Case 9310

Eurorad

Inferior vena cava filter placement in a patient with a retro-aortic left renal vein

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Section: Interventional radiology
Area of Interest: Interventional non-vascular Veins / Vena cava
Imaging Technique: Catheter venography
Imaging Technique: CT
Special Focus: Embolism / Thrombosis Case Type: Clinical Cases
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Patient: 34 years, male

Clinical History:

A patient with multiple pelvic fractures following a road traffic accident was found to have a right iliac vein thrombosis extending to the caval confleunce. Decision was made to place a retrievable G2 (Bard Inc.) temporary caval filter, with a plan to remove following full recovery.

Imaging Findings:

Following insertion of a G2 caval filter, a tilted placement within the cava is seen (Figure 1). Subsequent CT demonstrates a left retro-aortic left renal vein, with the struts of the misplaced filter protruding into it (Figure 2). Given the potential risk of proximal filter migration as a result of reduced opposition of the struts with caval walls, the first filter was retrieved. Left retro aortic renal vein was confirmed on subsequent venogram (Figure 3). Attempt was then made to place a G2 filter below the level of the left renal vein insertion. However, this was not possible due to lack of space between caval confluence and left renal vein insertion, and filter struts were constrained within the right iliac vein (Figure 4). This filter was again retrieved. Eventually, a G2 caval filter was deployed at L1/2 level on third attempt, between the left and right renal veins (figure 5).

Discussion:

Background:

Caval filters are reserved for prevention of massive pulmonary embolism in cases where anticoagulation is contraindicated or failed. Decousus (1998) suggested caval filters provide only short-term protection, with 2-year embolism rates no different to anticoagulation.

Temporary caval filters are for short term use/prophylaxis (pre-operatively or in pelvic trauma), when use of anticoagulation is inappropriate. Permanent filters remain an option when there is ongoing thromboembolic disease (e.g. Antiphosphilipid syndrome) despite of adequate anticoagulation.

Intra-procedural complications including misplacement during caval insertion are usually obvious and can be

corrected. Post procedural complications include migration and fracture of the filter, which may be as high as 18% of cases (Stawicki et al 2008). There may also be collection of thrombus within the filter over time and then eventually caval occlusion. If filter is placed in a supra renal position, this may result in renal vein thrombosis from stasis.

Imaging Perspective:

Normal placement of caval filters is below the renal veins in order to reduce risk of renal vein thrombosis. However a variation to conventional anatomy exists. The most common variant (17%) is a circum-aortic left renal vein, where the left renal veins split and envelope the aorta. A retro-aortic left renal vein simply travels behind the aorta as opposed to in front of it (3%). Other variations include duplicated left renal veins – this may drain into either the IVC or iliac veins. Additional variations depend on surrounding structures such as duplication or transposition of IVC, megacava (greater than 28mm) or crossed renal ectopia in which vasculature follows the organ involved.

The presence of circum-aortic left renal veins may result in filter failure, as they may provide a conduit for emboli. The presence of a megacava precludes the use of some commonly available filters due to risk of filter migration. A retroaortic left renal vein itself does not pose problems in filter placement. Attempts could be made to place the filter below the insertion of the retro aortic left renal vein. However, Trigaux et al (1998) suggests a shorter caval confluence to renal vein distance in the presence of the retroaortic renal vein. This may present a problem in filter insertion. Placing a filter superiorly to the renal vein entrance, and accepting a small increased risk of left renal vein thrombosis may be an acceptable option. Alternatively, bilateral iliac vein filters can be placed, however, this is dependent on the site of thrombus.
Differential Diagnosis List: A retro-aortic left renal vein - placement of IVC filter, Uncomplicated tilted caval filter placement, Caval thrombus

Final Diagnosis: A retro-aortic left renal vein - placement of IVC filter

References:

Decousus H, Leizorovicz A, Parent F, Page Y, Tardy B, Girard P, Laporte S, Faivre R, Charbonnier B, Barral FG, Huet Y, Simonneau G (1998) A clinical trial of vena caval filters in the prevention of pulmonary embolism in patients with proximal deep-vein thrombosis. New England Journal of Medicine 338: 409–415 (PMID:9459643)
Stawicki SP, Sims CA, Sharma R, Weger NS, Truitt M, Cipolla J, Schrag SP, Lorenzo M, El Chaar M, Torigian DA, Kim PK, Sarani B (2008) Vena cava filters: a synopsis of complications and related topics. J Vasc Access 9:102-10 (PMID: 18609524)
Urban BA, Ratner LE, Fishman EK (2001) Three-dimensional volume-rendered CT angiography of the renal arteries and veins: normal anatomy, variants, and clinical applications. Radiographics 21:373-86 (PMID:11259702)
Trigaux JP, Vandroogenbroek S, De Wispelaere JF, Lacrosse M, Jamart J (1998) Congenital anomalies of the inferior vena cava and left renal vein: evaluation with spiral CT. J Vasc Interv Radiol 9:339-45 (PMID:9540920)

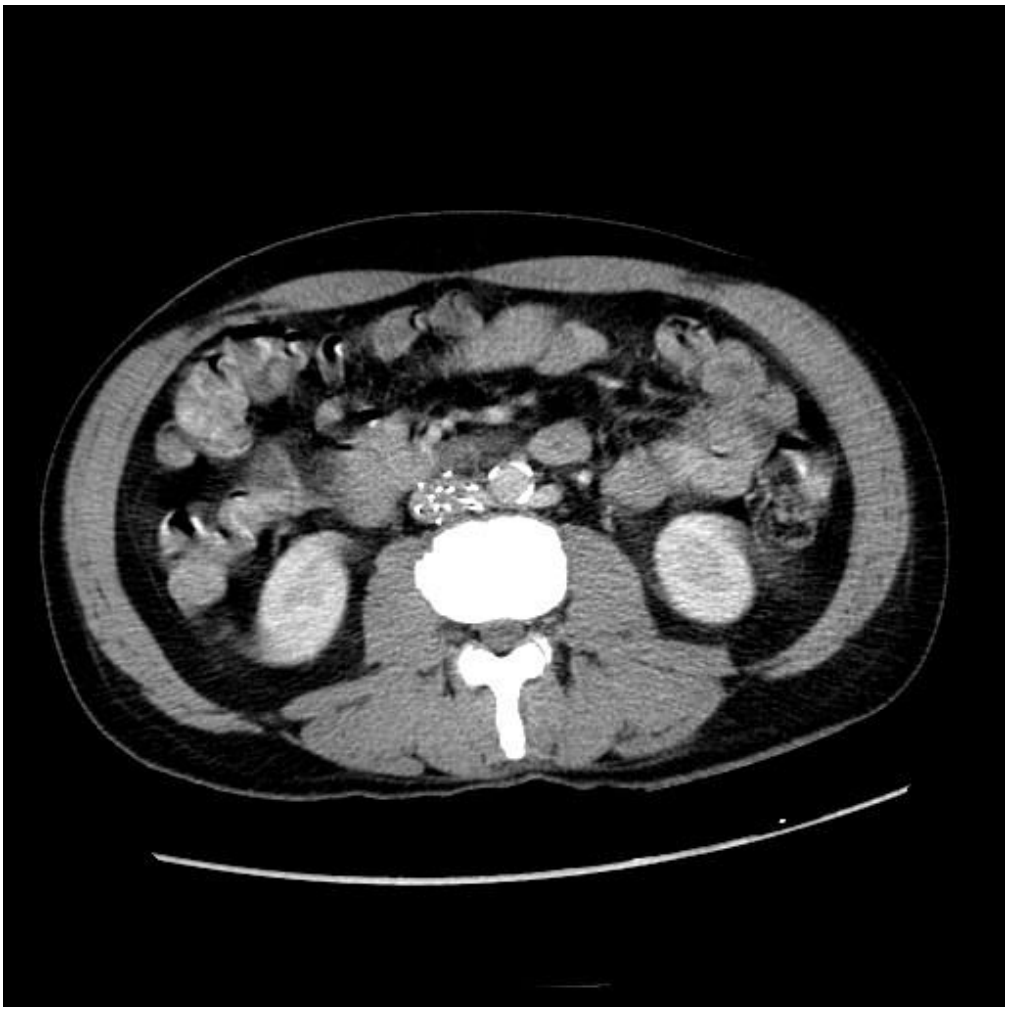
Figure 1

a

Description: Venography following first IVC filter insertion procedure demonstrating a tilted placement.
Origin:

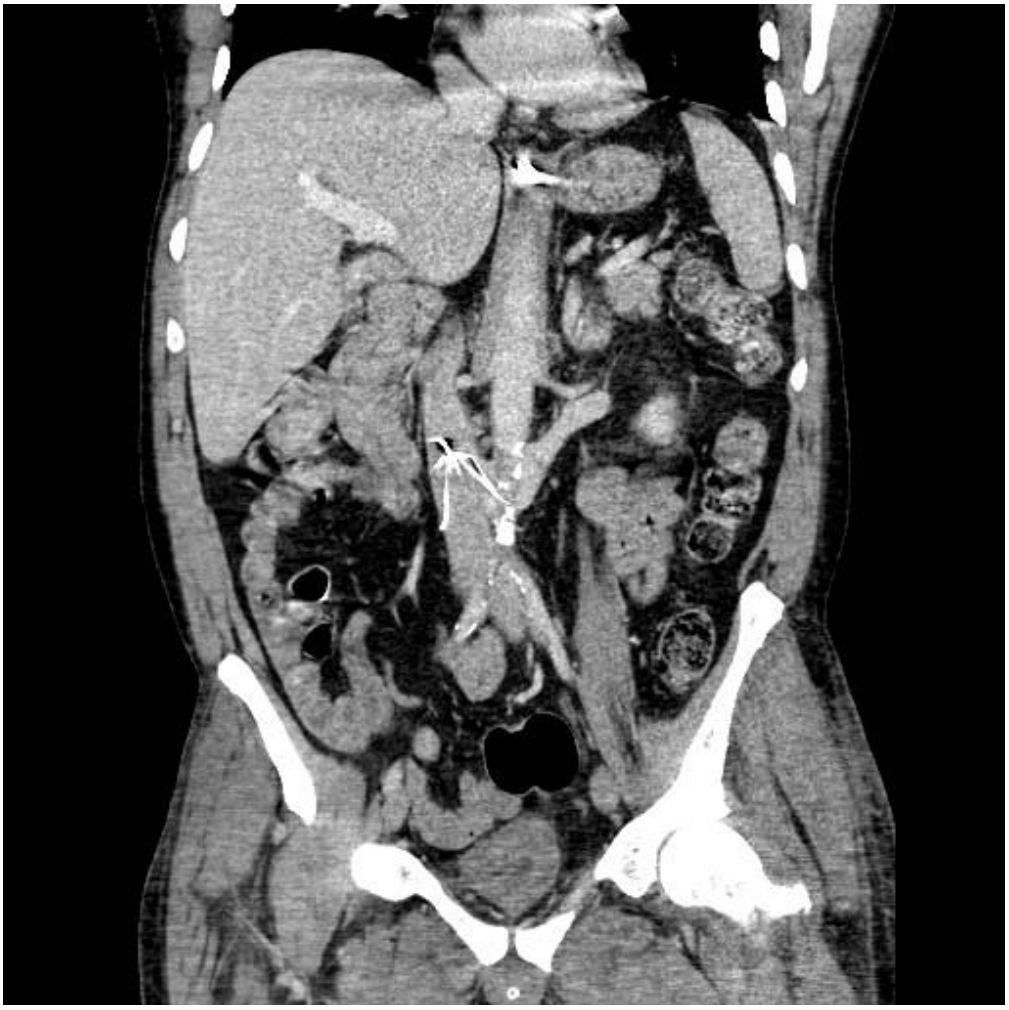
Figure 2

a



Description: CT demonstrates the presence of a left retro-aortic left renal vein, with the struts of the misplaced caval filter protruding into the left renal vein. **Origin:**

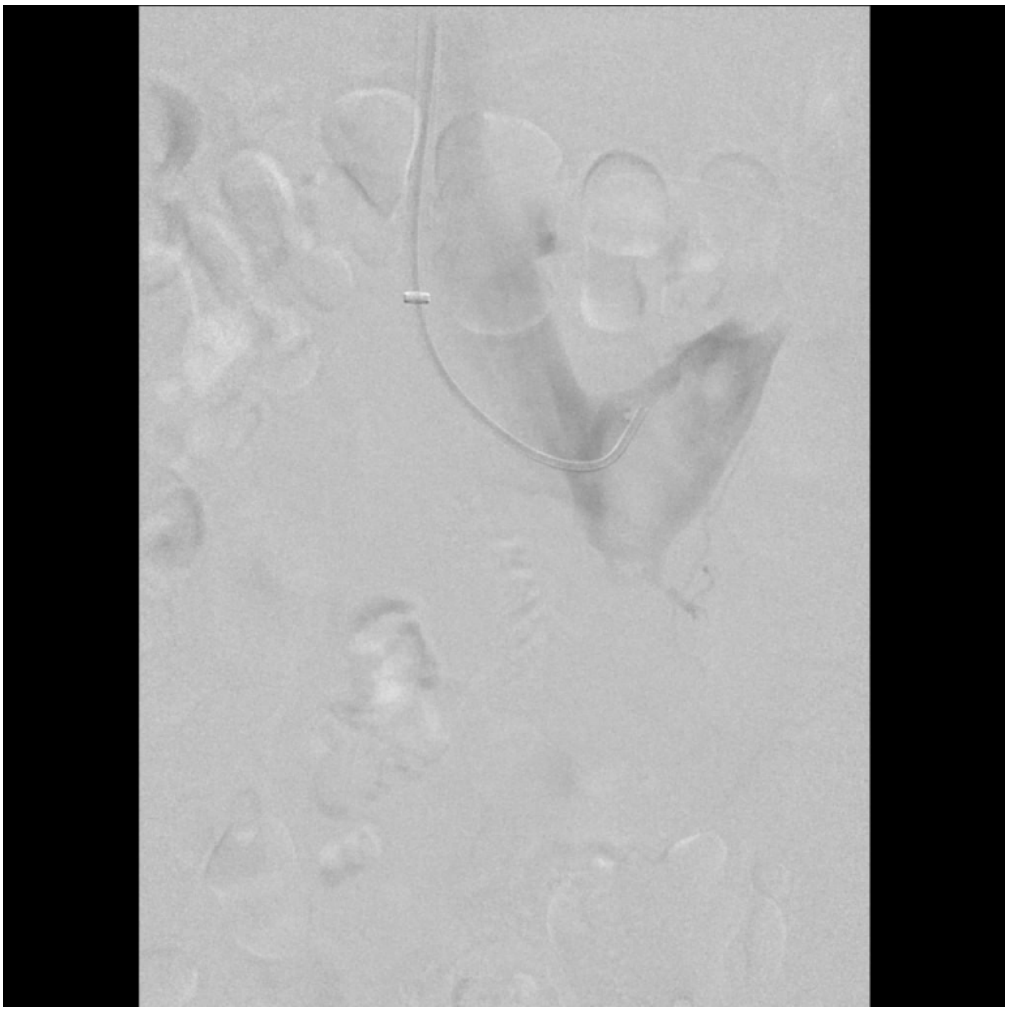
b



Description: CT demonstrates the presence of a left retro-aortic left renal vein, with the struts of the misplaced caval filter protruding into the left renal vein **Origin:**

Figure 3

a



Description: A retro aortic left renal vein was confirmed on venography. **Origin:**

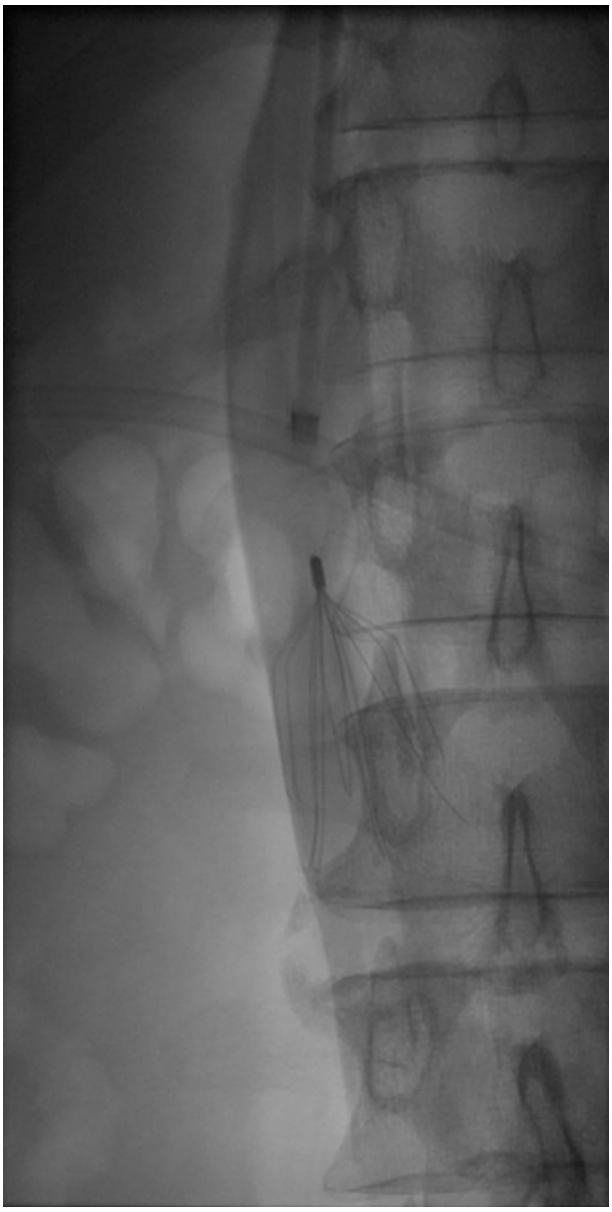
Figure 4

a

Description: It was not possible to place filter between caval confluence and left renal vein insertion, and filter struts were constrained within right the iliac vein. **Origin:**

Figure 5

a



Description: Final filter position following the third attempt. The filter was placed at the level between the insertion of the right renal vein and the more caudally placed insertion of the left renal vein. **Origin:**