Emergent Zone 0 TEVAR for

Acute Type A Aortic Dissection Following PCI for AMI With Cardiogenic Shock Supported by Impella and VA-ECMO

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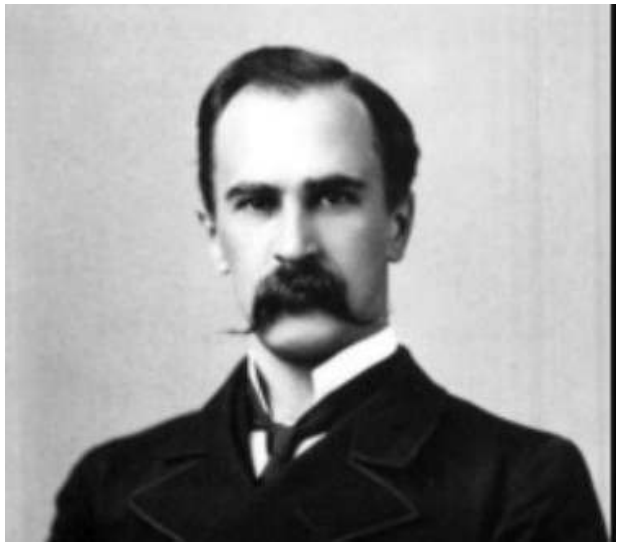
Aortic disorders: Aneurysms & Dissections

Sir William Osler's: "There is no disease more conducive to clinical humility than aneurysms of the aorta"



King George II died (1760) from Acute AAoD -> ruptured into pericardial sac.
Frank Nicholls: confirmed at autopsy.

Important role of Houston in surgery of aortic aneurysms. Asc, arch, TAA
(DeBakey, Cooley, Crawford)

1963 DeBakey successful repair Asc AoD using more modern techniques

Role of Stanford in clarifying benefits of **op** on Acute Type A & **med Rx** Type B. (Daily)
Hypothermia: brain protection (Griepp)

Role of TEVAR for Acute Type A Dissection.

- TEVAR for acute Type A aortic dissection in patients with prohibitive surgical risk is receiving increasing attention.
- We report use of TEVAR for Type A dissection after left main PCI complicated by cardiogenic shock on mechanical circulatory support (Impella + pVAECMO)

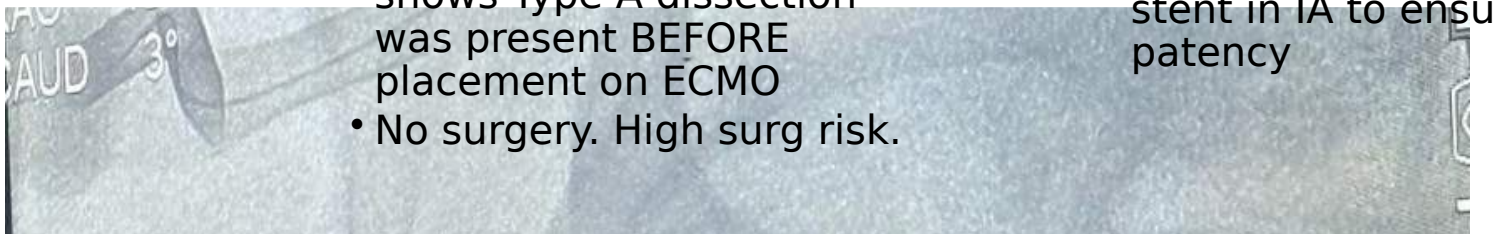
Patient Presentation and Hospital Course

Hospital Day 1

- 53 yo AA male presents with left main STEMI
- PCI via Right Radial
- VT with wire down LAD
- CT surg consulted with concern for LM dissection
- NorEpi 15 mcg/min, fluids
- Impella CP Placed via Rt CFA
- Lactate 4.9 ->1.9 by arrival to ICU

Hospital Day 2

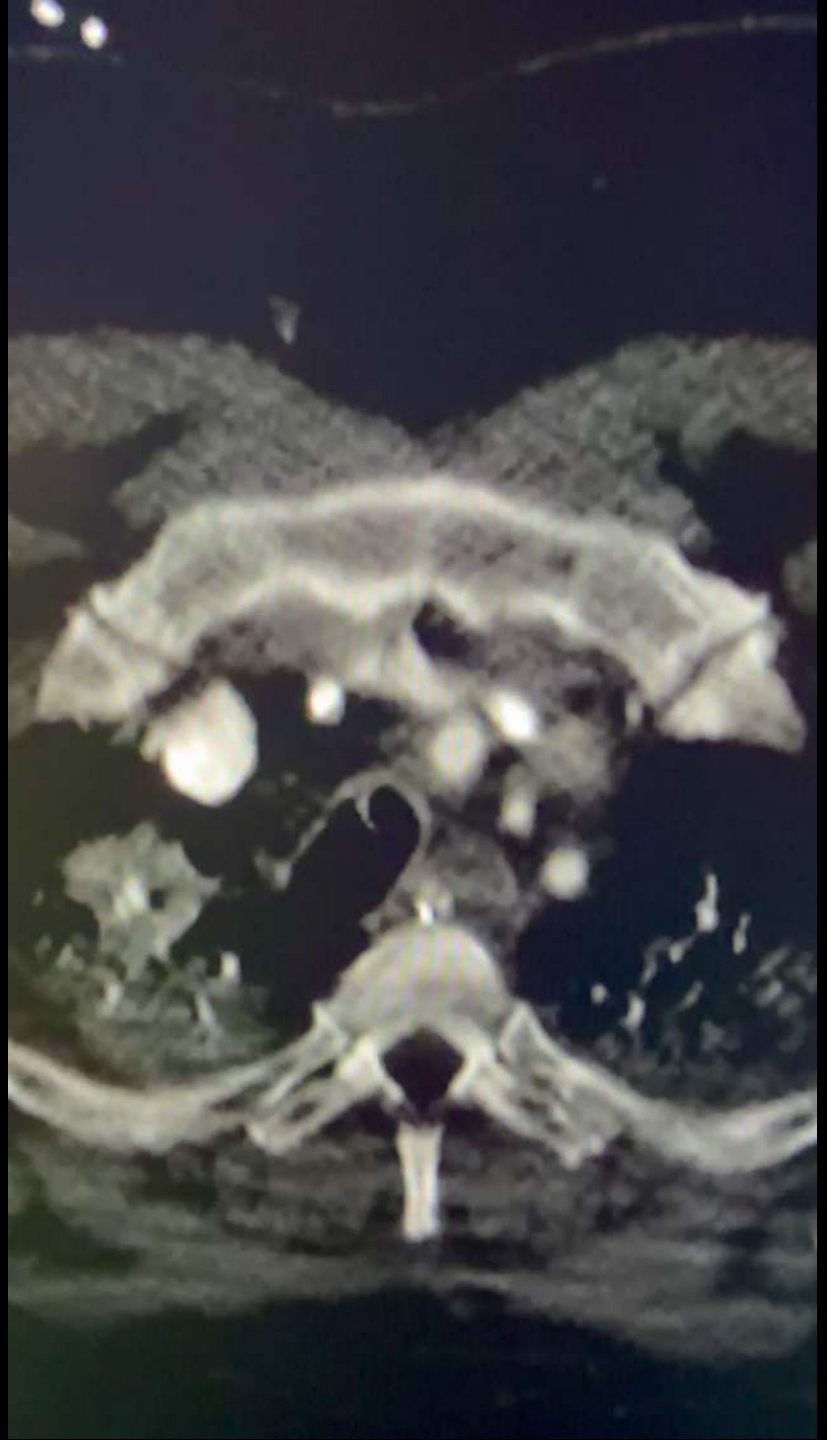
- Overnight decompensation with arrest in early morning hours
  ->TEE biV failure
- Decision to place on VA ECMO at bedside. 5.3LPM, Impella CP.
  - Epi 10mcg/min, Levo 40mcg/mn Vaso 0.08 (VIS 36)
  - Lactate 12
  - Post-ECMO cannulation TEE
  - ->Type-A dissection; LVEF 5-10%.
  - Review of pre-ECMO TEE shows Type A dissection was present BEFORE placement on ECMO
  - No surgery. High surg risk.

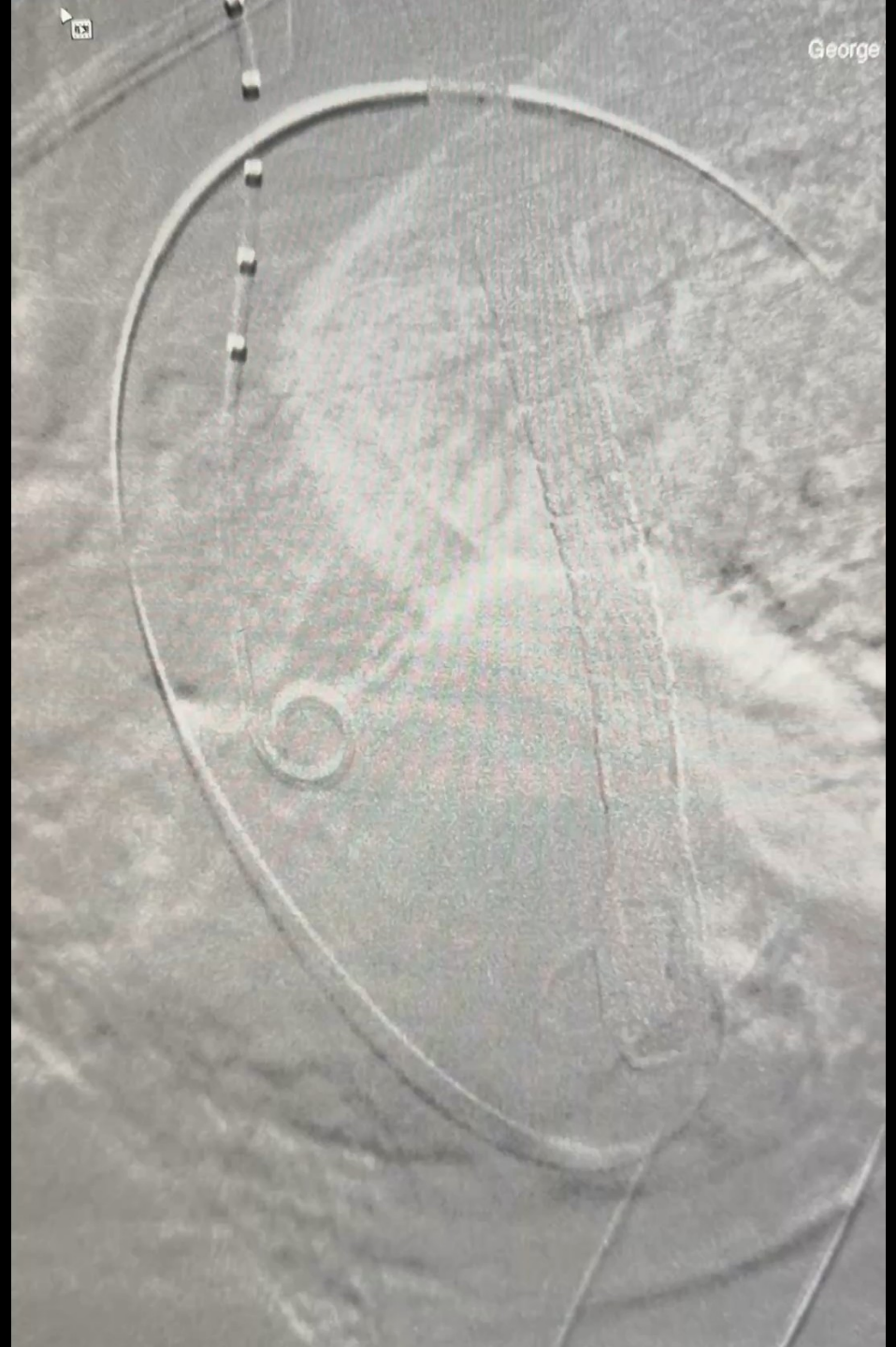


Hospital Day 3

- MultiD decision for TEVAR in Asc Ao position.
  Cutdown Left axill' art to sew graft for ***later*** placement Impella 5.5
- CP removed to facilitate delivery of TEVAR; px supported on ECMO thr'out with intermittent runs of VT/VF in absence of unloading, & TL encroach by FL Asc Ao
- Gore dryseal to RCFA to insert TEVAR placed from root up to innominate take off, with additional covered stent in IA to ensure IA origin patency

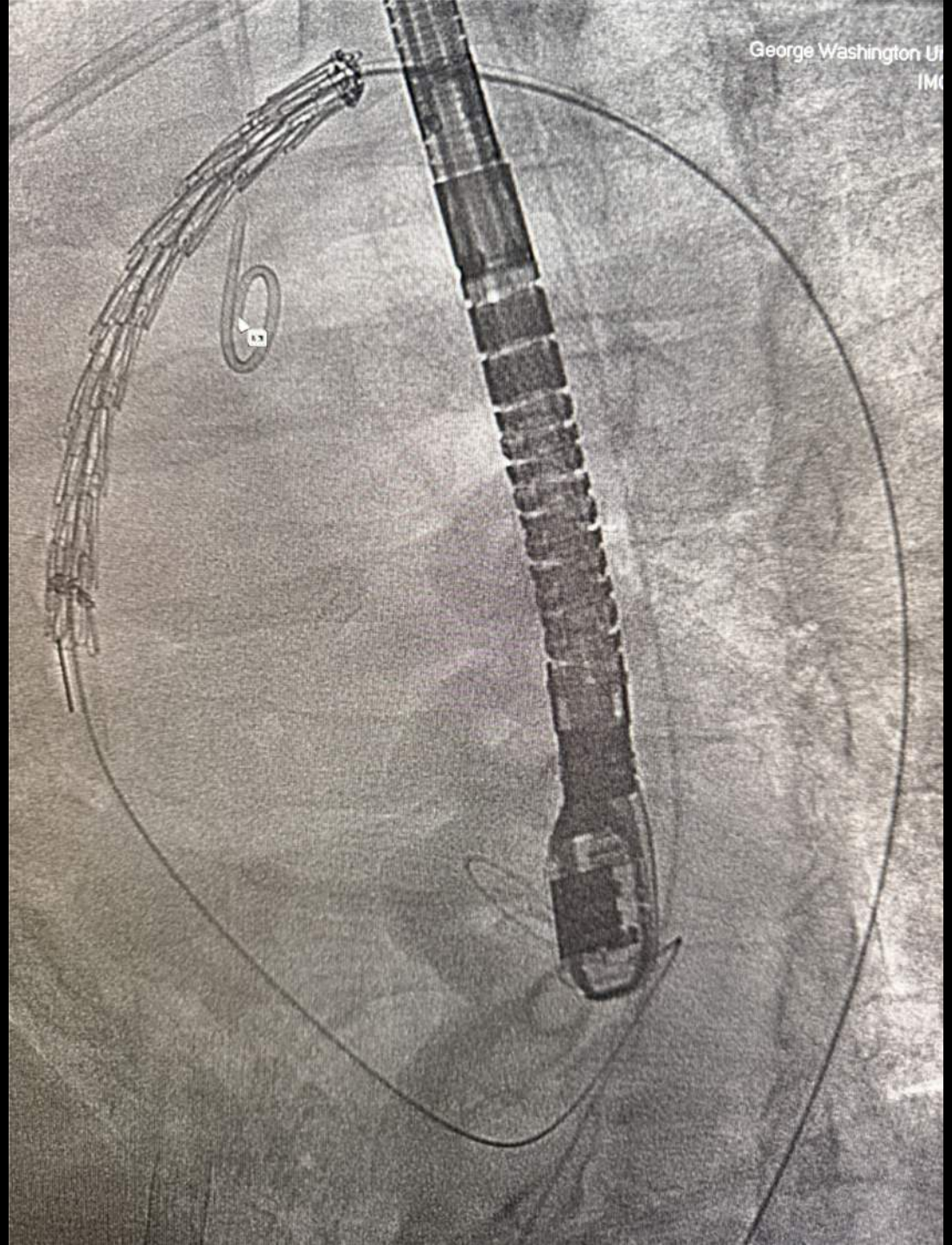
Pre-TEVAR: CTA on ECMO Type A. Aortic Dissection




George

TEVAR and a VBX in Innominate artery 4x29

- Gore TAG 40 mm x 40 mm x 10 cm.
- Above the RM & LM in aortic root -> take off of bovine arch from arch.
- Inno artery: VBX size 4 x 29


George Washington Un
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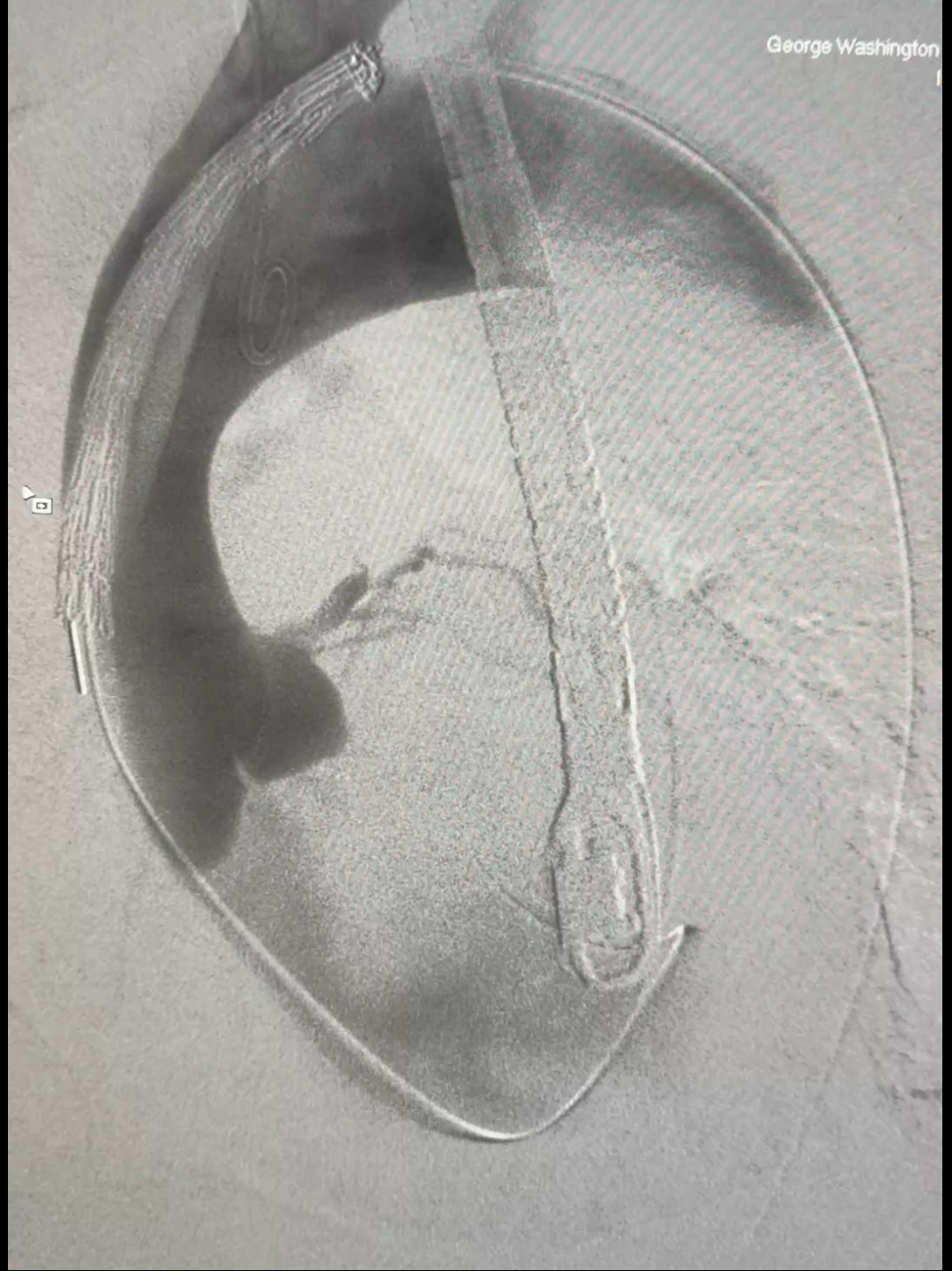
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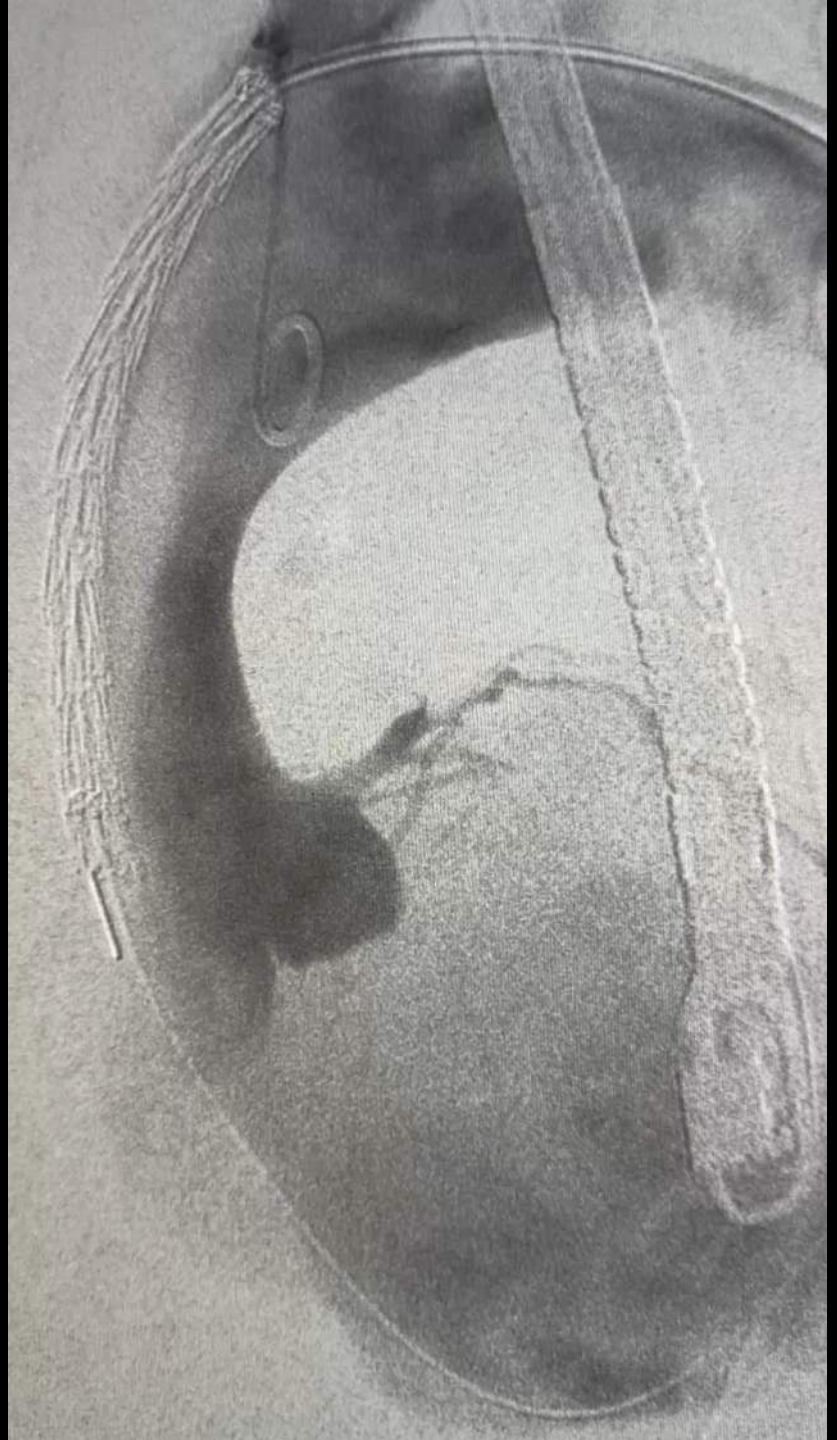

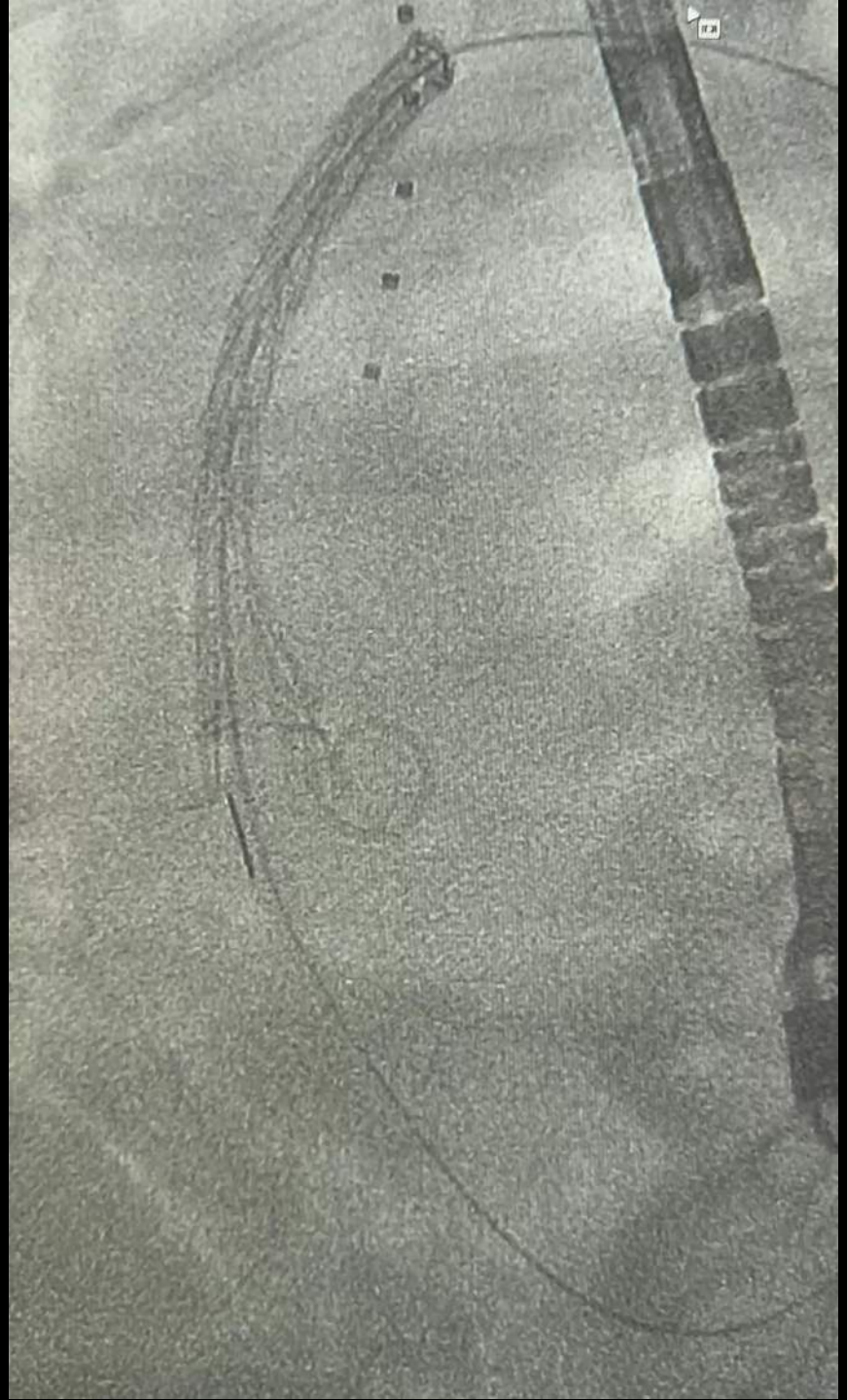

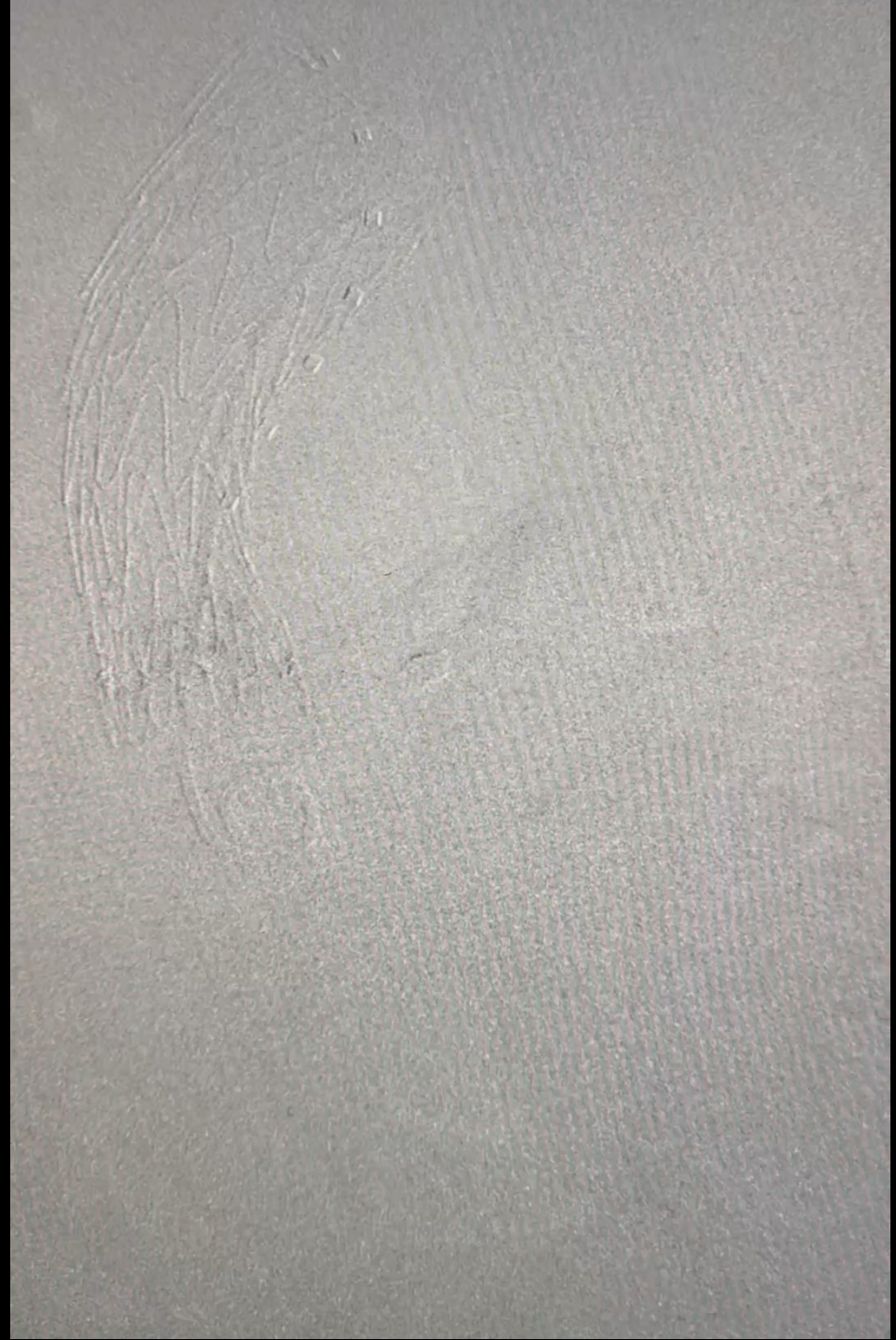

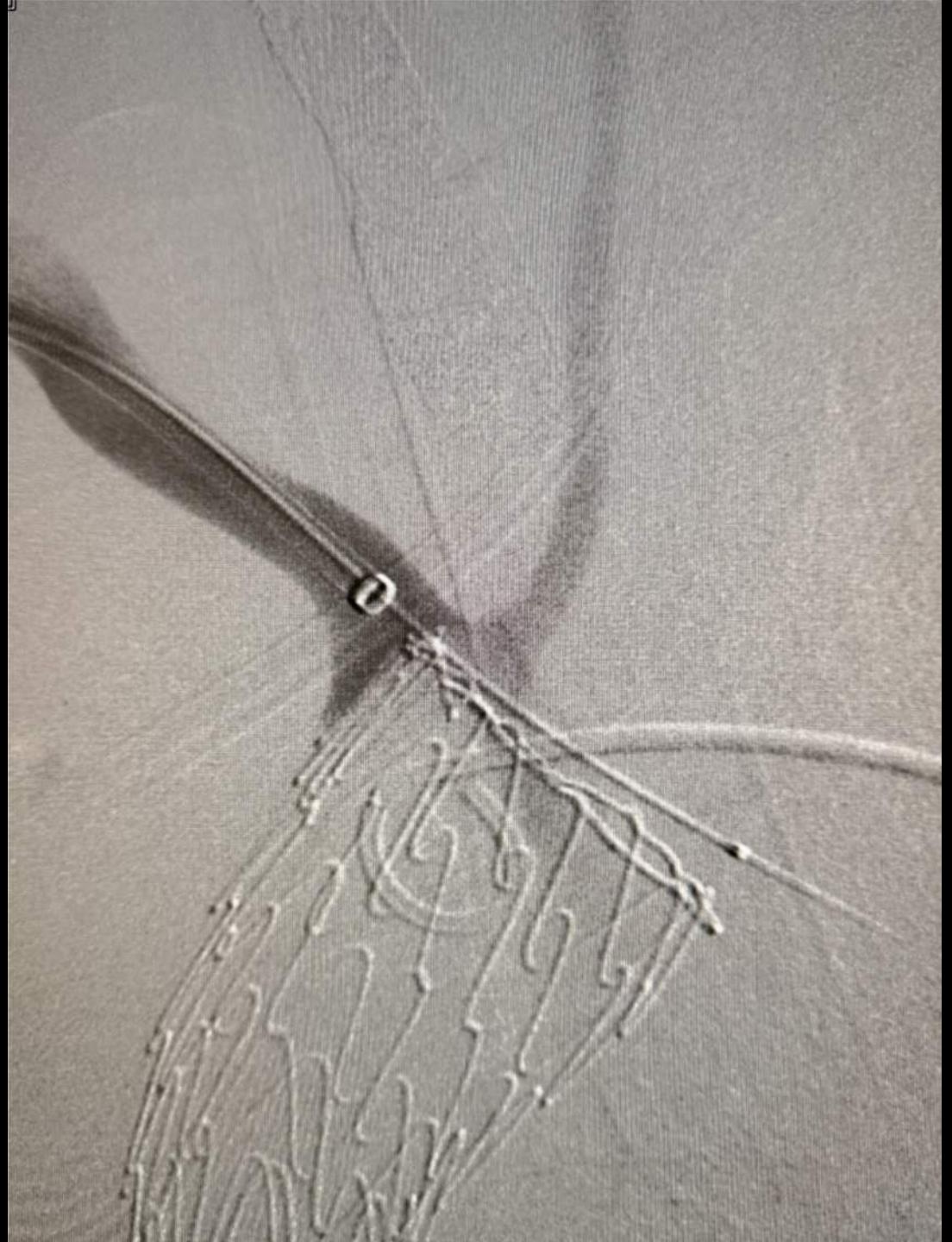

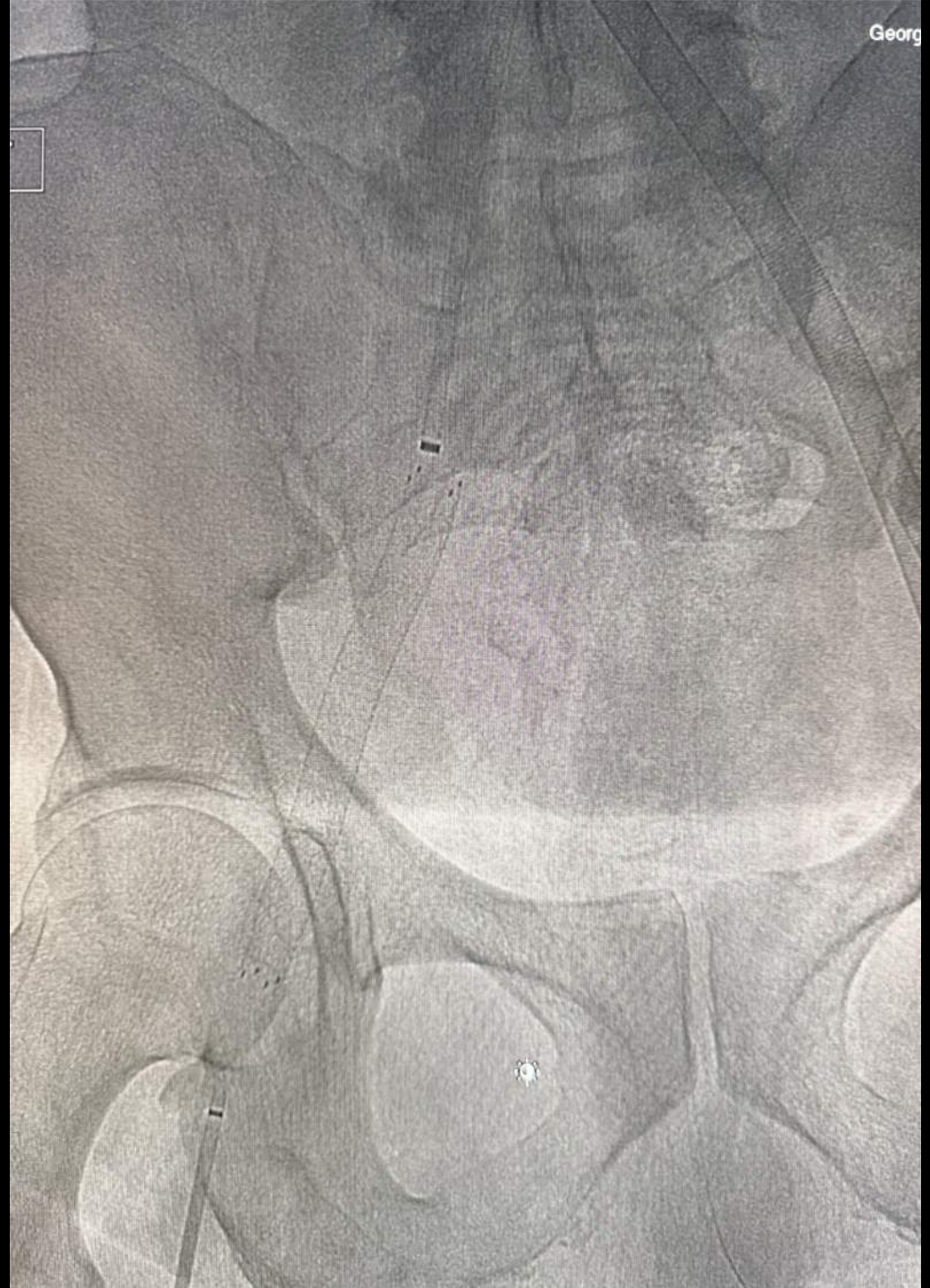
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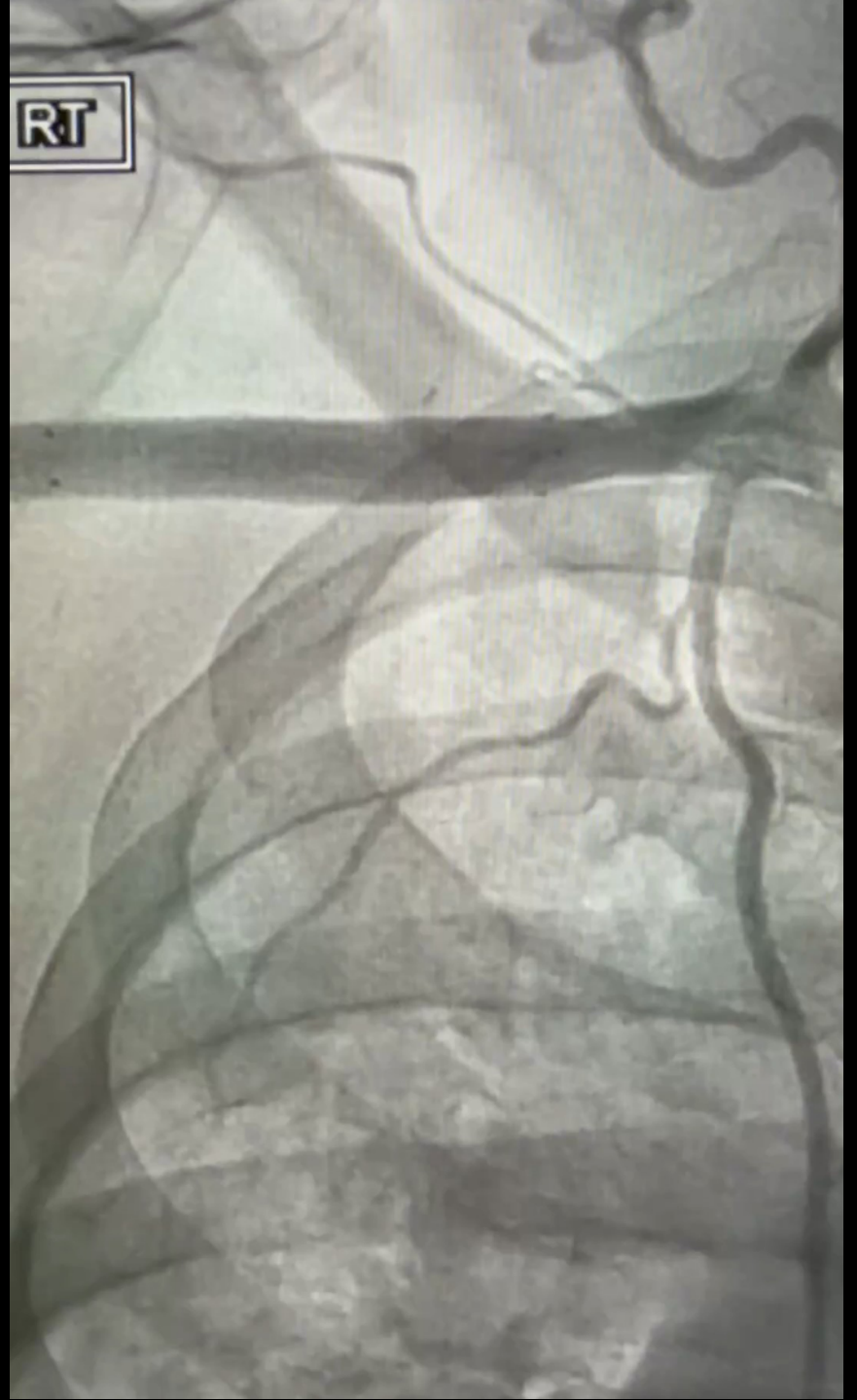
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Hospital Course Continued

Hospital Day 3 (cont)

- North/South syndrome at end of case (R-Rad PaO2 30’s). ECMO flow increased from 4.3-5.2lpm

Waveforms on Day 3

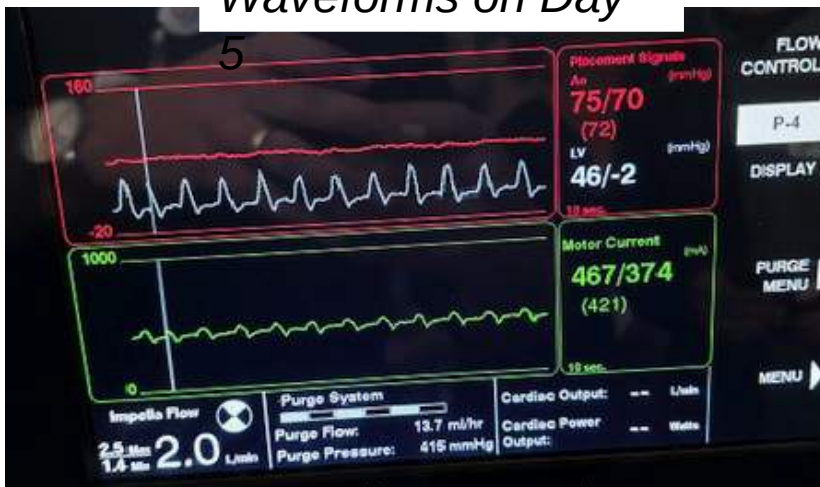
Hospital Day 4

- R.Ax hematoma noted at Impella site requiring intervention
- Unclear neuro status
- Slowly improving LV pulsatility
- Continued high support requirement
  - ECMO 5L, Impella 1-2L, Epi 6mcg/min, Levo 10 mcg/min (VIS 10)
  - High Vent settings (80-100% FiO2, PEEP 12

Hospital Day 5

- Concern for RUE compartment syndrome
- Patient Brachial artery with laminar flows seen on Doppler US
- CRRT
- LDH 10,000 -> 4800

Waveforms on Day 5



Hospital Course Continued

Hospital Day 6

- RUE suspected vasospasm

Hospital Day 7

- Unsuccessful ECMO ramp from 4.3 ->2.5lpm. LV with improved function (~30%) with severe MR, mild-mod RVD
- On/off low dose vasopressors, ECMO to 3.8lpm for slow wean

Hospital Day 11

- Minimal pulsatility noted with appropriate positioning

Impella CP waveforms Day 9

Impella 5.5 waveforms Day 11

Case Conclusion

Hospital Day 12

- VF x3 overnight requiring defib
- Concern for neuro injury with change in pupil assessment- CT head: ICH with concern for herniation
- Decision made to withdrawal support

Summary

- **Summary**
  Endovascular repair for inoperable acute Type A aortic dissection is increasingly reported in highly selected patients.
  In this case, VA-ECMO was instituted for refractory biventricular failure *prior to* recognition of the dissection.
  Paradoxically, VA-ECMO provided a stable hemodynamic platform that enabled emergent Zone 0 TEVAR placement in an inoperable patient.
  This case underscores the potential role of ECMO-supported endovascular strategies as a bridge or alternative therapy in select patients with acute Type A aortic dissection.

Concept of TEVAR as Salvage Therapy

- **Rationale for TEVAR**
- Seal the **proximal entry tear**.
- Reduce false lumen pressurization.
- Prevent rupture.
- Stabilize hemodynamics **without sternotomy or bypass**.
- **Challenges**
- Short ascending aortic landing zones.
- Coronary ostia proximity.
- Arch vessel involvement.
- Device limitations (no dedicated ascending grafts in most regions).

VA ECMO: Can it be used in Ao Dissections?

We know it can cause retrograde Ao Dissections from groin cannulation.

- Can VA ECMO be used in unstable px with Type A dissection?.
  Case reports describe this being done prior to operation.

- Have been used intraop, “central placement”

- We have Rx Type B AAoD post Rx PE Shock +Inari, that developed in a px on pVAECMO by switching arterial inflow to Ax graft “centroid VA ECMO” fixed the malperfusion problem. “A ~~Stitch~~ Switch in time saves Nine”

CTA Chest Abdomen and Pelvis On ECMO/“Two Circulations”.

- Type B dissection. Narrow true lumen. “No Contrast” false lumen
- Celiac, SMA, IMA come from TL. Distal narrowing of these vessels
- Patient continued to do poorly:
- LFTs, acidosis, decreasing EF, increasing need for inotropes

**Video/Gif files play automatically in*

POD 3- ECMO Reconfiguration

- ECMO: Arterial inflow converted from peripheral femoral artery (*retrograde*) to axillary artery (*antegrade)* in aorta
- Right axillary arterial cannulation via 8mm Hemashield graft with 22fr aortic cannula
- Open vessel closure of femoral arterial access site. Removal DLP

TEE Confirming Descending Aortic Dissection

**Video/Gif files play automatically in*

Repeat TTE POD2* from Axillary Cannulation

Improved Biventricular Function on Reduced Support

*(Thrombectomy POD 6)

*Video/Gif files play automatically in slideshow

What the Literature Shows

- Mostly **case reports** and **small series**.
- TEVAR used only when **open surgery is not possible**.
- Several reports describe **successful survival** after emergent TEVAR.
- Post-TAVR dissections are a recurring scenario where TEVAR is feasible.
- Larger observational analyses show:
  - Many inoperable patients have **anatomically coverable entry tears**.
  - Medical therapy alone has **extremely high mortality**.

Key message: TEVAR can be lifesaving in **select, anatomically suitable, inoperable patients**.

Examples from the Literature

- **Complete recovery** after emergent TEVAR in an inoperable Type A dissection (JVS Cases).
- TEVAR for **post-TAVR Type A dissection** with successful stabilization (JVS).
- Endovascular repair performed **without general anesthesia** in a prohibitive-risk patient (CTSNet).
- Imaging studies show **>50%** of inoperable patients may have treatable entry tears.
- **Pattern:** TEVAR is used as a **rescue**, not a replacement for surgery.

Assess Anatomic Suitability for TEVAR

- **Is the entry tear coverable?**
  - Typically between the **sinotubular junction** and **innominate artery**
- **Is there a proximal landing zone?**
  - Enough distance between **coronary ostia** and the tear
- **Is there a distal landing zone?**
  - Before the arch vessels, or with planned coverage + revascularization
- Evaluate:
  - Aortic diameter
  - Coronary proximity
  - Arch vessel involvement
  - Risk of retrograde propagation
- **If anatomy unsuitable → Medical therapy / palliative care**
- **If anatomy suitable → Proceed to technical planning**