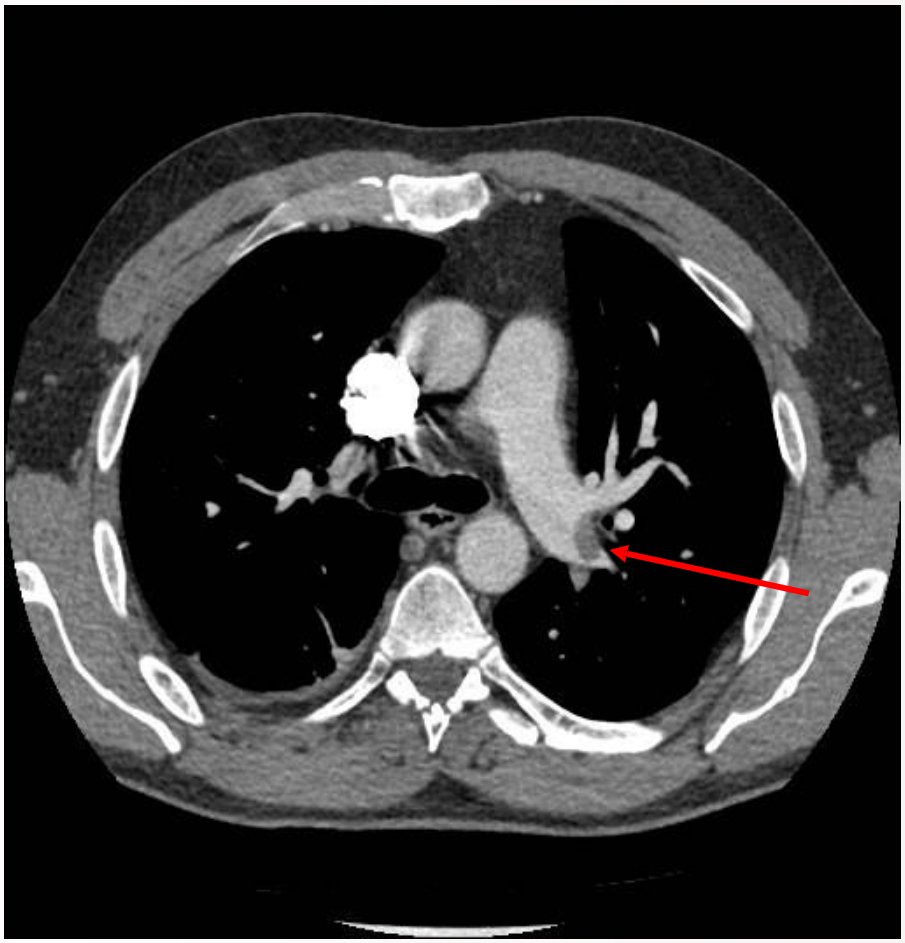
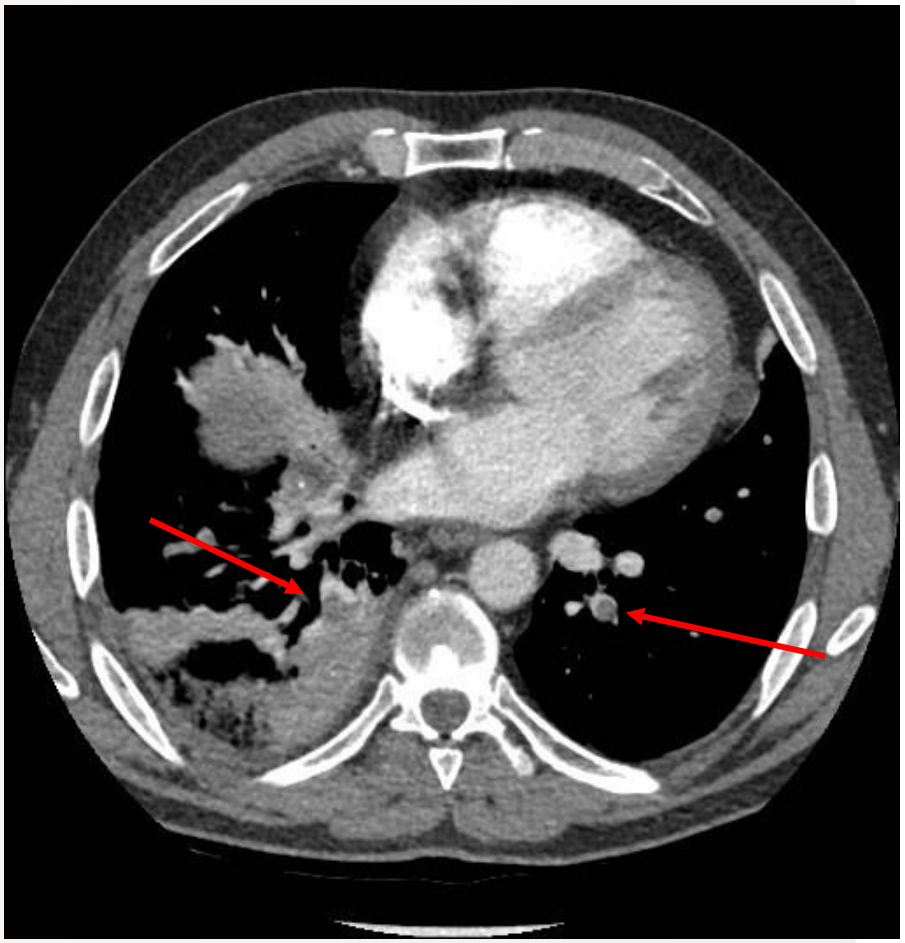
CAIR Case of the Month

Case Courtesy of Drs. M. Nassar, G. Kulbisky and A. Cassano-Bailey
University of Manitoba

Case Presentation

- 53 year old male with a left lateral tibial plateau fracture sustained playing recreational hockey
- Otherwise healthy
- Developed progressive pleuritic chest pain and hemoptysis during the week following the injury while awaiting surgery





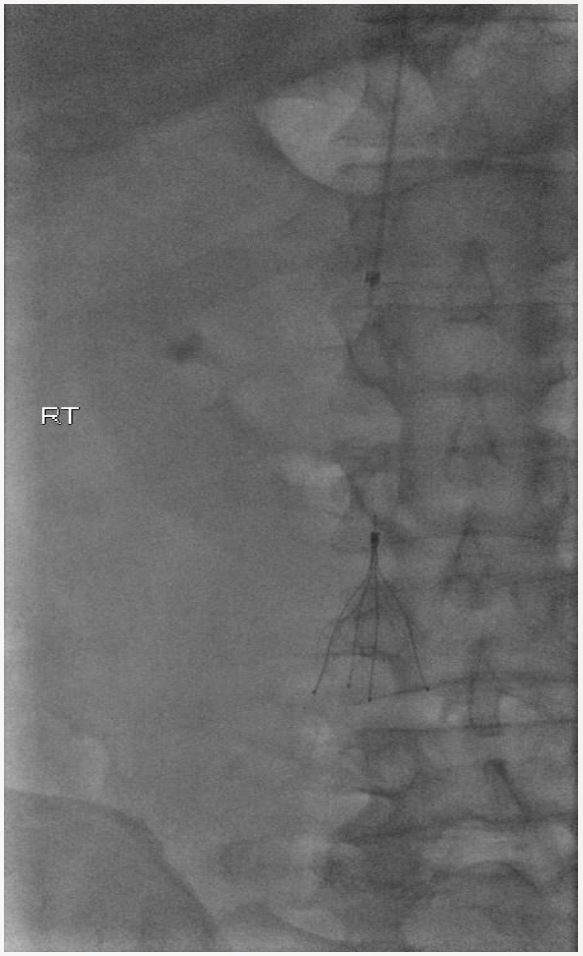
Case Presentation

- The patient was diagnosed with extensive left lower extremity deep venous thrombosis (DVT) the next day
- Hematology consulted and felt there was a significant risk of progression of emboli intraoperatively and postoperatively
- Inferior vena cava (IVC) filter placed preoperatively

Indications for IVC Filters

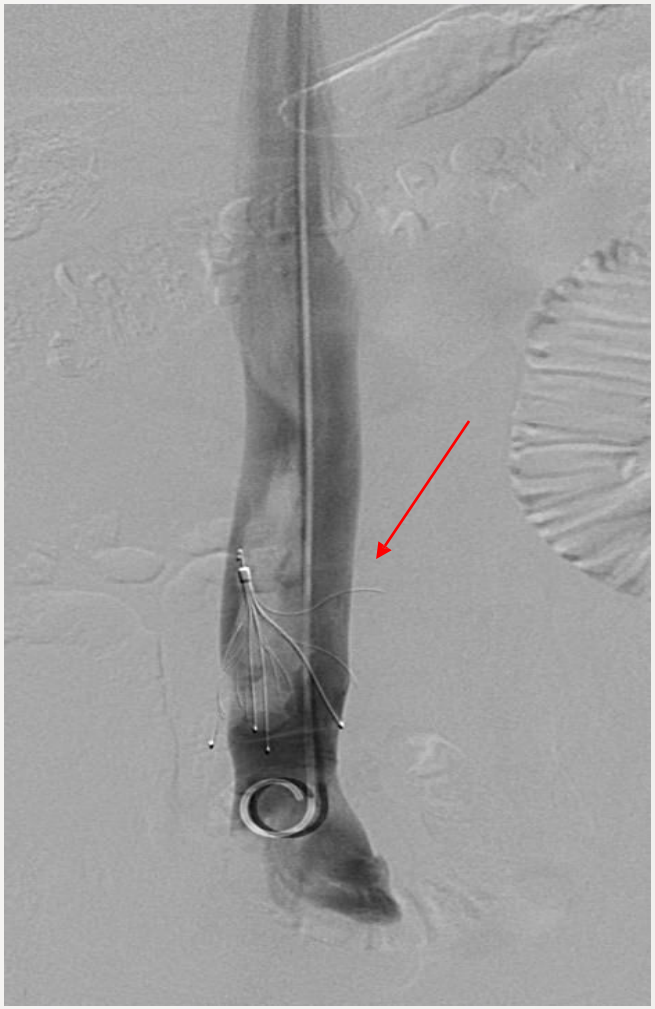
- Therapeutic
  - Evidence of pulmonary embolism (PE) or DVT involving IVC, iliac or femoral-popliteal veins with contraindication to anticoagulation
  - Perioperative with history of venous thromboembolism (VTE)
- Prophylactic
  - High risk of VTE but cannot receive anticoagulation due to high risk of bleeding

ACR-SIR-SPR Practive Parameters for IVC Filter Placement, Revised 2016

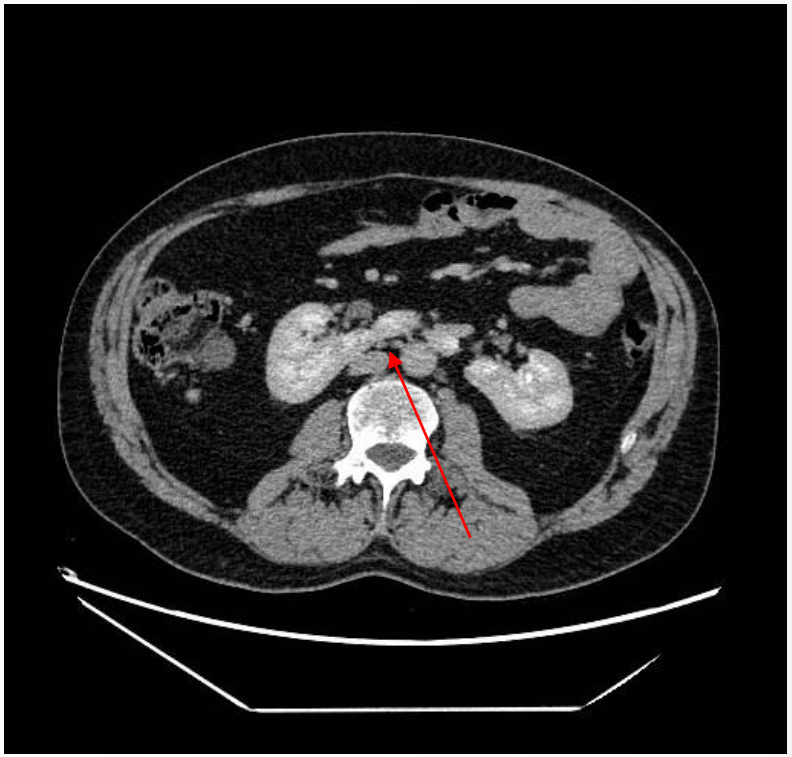


Cook Celect Vena Cava Filter placed in infrarenal IVC

- 1-month post-op the patient was brought back to the IR suite
- Right internal jugular vein (IJV) access
- Inferior venacavagram
  - Extensive thrombus in the filter
  - Strut displaced cephalad
- Follow-up CT venogram in 3 months to reassess clot burden recommended

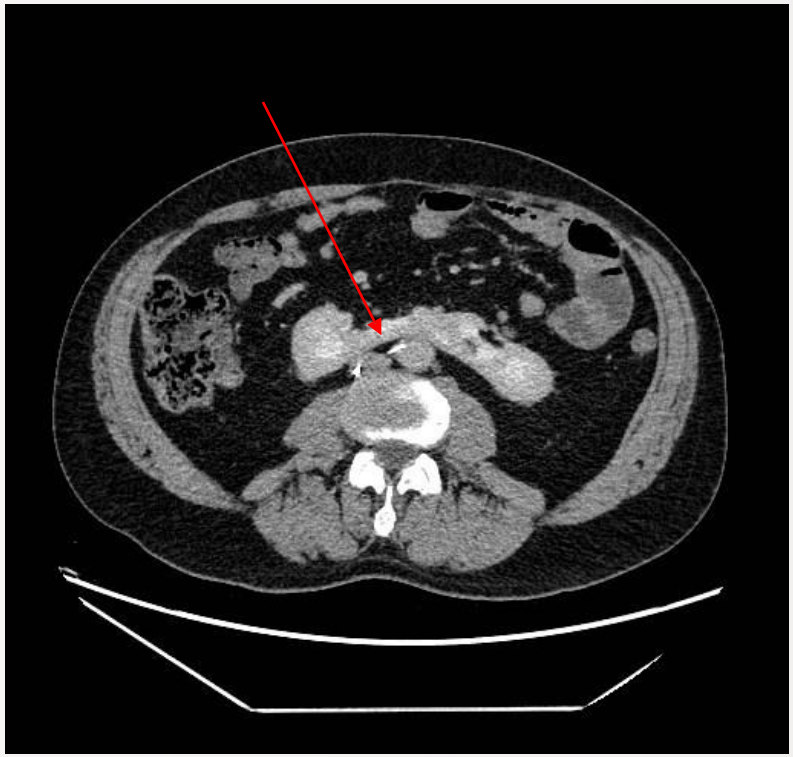


CT Venogram



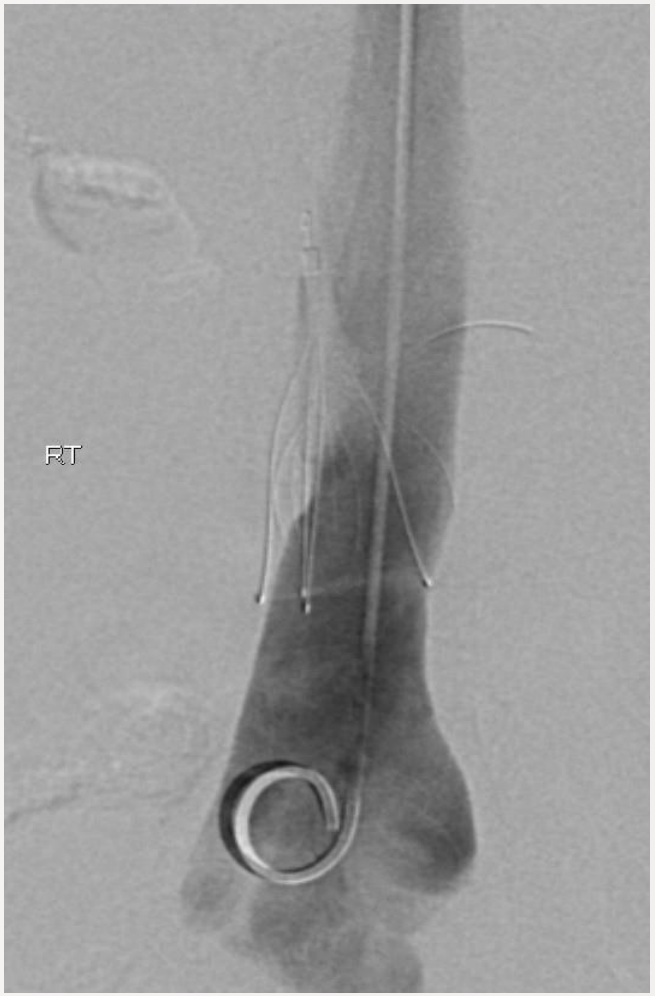
Horseshoe kidney with accessory renal artery

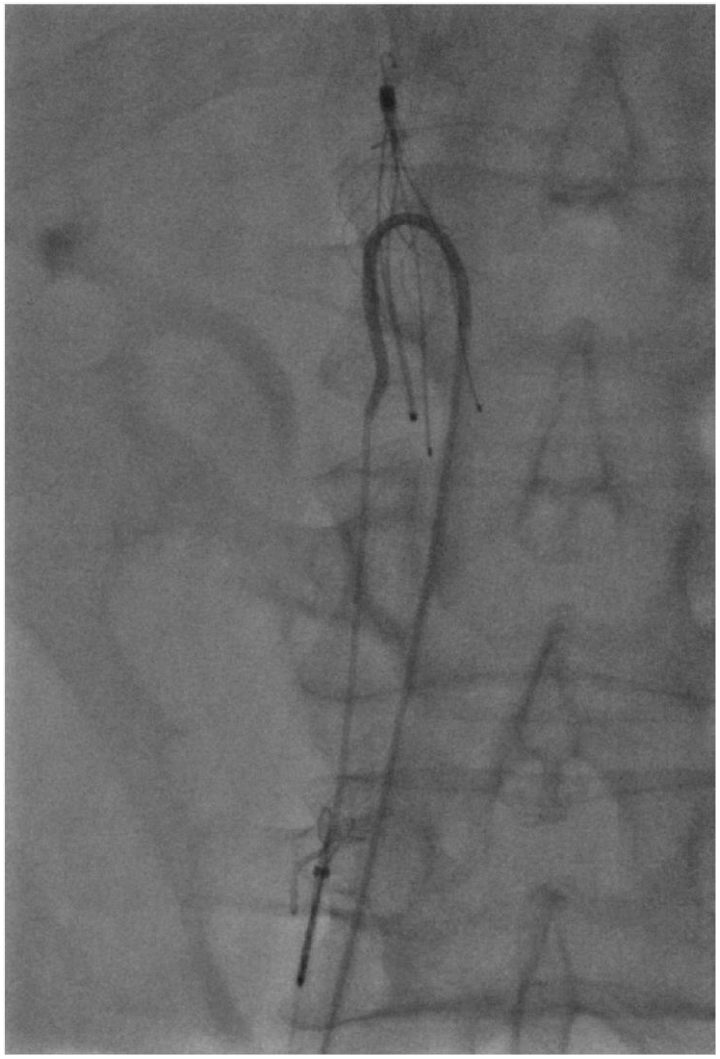
Displaced strut, possibly protruding, slightly inferior to accessory renal artery



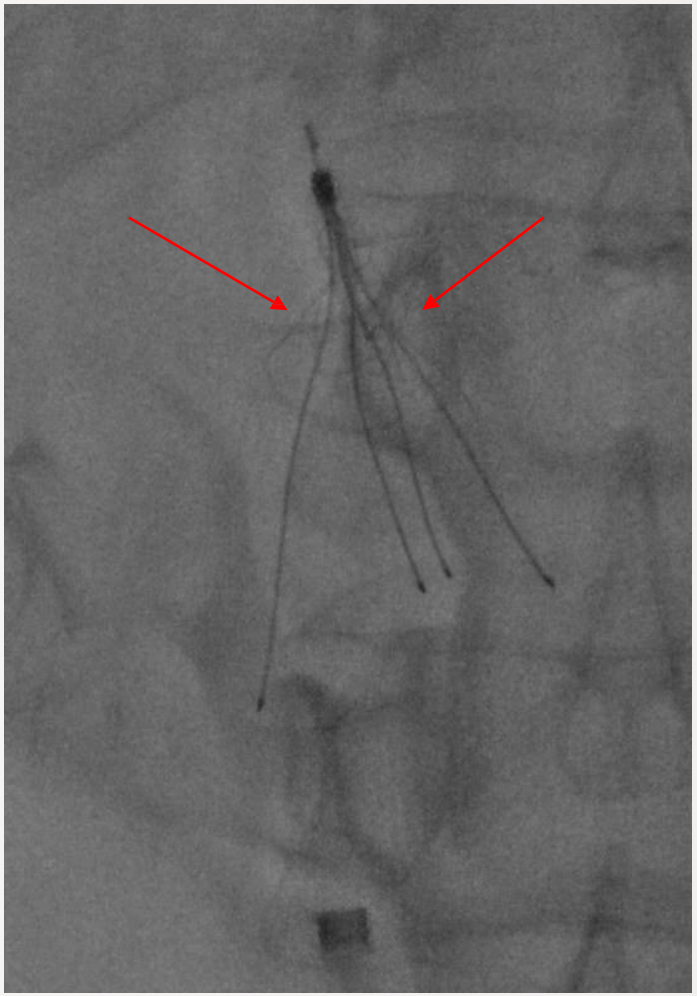
- Follow-up inferior venacavagram ~1 week after CT venogram
  - Decreased thrombus but still too much for retrieval
  - Tilted
  - Strut still displaced cephalad, possibly beyond IVC wall
- Plan for repeat inferior venacavagram in 2 months

- Multiple attempts to remove filter using the IVC filter removal sheath and snaring device were unsuccessful
- Secondary and tertiary venous access established in right IJV
- 2 additional venous access sites in right common femoral vein (CFV) established



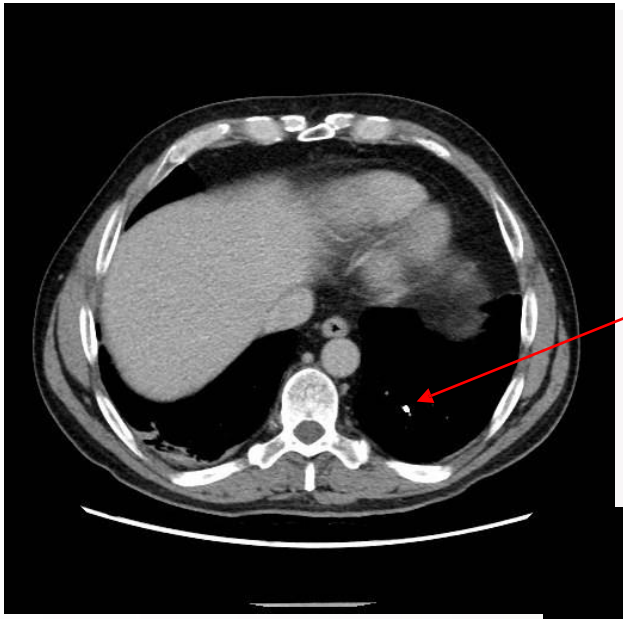


- Unsuccessful after multiple attempts
- Final cavagram showed small volume of thrombus within the struts
- Multiple struts now bent and pointing cephalad

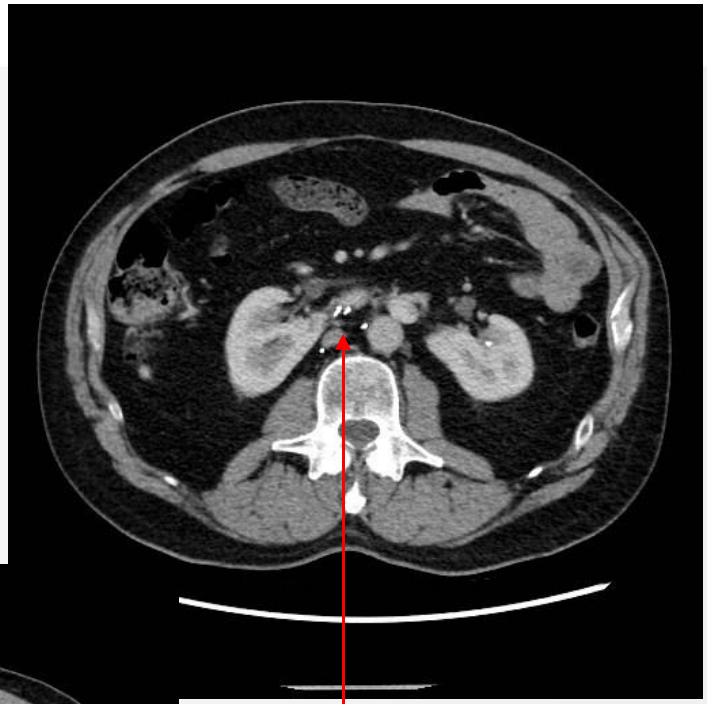


Clinical Follow-up

- Discussion with vascular surgeon on risks of leaving the filter versus removal
- Hypercoagulability workup negative
- Patient requested to have the filter removed due to risks of complication and not wanting to be on long term anticoagulation
- CT abdomen ordered prior to final attempt for planning



Embolized strut to left lower lobe pulmonary artery



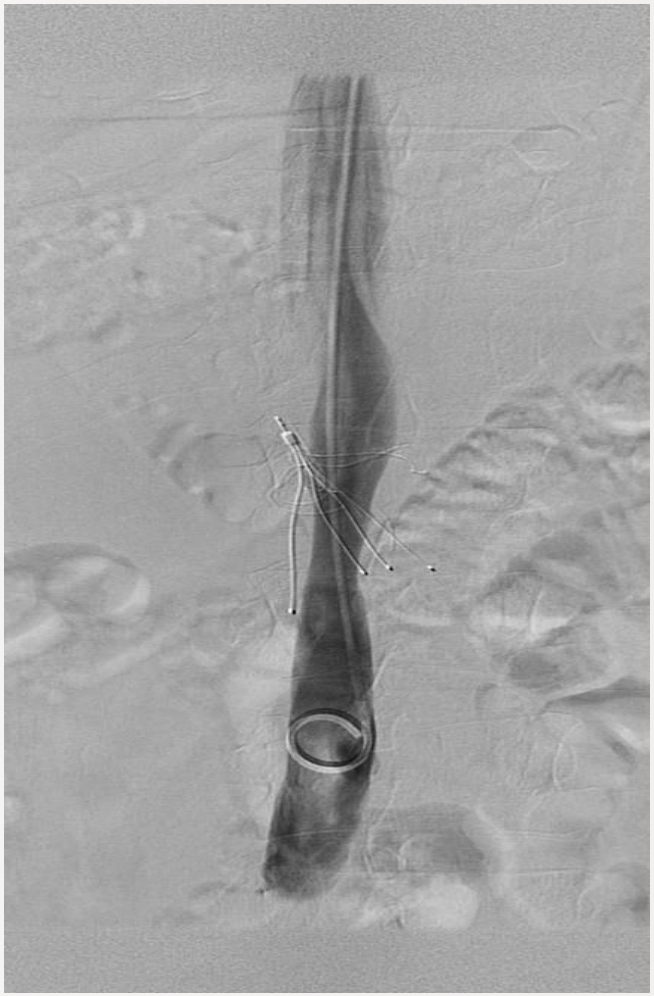
Tilting of retrievable hook

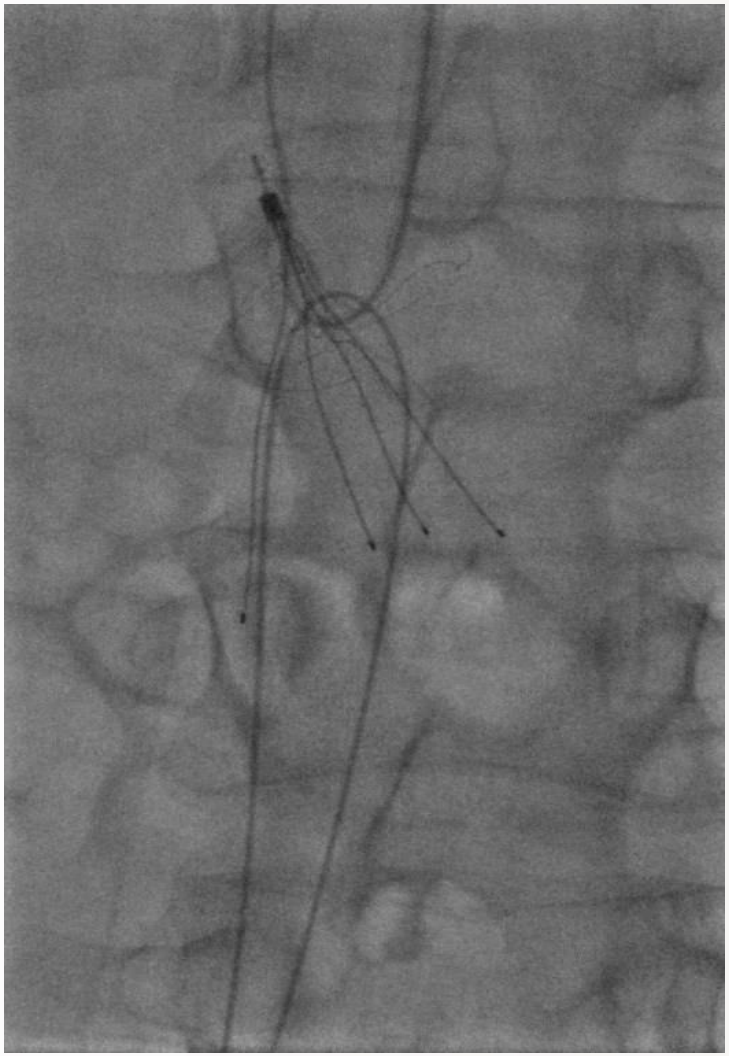
Struts protruding from IVC, in close proximity to accessory renal artery

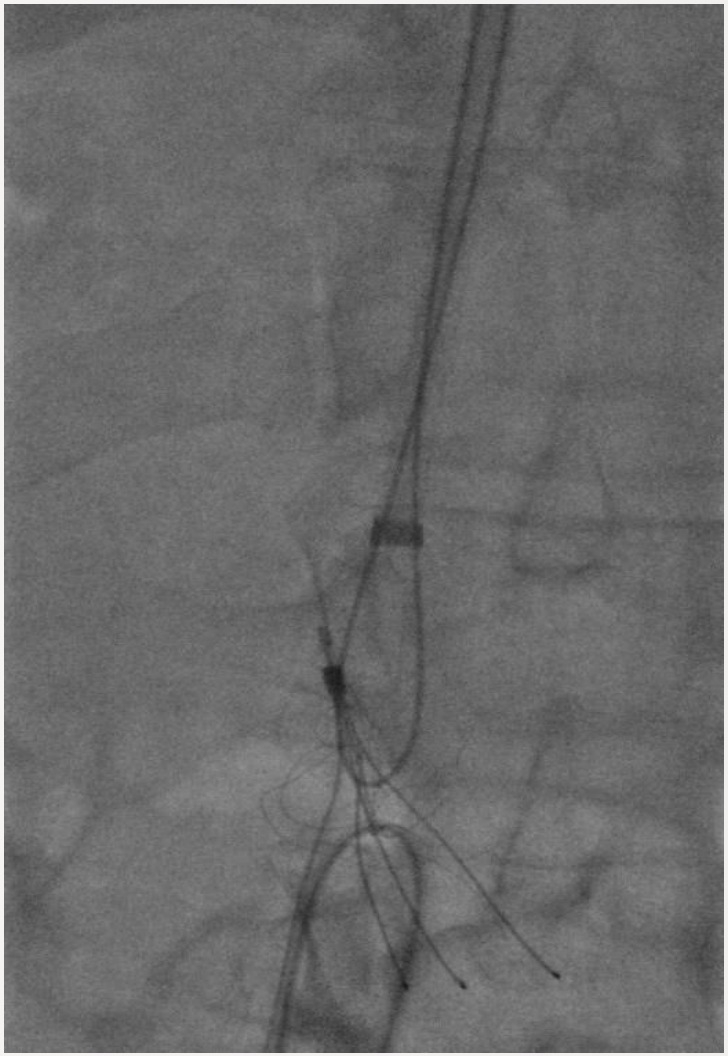
Struts protruding into isthmus of horseshoe kidney

Suspected renal infarct

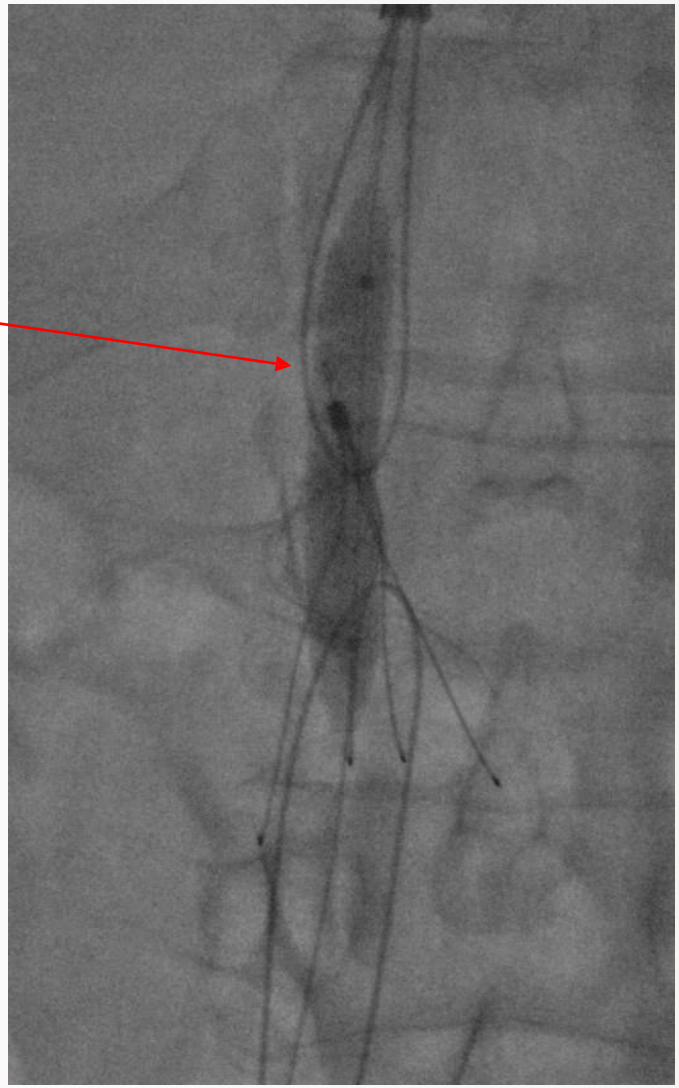
- Final attempt at retrieval
- Access with 10 Fr sheaths:
  - Right IJV
  - Bilateral CFVs

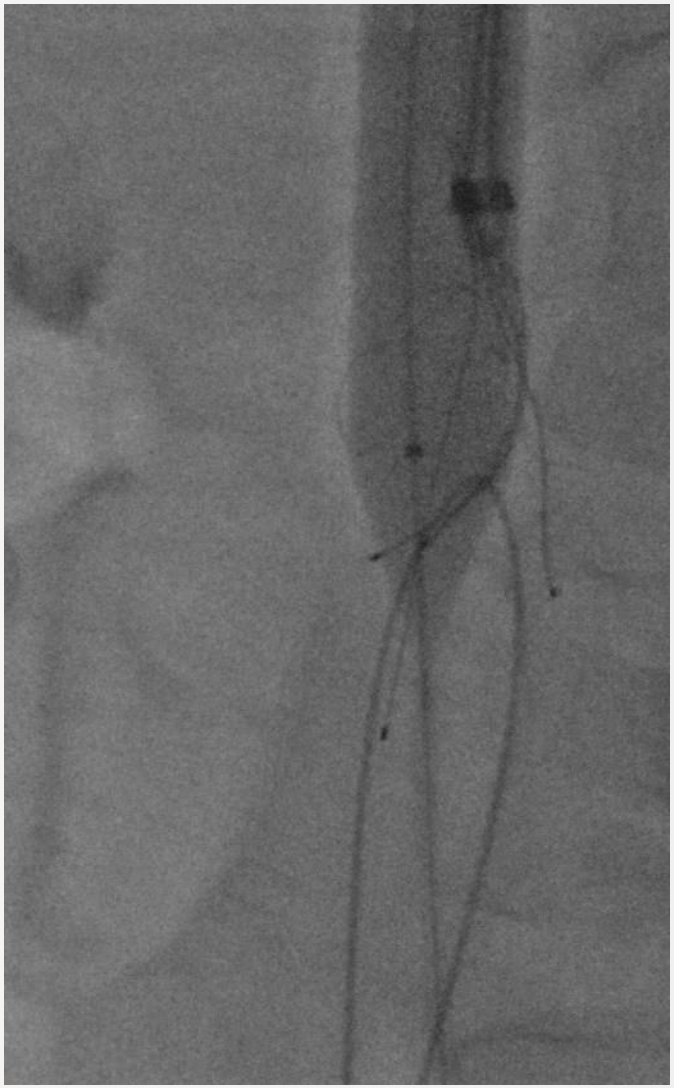






14 x 40 mm balloon for deflection



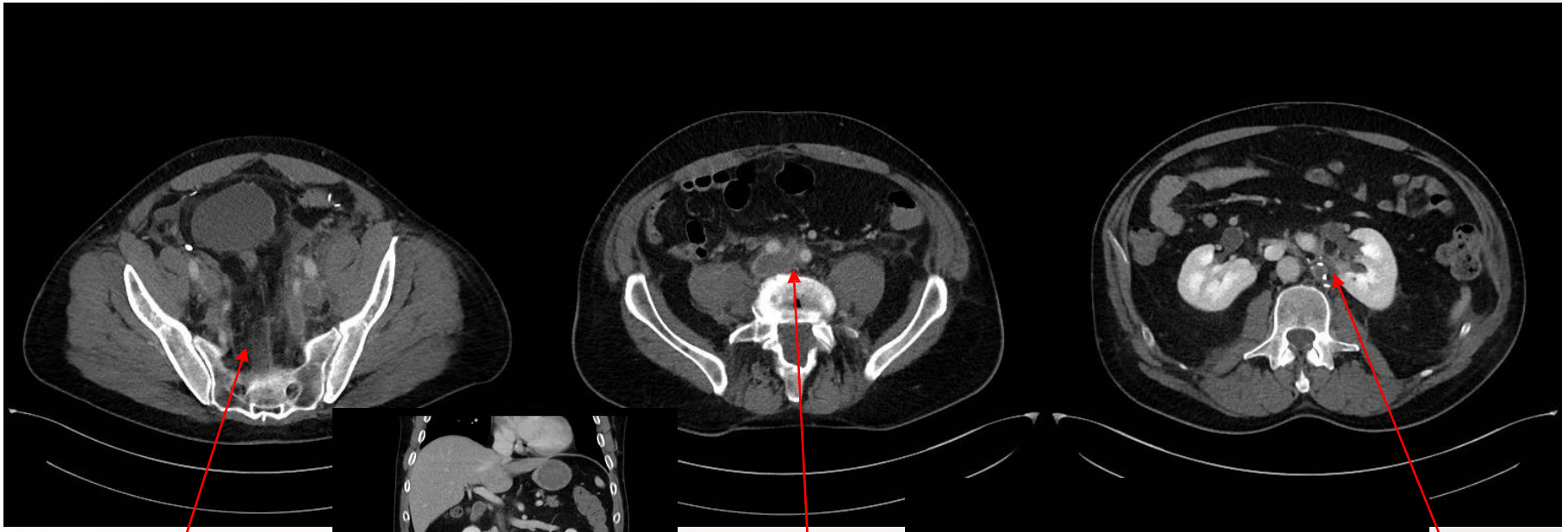


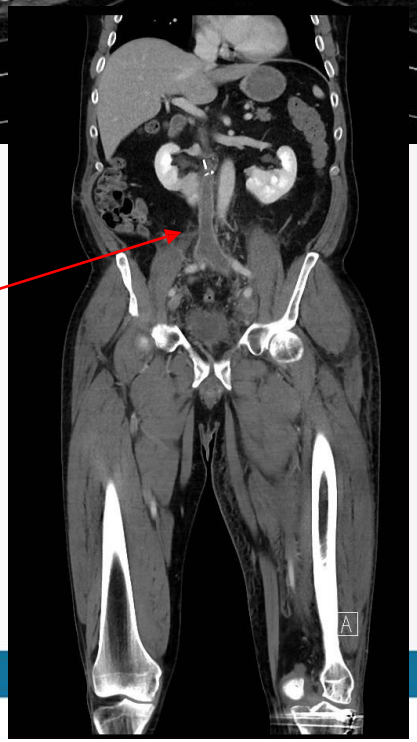
Multiple attempts with various techniques were unsuccessful in retrieving the filter and the procedure was aborted after nearly 6 hours.

The patient ultimately went on to surgery 2 months later.

Operative Note

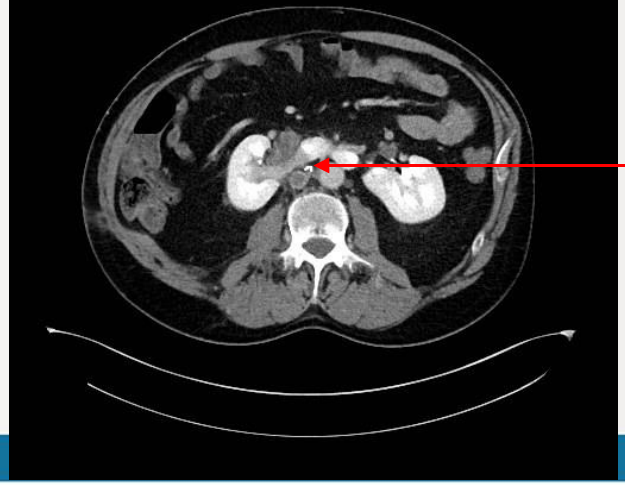
- IVC filter struts extruding from the IVC wall
- One strut dissected out from within horseshoe kidney and two struts dissected from adjacent musculature
- Hook of filter embedded in IVC wall “essentially ripped out”
- Partial thrombectomy of organized clot in IVC
- 2 months post-op the patient presented to the ED





Extensive thrombus of IVC and bilateral iliac veins extending into lower extremities

Thrombosed accessory renal vein



Venous renal infarcts

Post-operative Clinical Course

- Multidisciplinary rounds: Thrombus debulking beneficial to reduce post-thrombotic syndrome
- Not amenable to catheter-directed tPA
- Systemic tPA administered
- Follow-up CT venogram showed no significant change in clot burden
- Currently remains on long-term anticoagulation
- Symptomatic with limited mobility and ongoing edema

Discussion

- IVC filters are effective in reducing the risk of pulmonary emboli in appropriately selected patients
- Despite a lack of clear supporting evidence, IVC filter use has increased with the advent of retrievability for prophylactic indications
- Recently, there has been increased emphasis on timely removal of filters that are no longer indicated to avoid serious complications

Discussion

- The retrievable structure makes these filters more prone to device-related complications
- Prolonged dwell time makes removal of filters more difficult and is associated with increased complications
  - Filter tilting
  - Embedded or protruding struts
  - Fibrous cap formation

Discussion

- Development of advanced retrieval techniques has improved retrieval rates
  - Recovery cone
  - Tip deflection
  - Loop-snare techniques
  - Balloon displacement
  - Dissection with endobronchial forceps or laser

Discussion

- To our knowledge, only a single study has been done specifically evaluating outcomes and complications in IVC filter retrieval using advanced techniques

Chen et al, 2019

  - Retrospective review of outcomes after complicated retrieval
  - n=79; 100% success rate
  - 6 serious complications: 4 popliteal puncture hematomas, 2 hematuria

Discussion

- Long-term safety profile of retrievable filters left inside the body is not well established
- A recent systematic review by Bikdeli et al refuted the systematic review findings of Angel et al that long-term retrievable IVC filters led to increased DVTs
- Both studies acknowledge limitations due to a lack of prospective controlled trials

Conclusions

- Previous perceptions were that retrieval of IVC filters with prolonged dwell times should not be attempted
- Recently developed advanced techniques and growing pressures for timely removal has resulted in increased complex filter retrieval efforts
- IVC filter removal can be challenging and caution in utilizing advanced techniques is paramount
- In our presented case, advanced techniques were unsuccessful and resulted in significant adverse outcomes
- There is a lack of literature available evaluating patient outcomes and complications with the use of advanced retrieval techniques

References

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4.Bikdeli, B. et al. Inferior Vena Cava Filters to Prevent Pulmonary Embolism: Systematic Review and Meta-Analysis. Journal of the American College of Cardiology 70, 1587–1597 (2017).

5.McLoney, E. D., Krishnasamy, V. P., Castle, J. C., Yang, X. & Guy, G. Complications of Celect, Günther tulip, and Greenfield inferior vena cava filters on CT follow-up: a single-institution experience. J Vasc Interv Radiol 24, 1723–1729 (2013).

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