CAIR Case of the Month

Case Courtesy of Drs. P. Kennedy, D. Klass and J. Chung
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BACKGROUND

- **Both transradial (TR) and transfemoral (TF) access are safe approaches for endovascular procedures**
- **TR is the standard for most visceral artery interventions at our institution**
  - **Lower all-cause mortality [1-2]**
  - **Lower major bleeding [1-2]**
  - **Lower access site complications [1-3]**
  - **Preferred by patients [3]**
  - **Safe and feasible in morbidly obese patients [4]**

BACKGROUND

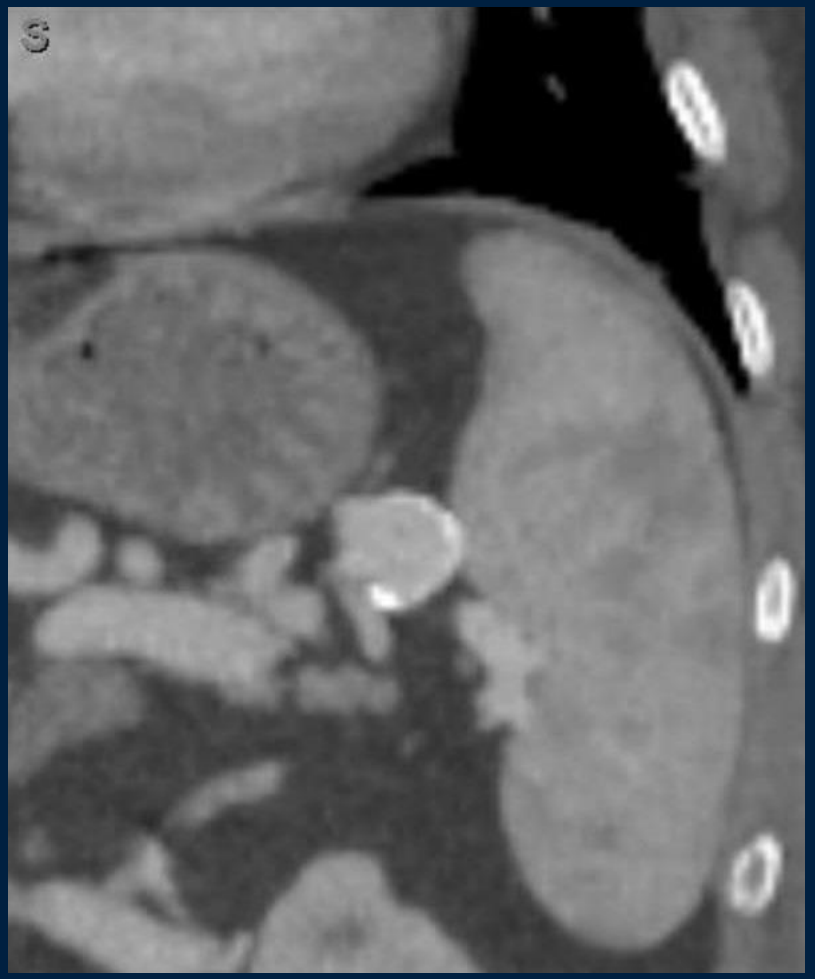
- Major complication rate 2% or less [2-4]
- Complications [2-6]
  - Vasospasm
  - Hematoma without underlying vascular injury
  - Pseudoaneurysm
  - Dissection
  - Subacute or delayed occlusion
  - Digital ischemia
  - Stroke
- No cases of stroke at our institution in > 5000 cases
- No known cases of death in the literature related to TR vascular access site complications

BACKGROUND

- **Performing TR procedures effectively requires adequate training, equipment, and infrastructure to prevent and manage complications**
  - **Bedside Barbeau Test [7]**
  - **Tumescent anesthesia**
  - **Intra-arterial antispasmotic cocktail**
  - **Sheath hygiene**
  - **Ulnar artery compression [8]**
  - **Rapid hemostasis protocol [9]**

CASE REPORT: INITIAL PRESENTATION

- 47-year old woman, Jehovah's Witness
- History of hypertension, chronic microcytic anemia, and obesity
- Incidental 2.4 cm splenic artery aneurysm on CT chest
- Presented for elective transarterial embolization



PROCEDURE

- Conventional left radial micropuncture access
  - Vessel accessed on 2nd puncture attempt
- 5 French hydrophilic sheath
  - Administered heparin 2000 units, verapamil 2.5 mg, and nitroglycerin 200 mcg intra-arterially
- 5 French Ultimate 1 catheter to celiac artery through to splenic artery

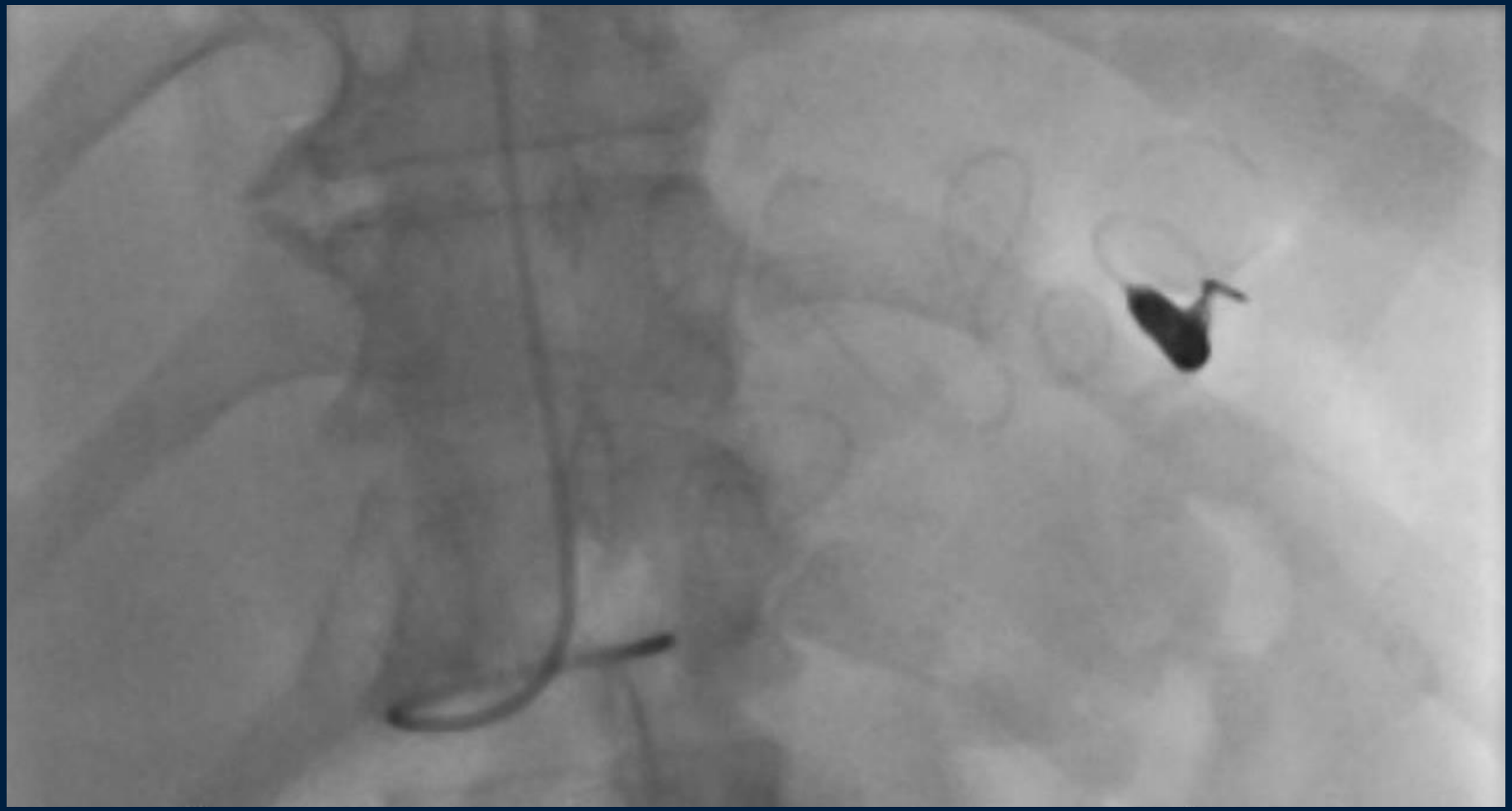
PROCEDURE

Digital subtraction angiography confirmed the presence of a 2.4 cm splenic artery aneurysm near the hilum with a highly tortuous splenic artery proximally and large inflow and outflow vessels noted

PROCEDURE

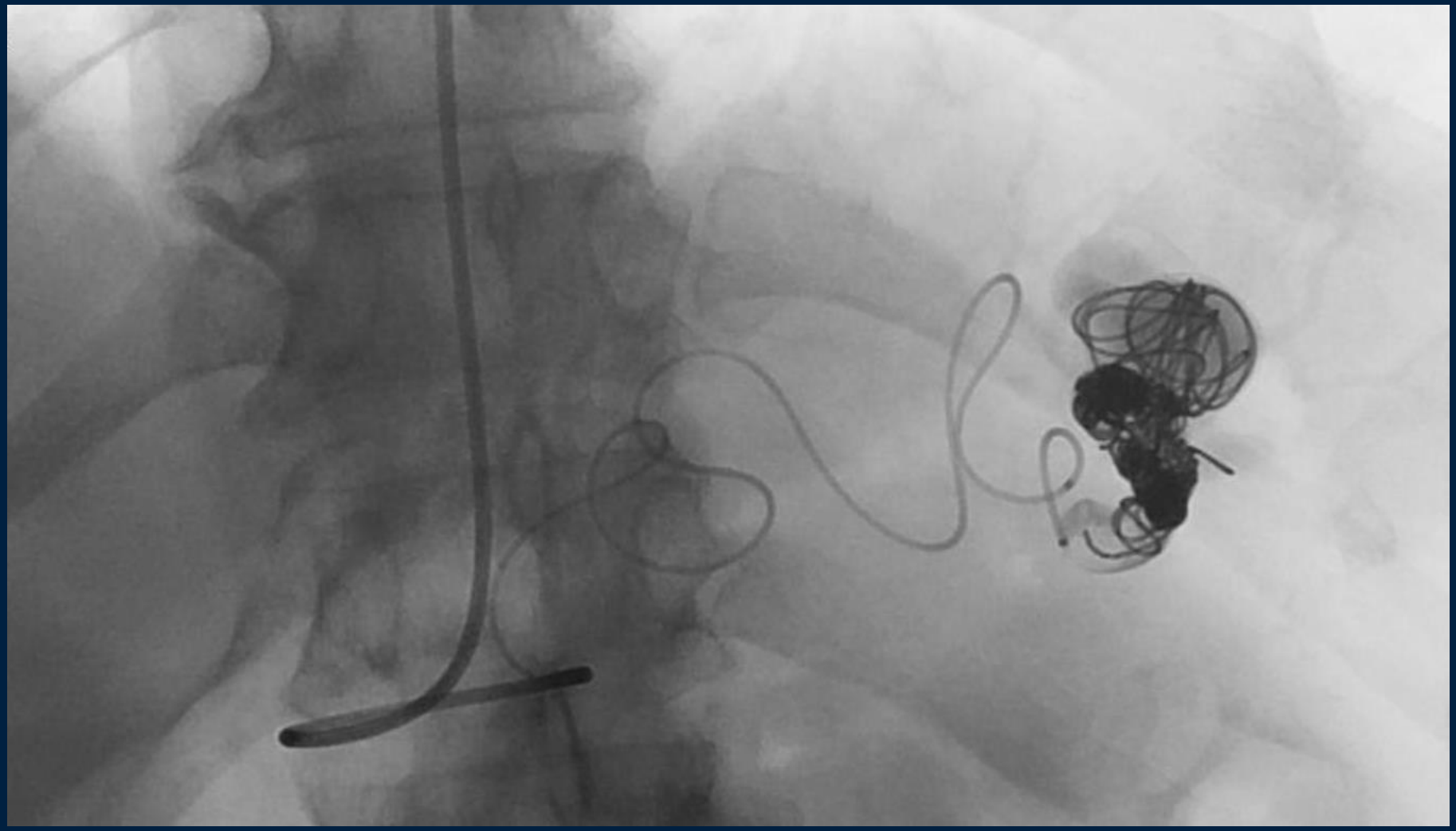
A 150 cm 2.8 French microcatheter and 0.016” microwire were used to further select the splenic artery, through the aneurysm into the principal outflow vessel

PROCEDURE



The outflow vessel was embolized using one 30 cm detachable coil and one 15 cm detachable coil

PROCEDURE



The aneurysm sac and inflow vessel were embolized using two 60 cm detachable coils and Onyx 34 liquid embolic

PROCEDURE

Post-embolization angiography: no residual contrast filling of the aneurysm sac, with patency of small collaterals to the spleen likely arising proximal to the embolized segment

PROCEDURE

- No additional heparin administered during the procedure
- Base catheter removed over the microcatheter
- Sheath removed, non-occlusive hemostasis achieved using a hemostatic disc and an external balloon compression band
- Aspiration and flushing of the sheath prior to removal not documented, therefore sheath hygiene is uncertain

POST-PROCEDURE CLINICAL COURSE

- Described left forearm and hand pain immediately post-procedure
- Assessed by IR in stretcher bay and vascular surgery consulted
- Increased turgor of the left hand noted compared to the right
- Palpable radial and ulnar pulses with a patent radial artery on ultrasound and Doppler signal present in the palmar arch and in the digits
- Pain felt to be related to radial artery spasm
- Monitored overnight
- Discharged the following morning with improvement in pain and decreased turgor

POST-PROCEDURE CLINICAL COURSE

- Presented to ER at outside centre on post-procedure day 3 with worsening pain and numbness in an ulnar distribution in the left hand
- Cyanotic patches noted on the 4th and 5th digits as well as the hypothenar eminence and the palmar aspect of the 1st digit
- CT angiogram obtained
- Transferred to our centre and admitted for inpatient management

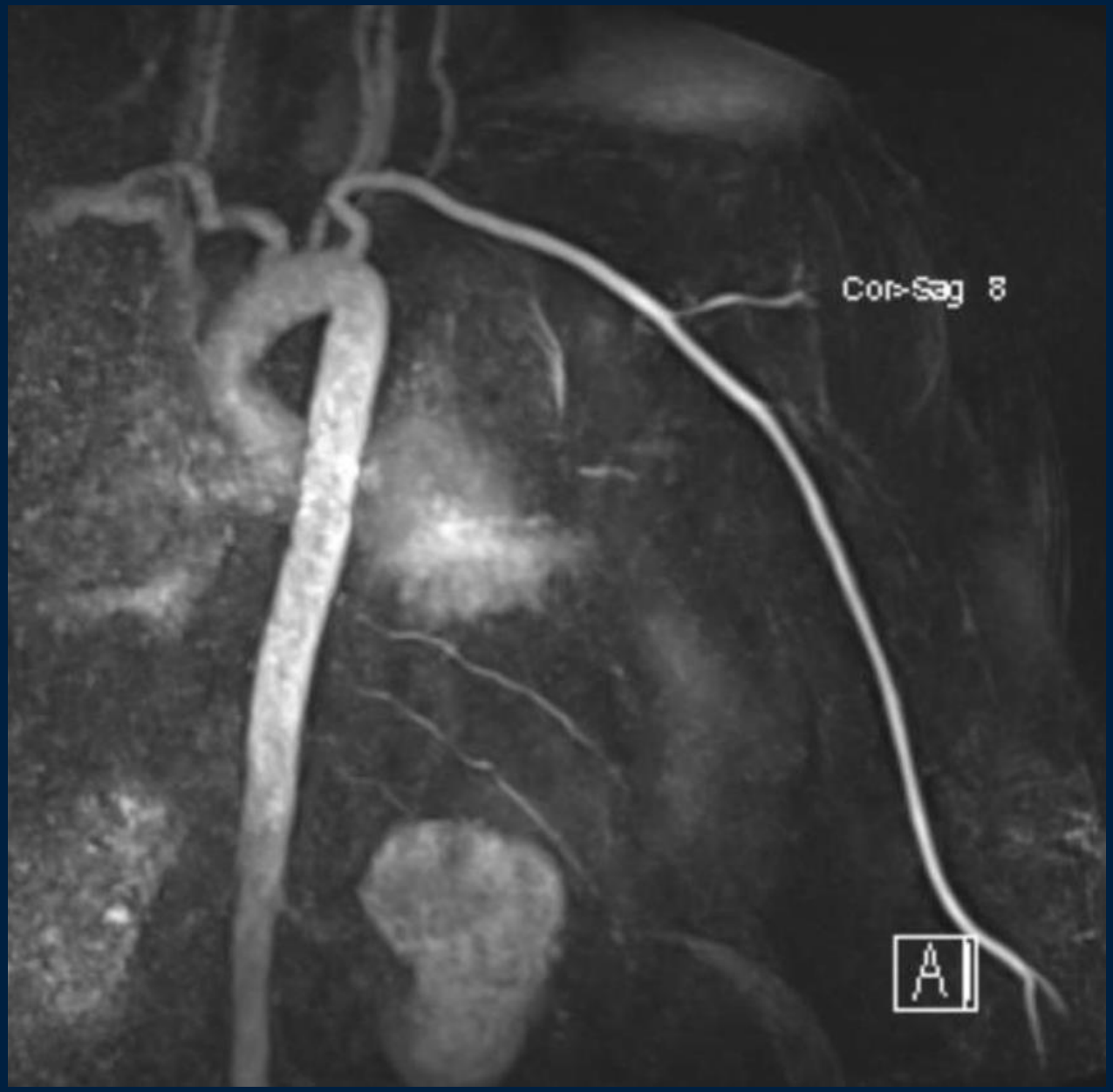
CT ANGIOGRAPHY (OCTOBER 21ST, 2018)

- Good contrast filling of the brachial and radial arteries
- No contrast filling of the ulnar artery, possibly related to phase of contrast
- Inadequate assessment of the palmar arches and digital arteries

MANAGEMENT

- Initiated non-operative management upon admission
  - Heparin infusion
  - Warm compresses
  - Nitroglycerin paste
  - Analgesia
- MR angiogram obtained

MR ANGIOGRAPHY (OCTOBER 22ND, 2018)



- Widely patent left subclavian artery, axillary artery, and brachial artery

MR ANGIOGRAPHY (OCTOBER 22ND, 2018)

- Widely patent radial artery
- No contrast filling of the ulnar artery beyond its proximal segment

MR ANGIOGRAPHY (OCTOBER 22ND, 2018)

- Supply to the palmar arches via the radial artery
- Poor contrast filling of the 4th and 5th digital arteries
- Early takeoff of a diminutive superficial palmar arch noted

MANAGEMENT

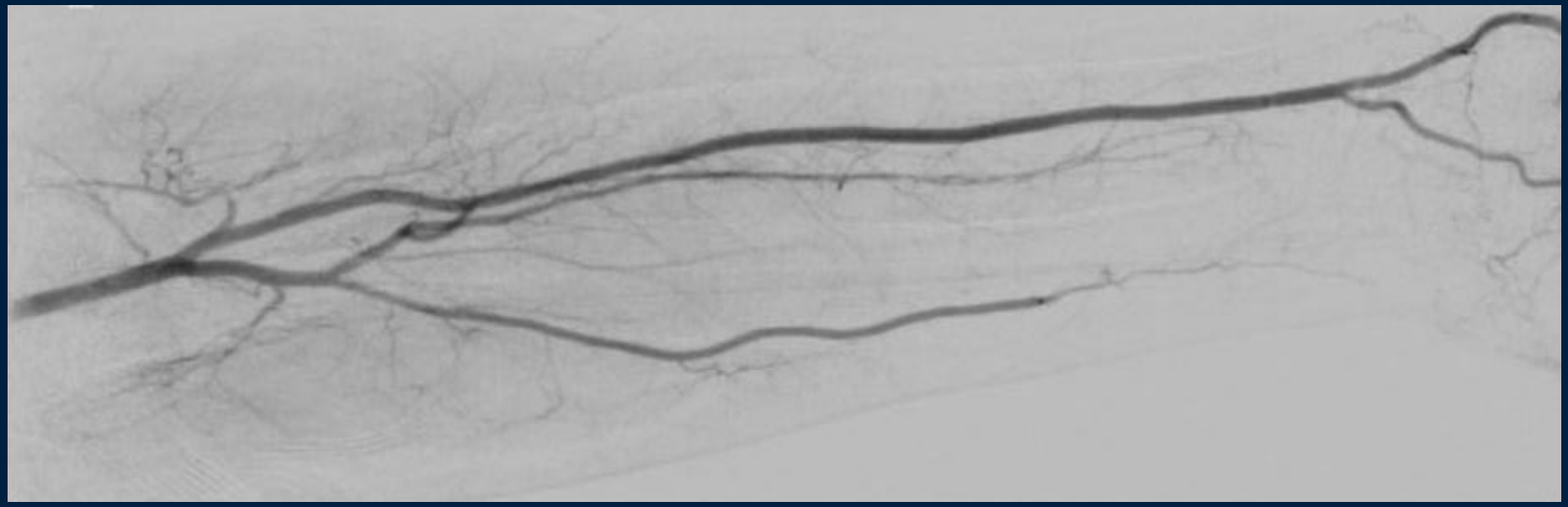
- No significant improvement in digital ischemia by post-procedure day 6
- Post-procedure day 7: CT-guided sympathetic nerve root block
    - Minimal to no improvement in cyanosis and pain

MANAGEMENT

- **Post-procedure day 9: thoracoscopic sympathectomy**
  - **Temporary improvement in pain but no improvement in cyanosis**
- **Post-procedure day 12: catheter angiogram for definitive evaluation**

CATHETER ANGIOGRAPHY (OCTOBER 30TH, 2018)

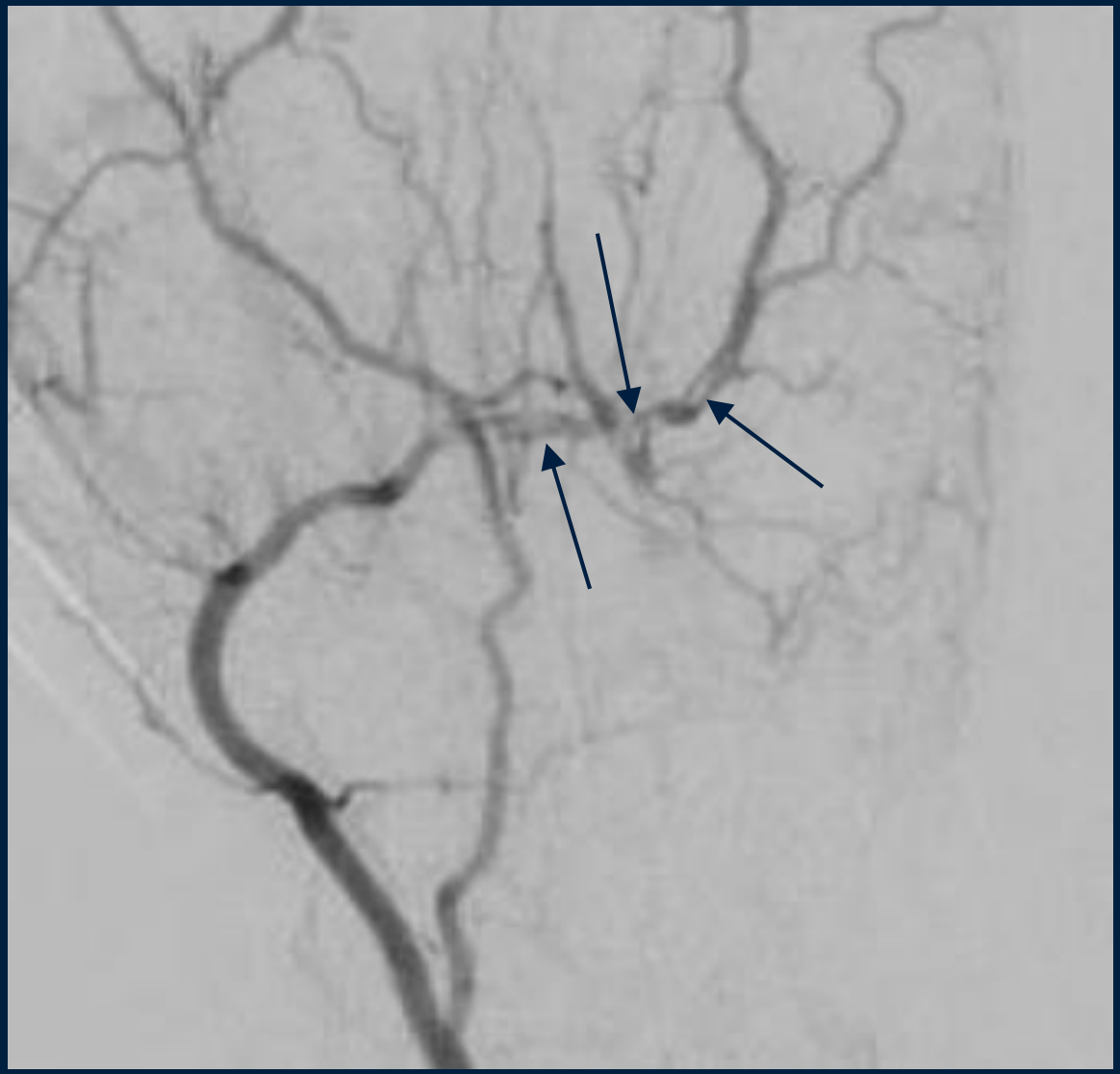
- Improved patency of the ulnar artery in its proximal and mid segments
- No flow in its distal segment
- Widely patent radial artery



CATHETER ANGIOGRAPHY (OCTOBER 30TH, 2018)

- No contribution to the palmar arches from the ulnar artery
- Persistently poor contrast filling of the 4th and 5th digital arteries

CATHETER ANGIOGRAPHY (OCTOBER 30TH, 2018)



Nonocclusive filling defects in the deep palmar arch suggesting thromboembolic etiology, with retrograde filling of a short length of the distal ulnar artery noted

MANAGEMENT

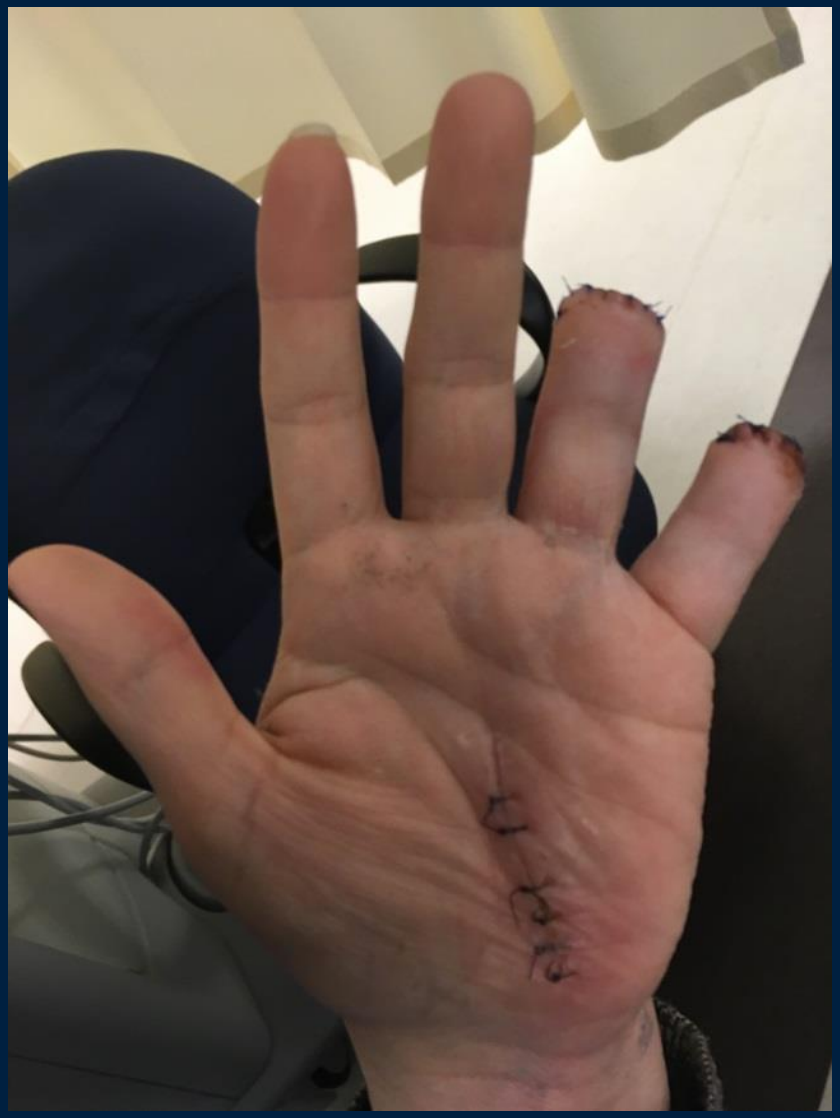
- **Post-procedure day 13: brachial-to-ulnar artery bypass grafting**
  - **No improvement with evolution to necrosis of the 4th and 5th finger tips**
- **Seen by plastic surgery in hospital for wound care and consideration of amputation**

MANAGEMENT

- **Discharged from hospital 10 days post bypass**

MANAGEMENT

- **Discharged from hospital 10 days post bypass**
- **Underwent amputation of the distal 4th and 5th digits 1 month post-embolization**



DISCUSSION: PROPOSED MECHANISMS

- **Elongated thrombus on tip of microcatheter, dislodged in upper arm during removal and embolized to ulnar artery**
- **Elongated thrombus on tip of sheath, dislodged and followed path of least resistance to ulnar artery during removal**
- **Thrombus on tip of sheath, dislodged upon sheath removal and embolized to palmar arch with subsequent proximal extension of thrombus into the ulnar artery**

DISCUSSION: SINGLE INSTITUTION EXPERIENCE

Review undertaken of all women age 18-60 who underwent TR access over 5 years by our service

- **Total number of procedures: 225**
- **Access site complications: 9 (4.0%)**
  - **Minor complications: 8 (3.6%)**
    - **4 pseudoaneurysms not requiring invasive treatment (1.8%)**
    - **4 radial artery thromboses not requiring invasive treatment (1.8%)**
  - **Major complications: 1 (0.4%)**
    - **1 ulnar artery thrombosis requiring invasive treatment (0.4%)**

DISCUSSION: PRACTICE MODIFICATION

- **Previously used a standard transradial cocktail administered intra-arterially immediately after sheath insertion**
  - **Heparin 2000 units, verapamil 2.5 mg, nitroglycerin 200 mcg**
- **Altered our practice to reduce the incidence of thrombosis**
  - **Changed heparin in cocktail to weight-based dosing (50 units/kg)**
  - **Additional 2000 units of heparin every 60 minutes of intra-arterial procedure time**

DISCUSSION

- **No other known cases of clinically significant ulnar thrombosis in the literature**
- **Could the diagnosis have been discovered earlier?**
- **Would more aggressive anticoagulation been helpful? Harmful?**
- **Should catheter-directed thrombolysis / thrombectomy been undertaken?**
- **Should bypass grafting been undertaken earlier?**

SUMMARY

- **Ulnar thrombosis with digital ischemia is an extremely rare complication from TR access**
- **This case serves as a reminder of the importance of proper technique to reduce complication rates**
- **TR access remains a safe and effective approach for visceral artery intervention**

REFERENCES

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