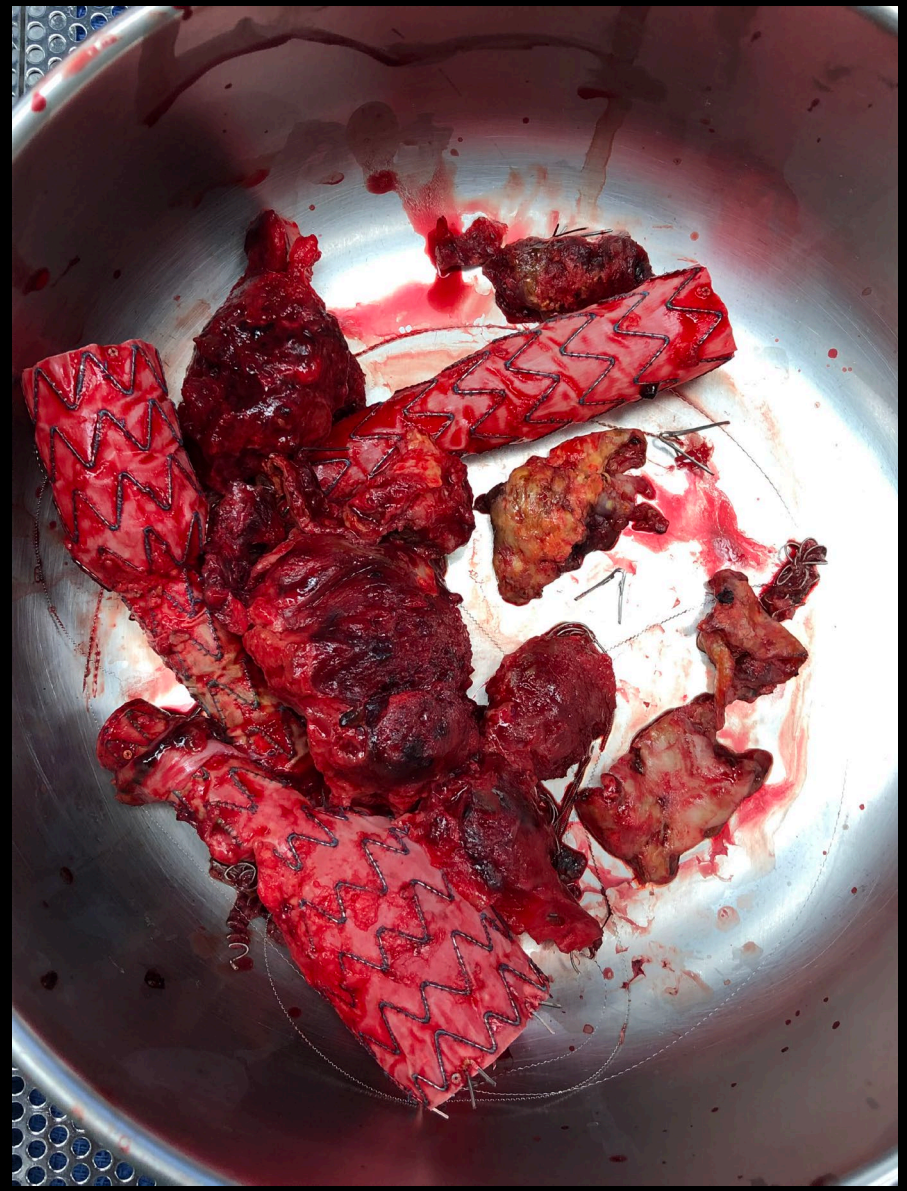
- I favour partial graft explant if reasonable (no infection)
  - Suprarenal clamp
  - Incorporate proximal endograft fabric if anatomy allows
  - Leave the suprarenal bare stents behind

  - 'Circumferential' felt reinforcement at prox anastomosis
  - If no iliac aneurysm, incorporate iliac limbs in anastomosis to the iliac artery

WHAT ARE SOME FUNDAMENTALS IN MY PRACTICE

- Caveats:





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WHAT ARE SOME FUNDAMENTALS IN MY PRACTICE

- Consideration for direct anastomosis to the iliac endograft limbs without native artery incorporation
  - Selective based on patient's comorbidities and confidence on distal iliac seal
  - Not usual situation
- Look aggressively for any occult back bleeding lumbar/middle sacral
- Plicate the aneurysm sac aggressively

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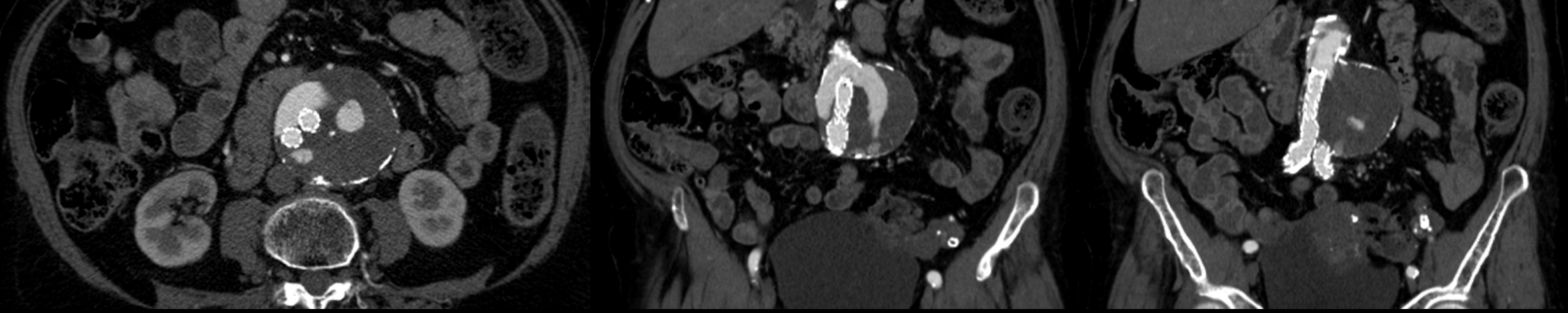

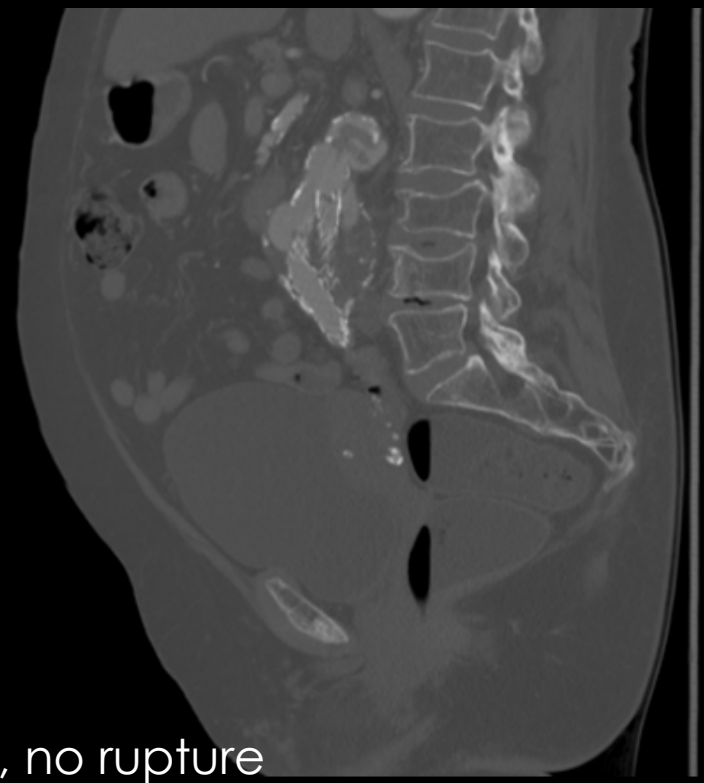

86 yo female with no past medical history; no meds, living at home
Large juxtarenal AAA; not great anatomy for FEVAR
2016 did EVAR with Ovation graft; difficult; postop type 1a
Leak 'observed' for short period, returned with pain and expansion, no rupture

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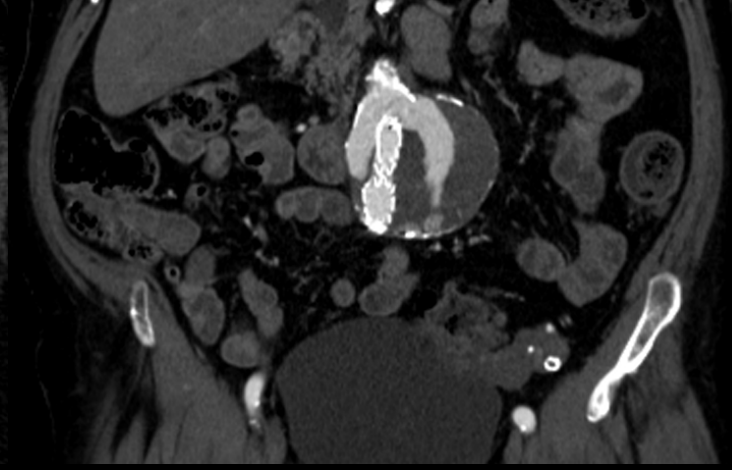
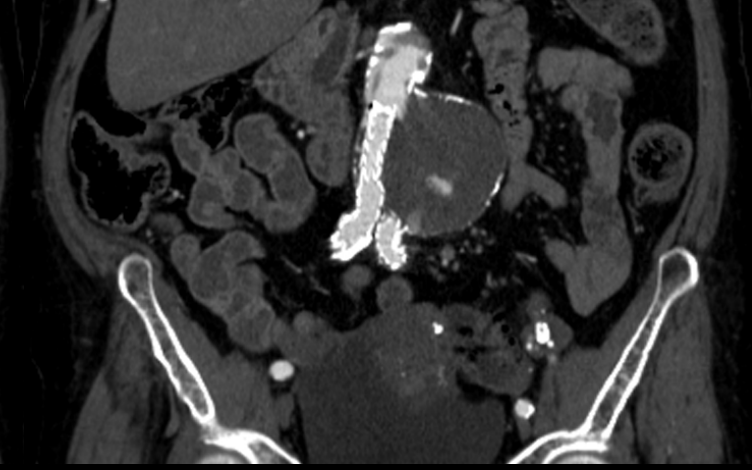
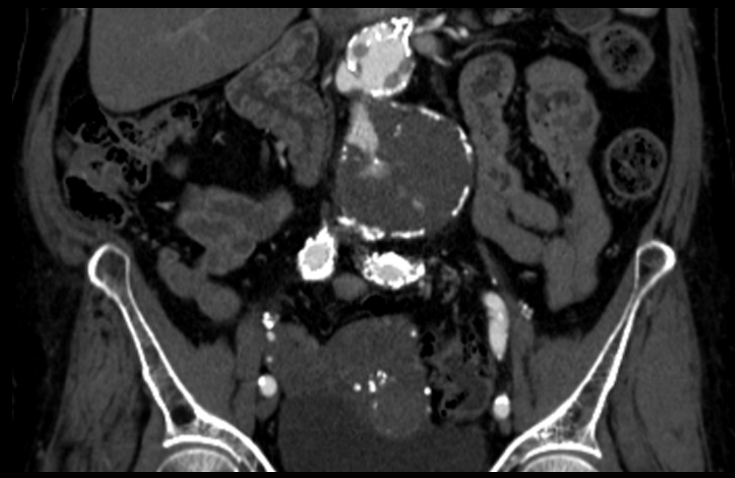
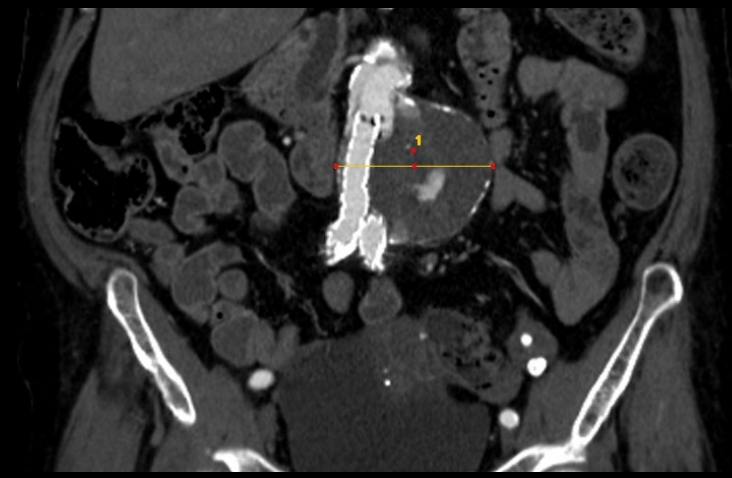
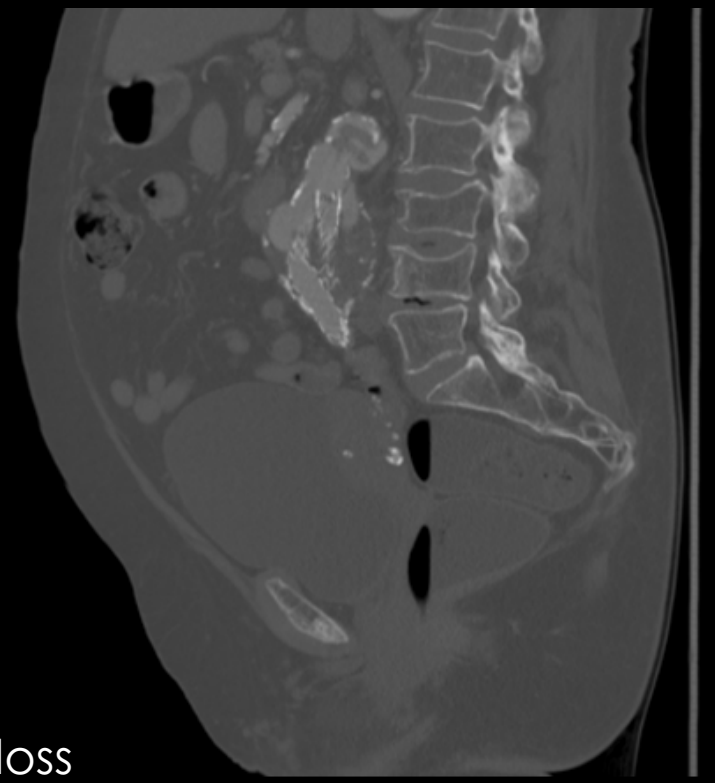

At age 87 taken to the OR for laparotomy
Supraceliac clamp followed by rapid conversion to suprerenal clamp
Partial explant of proximal graft; prox anast felt reinforced
Iliac limbs removed bilat anast. to common iliac arteries; 2.5L blood loss
Patient was discharged on postop day #5 !!

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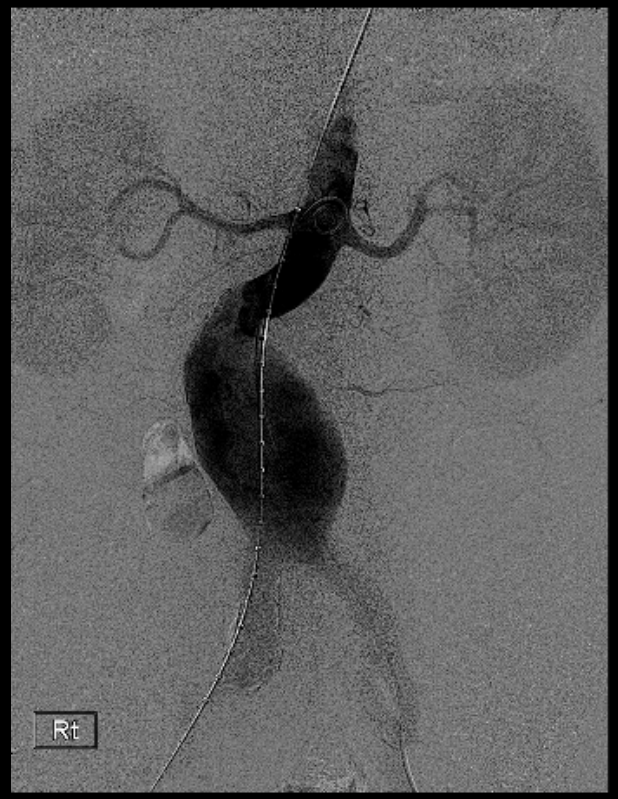

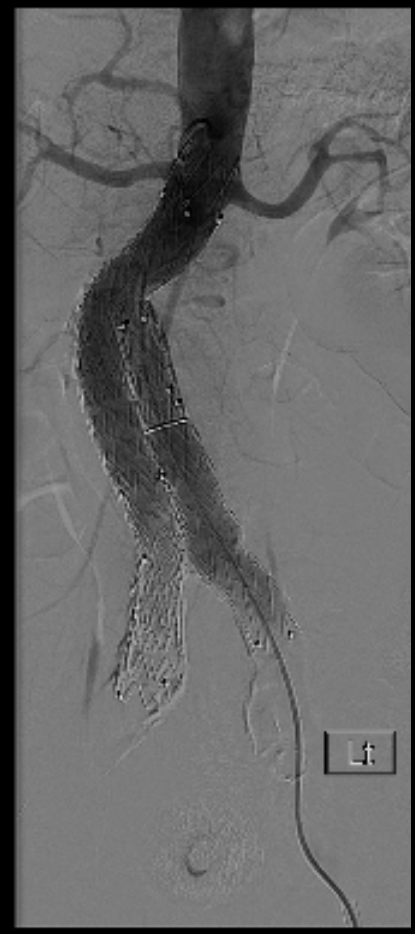

76 yo male; large infrarenal AAA; very active; skiing and travelling ++
He really wanted EVAR but was also good risk for open repair
Uncomplicated 'ideal' on-IFU bifurcated EVAR in 2019

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Postoperative IMA and lumbar endoleak
AAA grows 8mm at 6 months
Enters the endoleak treatment vortex

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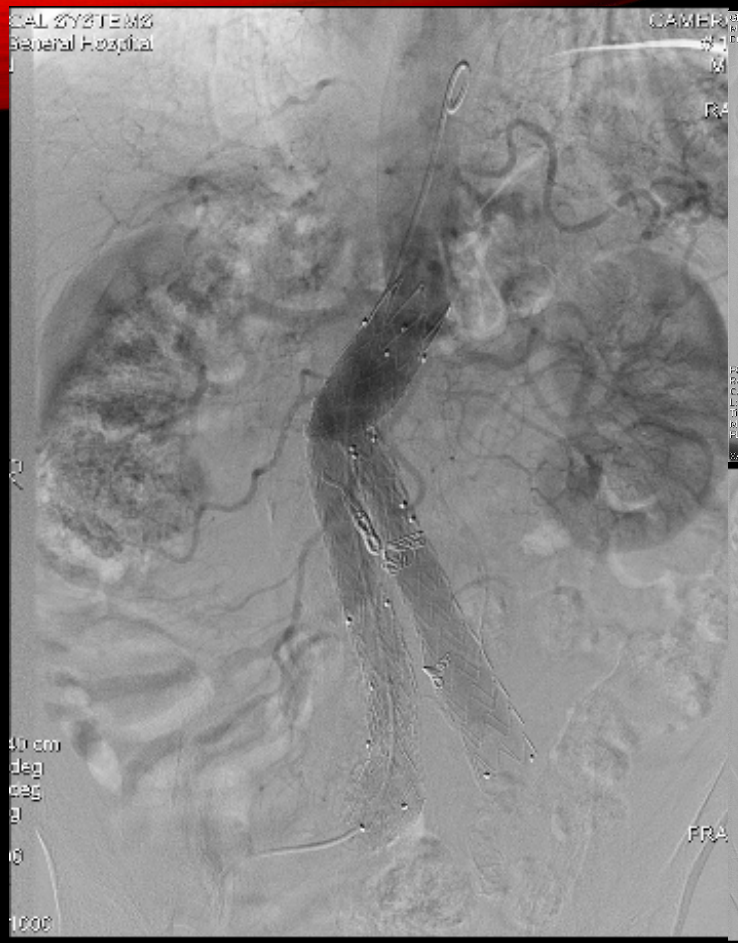

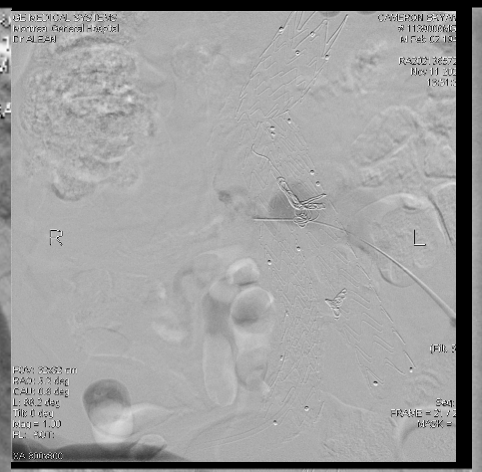

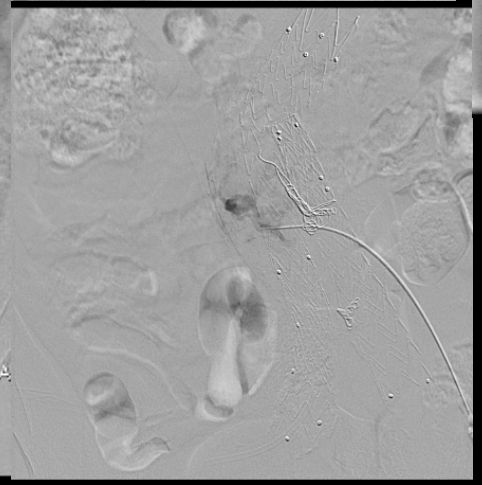

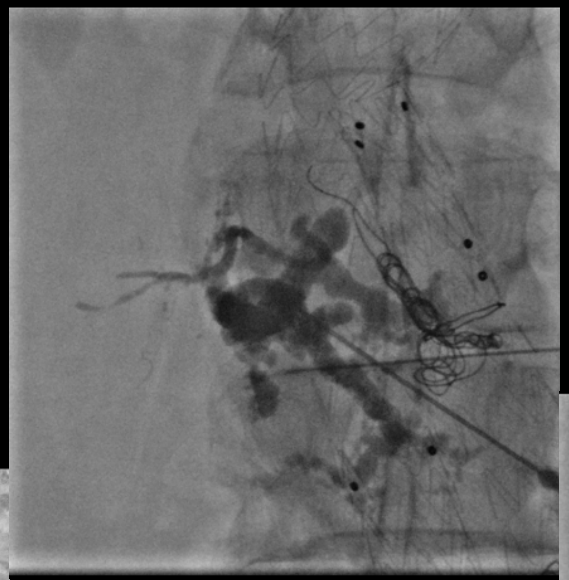

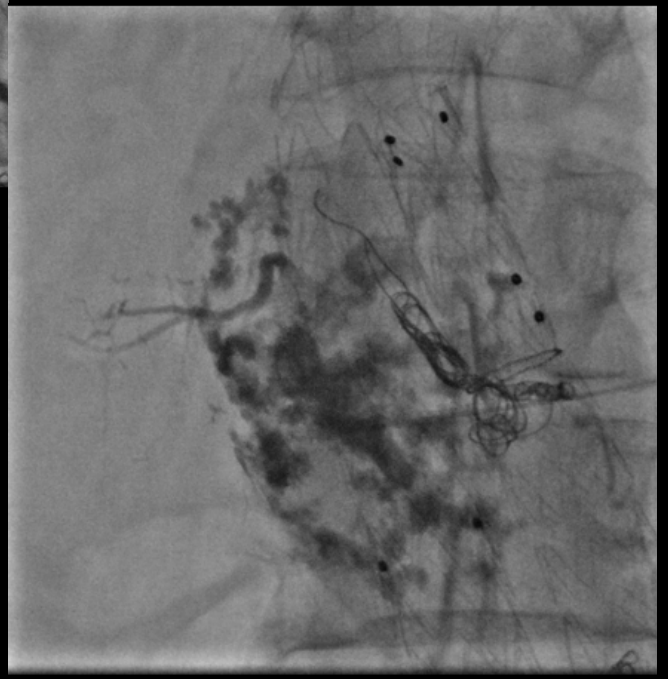

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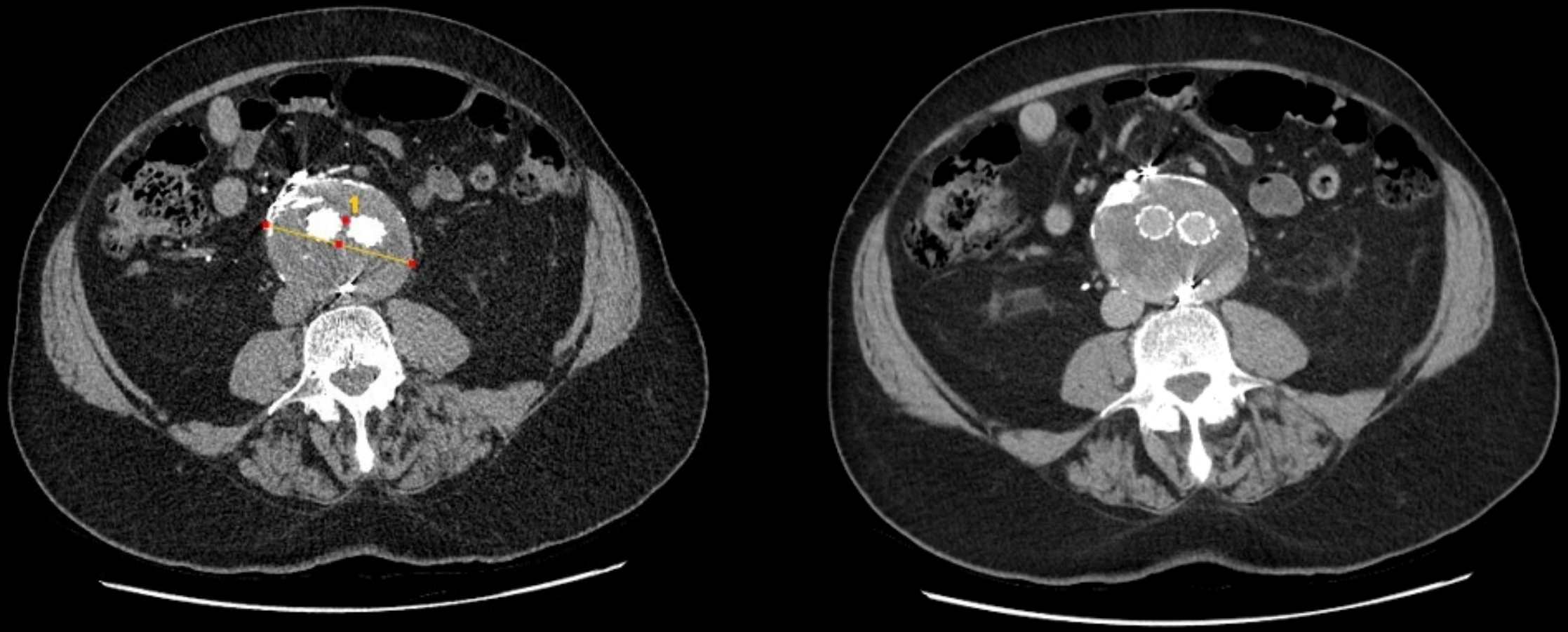

2024: 3 embolization procedures all of which are ‘successful’
Aneurysm continues to grow and persistent sac perfusion
from what seems to be multiple type 2 sources
No type 1a or 1b is present

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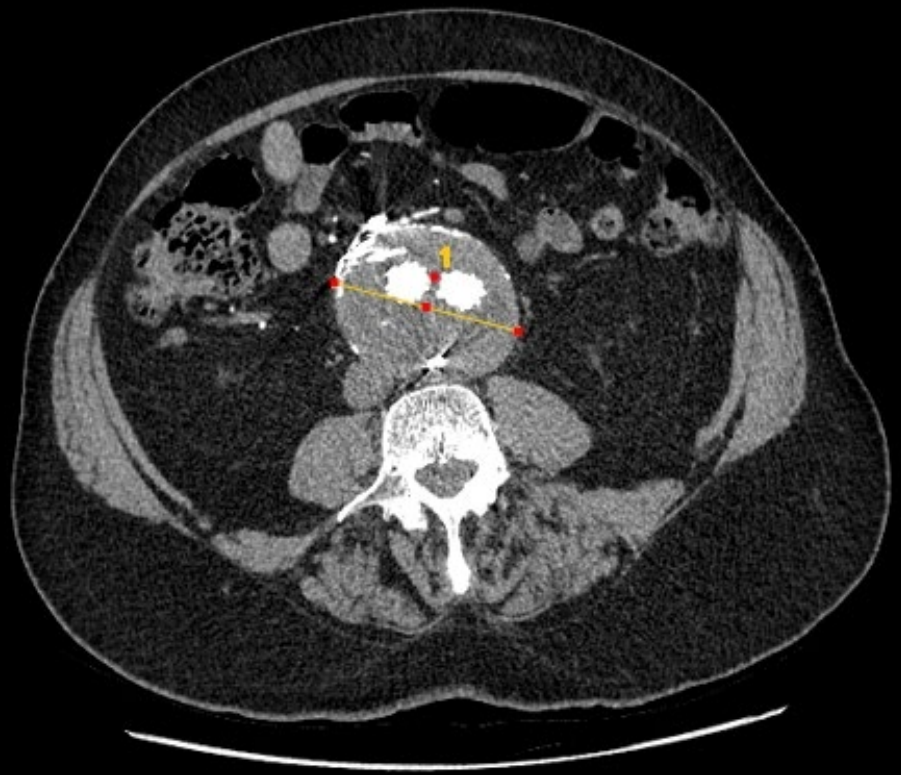

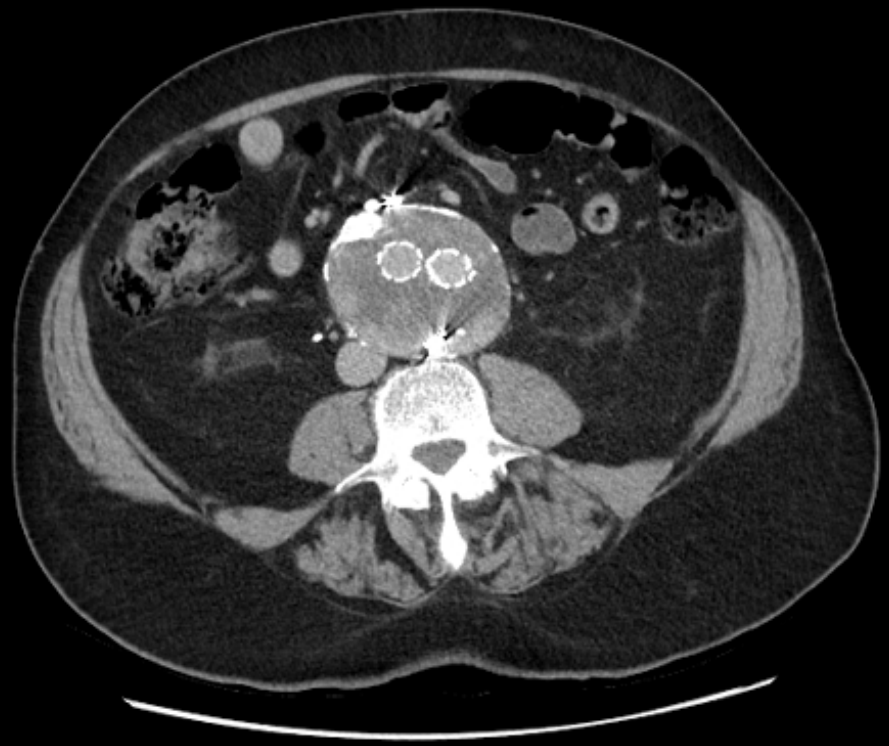

May 2024: age 81

Midline laparotomy suprarenal control; bilateral iliac clamping

Aortic wall at proximal graft very, very thin; diffuse aortic wall bleeding; 2 lumbars

Preserved very proximal part of EVAR and did felt reinfored prox. Incorporating endograft fabric

Distal anastomoses done to the iliac origins, preserving the iliac limbs in situ

3 litres of intraoperative blood loss; most returned

Discharged home POD 7; by winter 2024 he was back skiing in the Alps with his grandchildren

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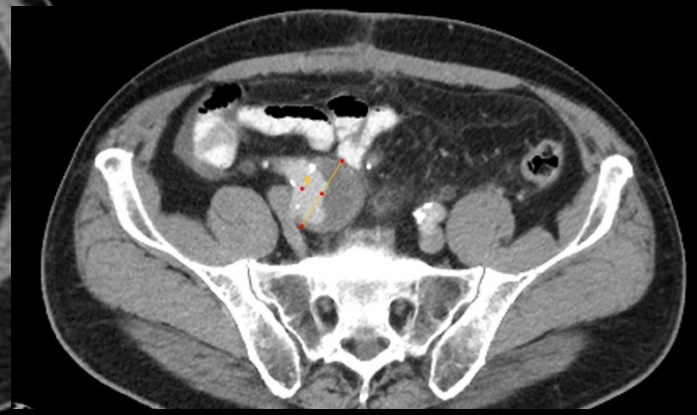
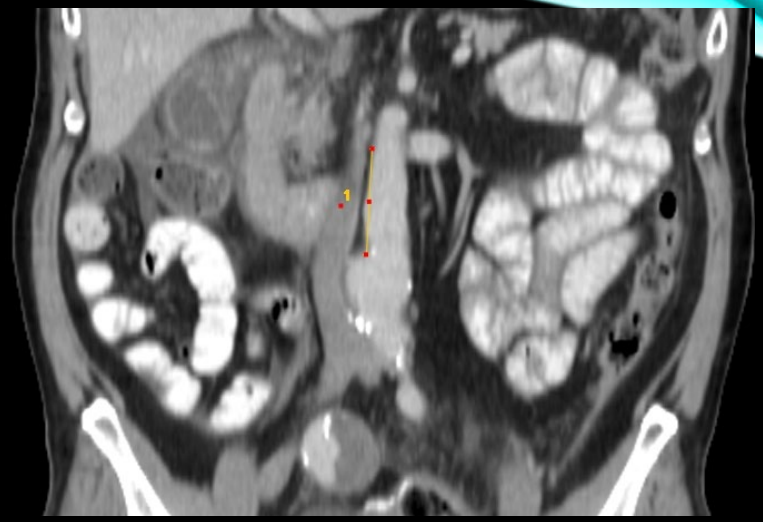

60 yo male referred to me by colorectal surgery in 2010
Had a recent laparotomy for a right hemicolectomy and a sigmoid resection for cancer and large polyp
4.5 cm infrarenal AAA and large 4.8 cm right common iliac aneurysm; patent IMA
Right EIA to IIA bypass via a RLQ transverse incision; bifurcated EVAR
No complications
1 year postop; AAA now 3.7 cm and right CI 3.9 cm; EIA-IIA bypass occluded (asymptomatic)

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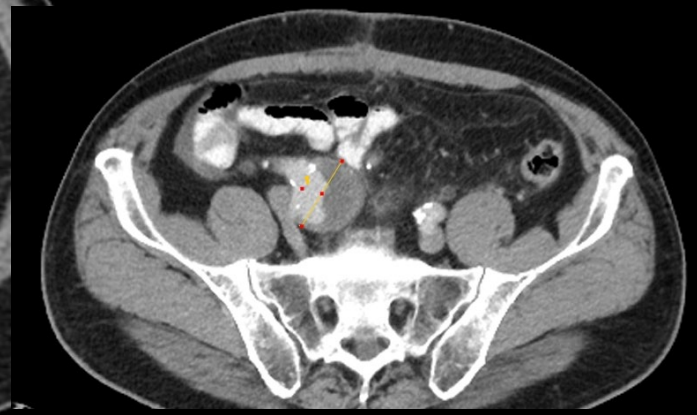

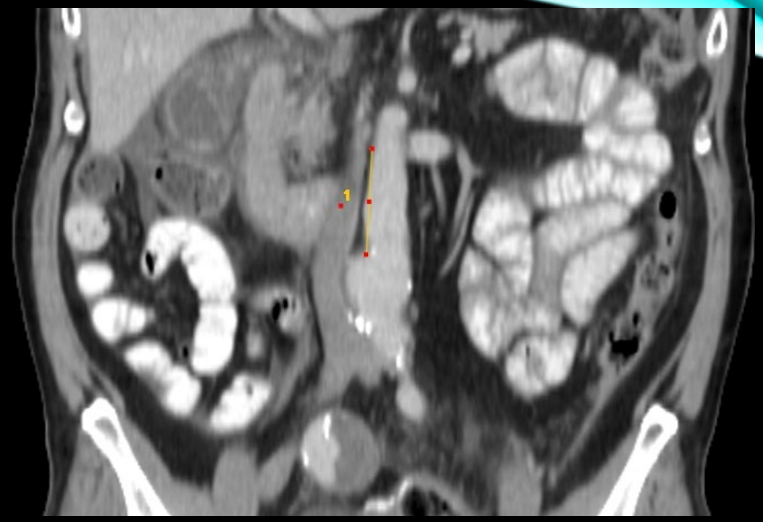

11 years postop in 2021 his AAA starts to grow
Identified with ‘new’ IMA and lumbar endoleak
No signs of 1a or 1b
Embolization in 2023, 2024, January 2025
IMA, multiple lumbars

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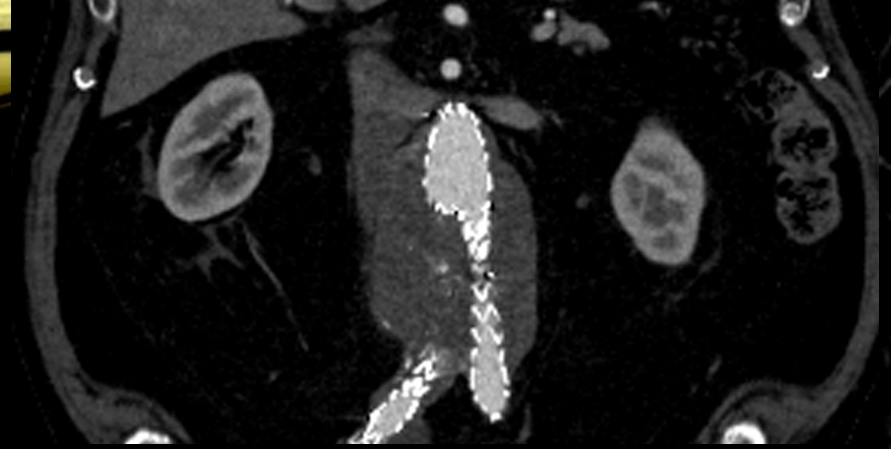


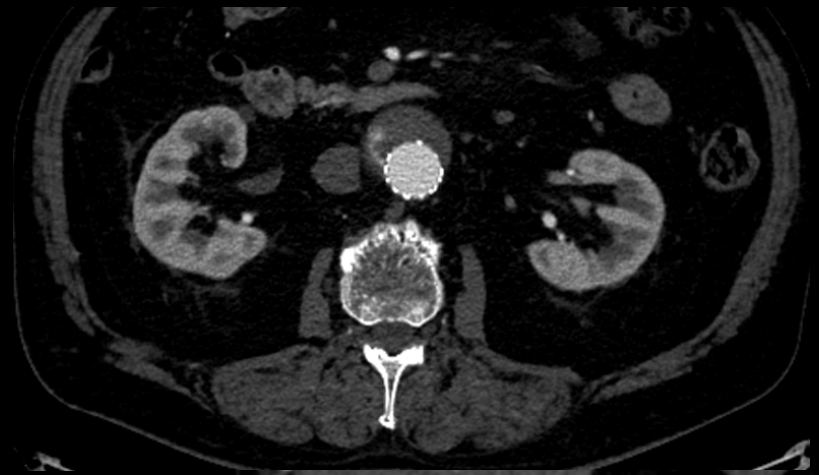

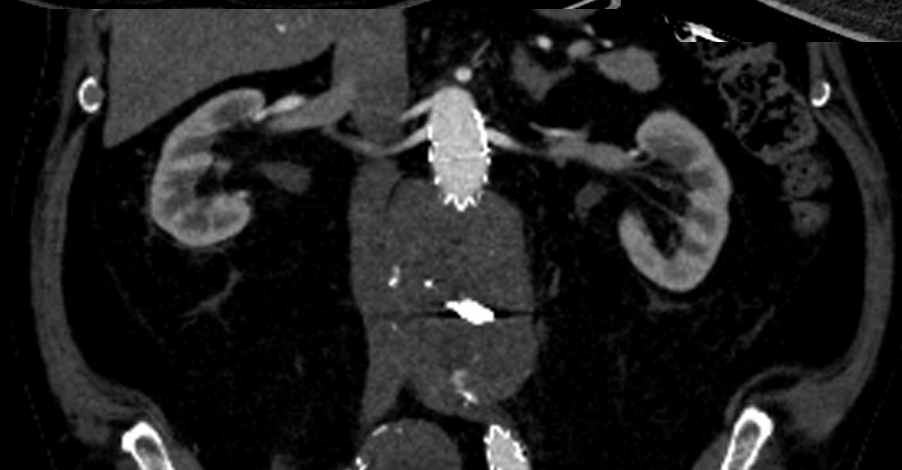

CTA February 2025; age 73
Persistent multiple lumbar type 2
Probable 1a endoleak

Currently formulating a plan

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OPEN CONVERSION AFTER EVAR

- Endograft failure is an expected outcome for some EVAR patients
- Many failures can be successfully managed with endovascular interventions

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OPEN CONVERSION AFTER EVAR

- We need to be able to identify those patients who are best managed with open conversion after EVAR
- We should develop an approach to preoperative anatomic assessment and maintain discipline in the operating room in arriving at a reconstruction plan and techniques that balance long-term durability with perioperative risk

THANK YOU

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