

CIRA Case of the Week

November 2016

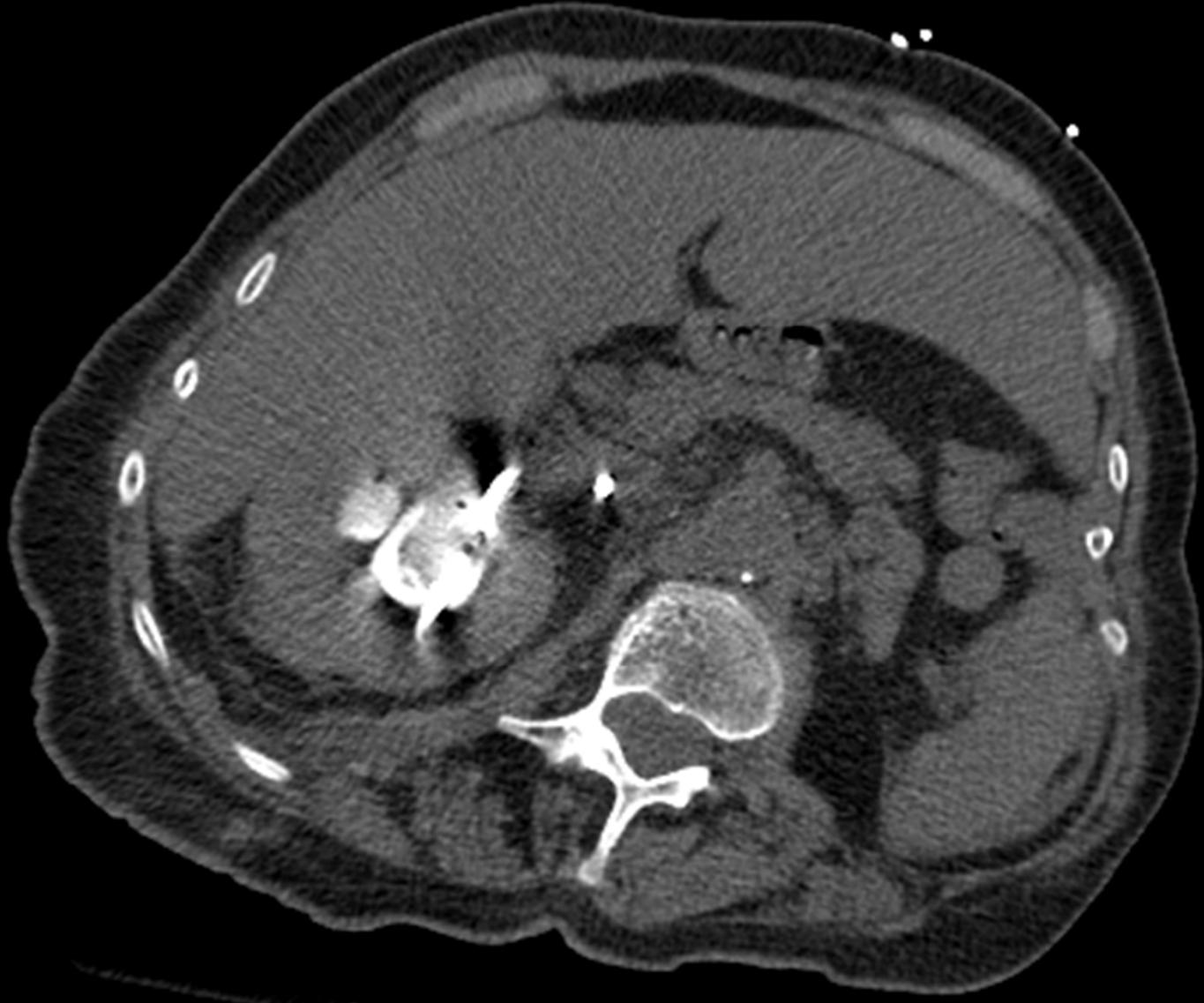
Case Courtesy of Drs. Klaudia Jumaa,
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Western University

- A vascular surgery consult was requested for an extra-renal nephrostomy tube inserted at a peripheral hospital
- Vascular surgery accepts the transfer, but the patient is a 76 year-old nursing home resident with a solitary right kidney, end-stage renal disease, coronary artery disease with prior MIs, and dementia

- The patient arrives and is stabilized in the ICU
- Vitals: P 102 BP 124/66 SpO2 98% (2L NP)
- Bloodwork: Hb 122 Cr 269 INR 1.2 PTT 22
- Lines and tubes: two PCN catheters, one draining blood-tinged urine and the other containing sanguineous drainage

- No procedural notes were available with regards to insertion technique
- The only available information was a post-procedural CT







- Procedural challenges:
 - Potentially injured structures:
 - Collecting system **UNKNOWN**
 - Renal artery **UNKNOWN**
 - Right renal vein **SUSPECTED**
 - IVC **SUSPECTED**
 - Surrounding structures (bowel) **UNLIKELY**

- Patient considerations:
 - Medical
 - Significant comorbidities precluded surgery
 - Stabilized in ICU and intubated

1. Rule out penetrating IVC injury



1. Rule out penetrating IVC injury

Venogram demonstrates:

- No contrast extravasation from IVC to suggest penetrating injury, although not completely excluded
- Reflux into right renal vein suggests the "aberrant" PCN had partially traversed the right renal vein prior to entering the IVC, although not yet confirmed

2. Localize the vascular injury

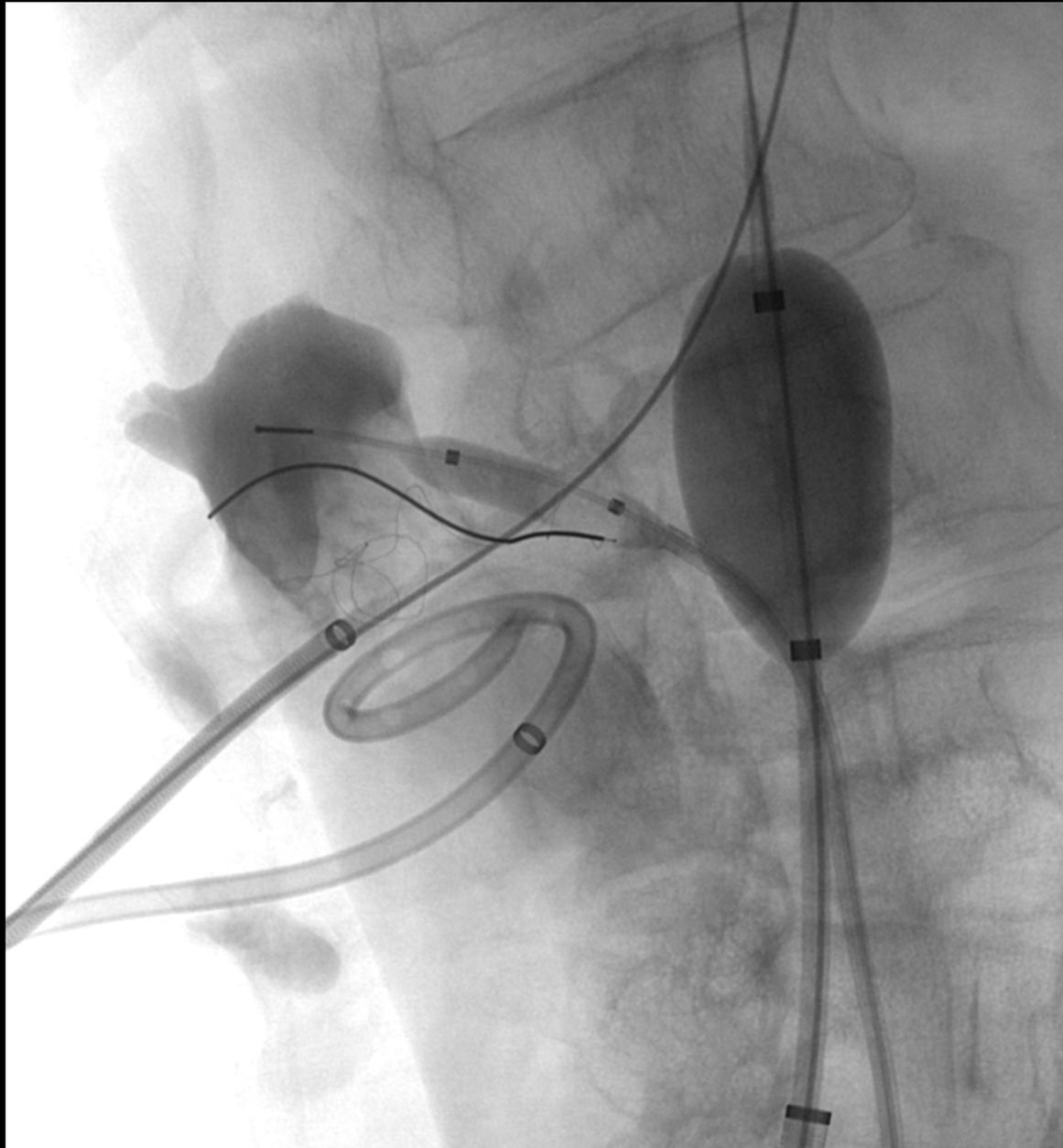


2. Localize the vascular injury

Selective venogram demonstrates:

- An accessory inferior right renal vein
- Site of PCN injury suspected to be where the “aberrant” PCN and C2 catheter appear to cross over

3. Tamponade bleeding

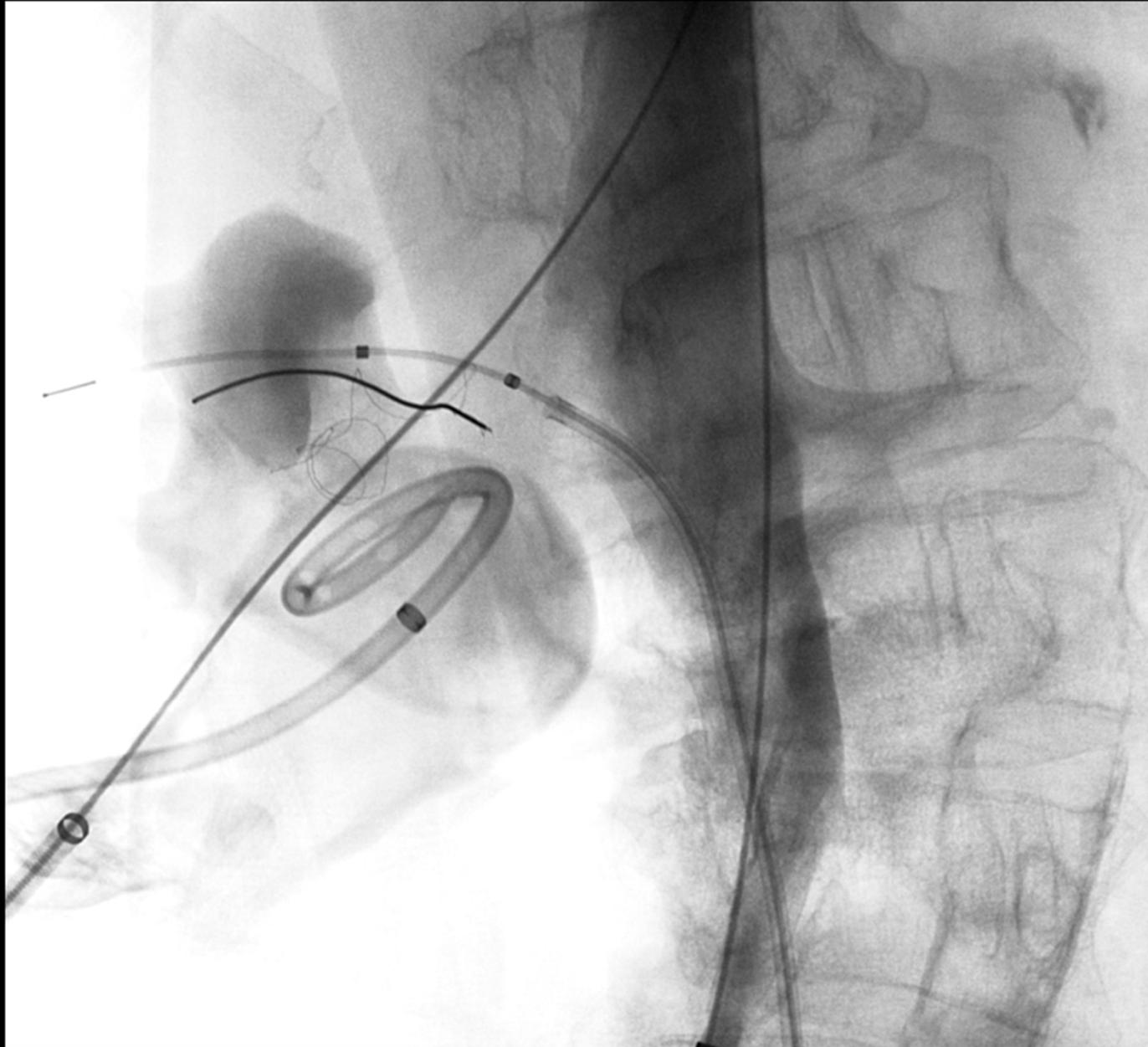


4. Remove “aberrant” PCN

- Guidewire was advanced through the aberrant PCN
- IVC and right renal vein balloons were inflated
- “Anatomic” PCN was opened to gauge bleeding
- The “aberrant” PCN was retracted out over the wire
- Balloons were deflated after 10 minutes to ensure hemostasis

5. Ensure hemostasis is achieved

No blush
of contrast



Case Conclusion

- “Aberrant” PCN was successfully removed
- “Anatomic” PCN was left in place.
- The patient returned to ICU and was repatriated back to home hospital shortly thereafter
- She will be brought back for removal of the fractured guide wire on an elective basis

Summary

- Hemorrhagic complications of PCN are uncommon; PCN translation into the renal vein or IVC is rare
- Few case reports in the literature regarding treatment of such complications
- Surgical and ICU back-up is recommended in case there are complications
- If vascular injury is suspected, first rule out arterial injury

Summary

- If venous injury is suspected,
 1. Rule out penetrating IVC injury
 2. Delineate vascular injury with selective venogram
 3. Tamponade any sources of bleeding
 4. Remove PCN under fluoroscopic guidance
 5. Ensure hemostasis is achieved

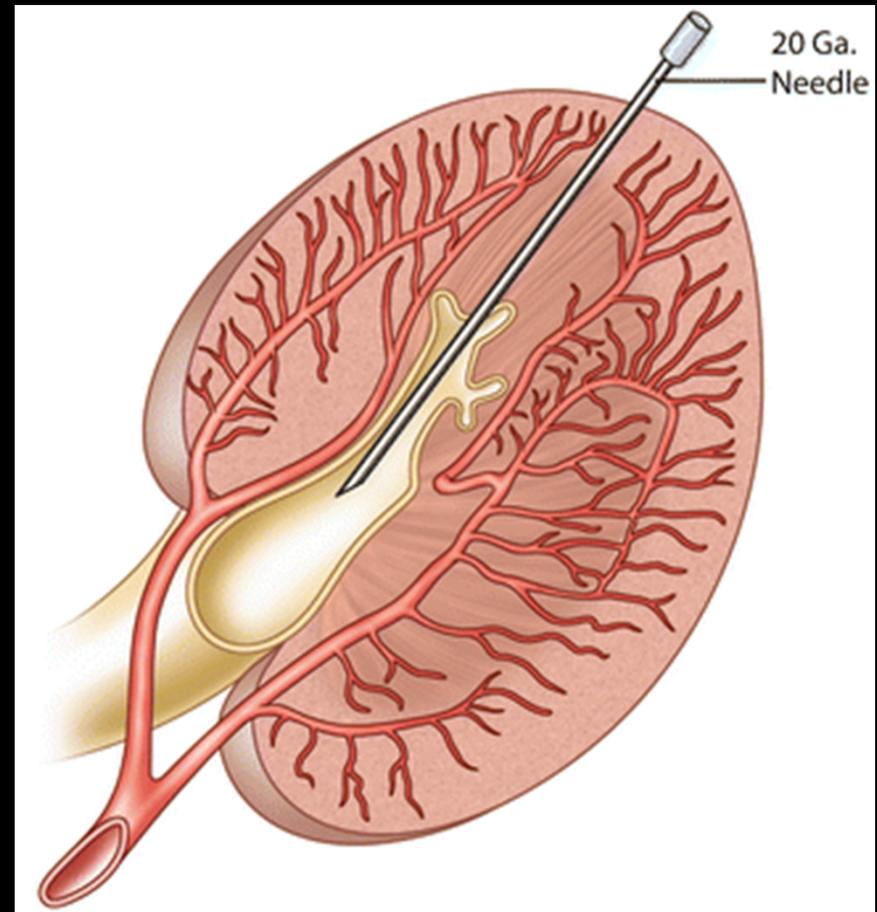
Percutaneous Nephrostomy (PCN)

- First described in 1955 by WE Goodwin et al for the treatment of hydronephrosis
- Success rates:
 - Obstructed dilated collecting system 98% (>95%)
 - Non dilated collecting system 85% (>80%)
 - Complex stone disease 85% (>75%)
- Rate of major and minor complications in all-comers is 10%

Relevant Anatomy for PCN Insertion

Renal artery divides into anterior division (75%) and posterior division (25%)

Renal parenchyma is avascular between these divisions: the **Brödel bloodless line of incision**, just posterior to the lateral convex border of the kidney

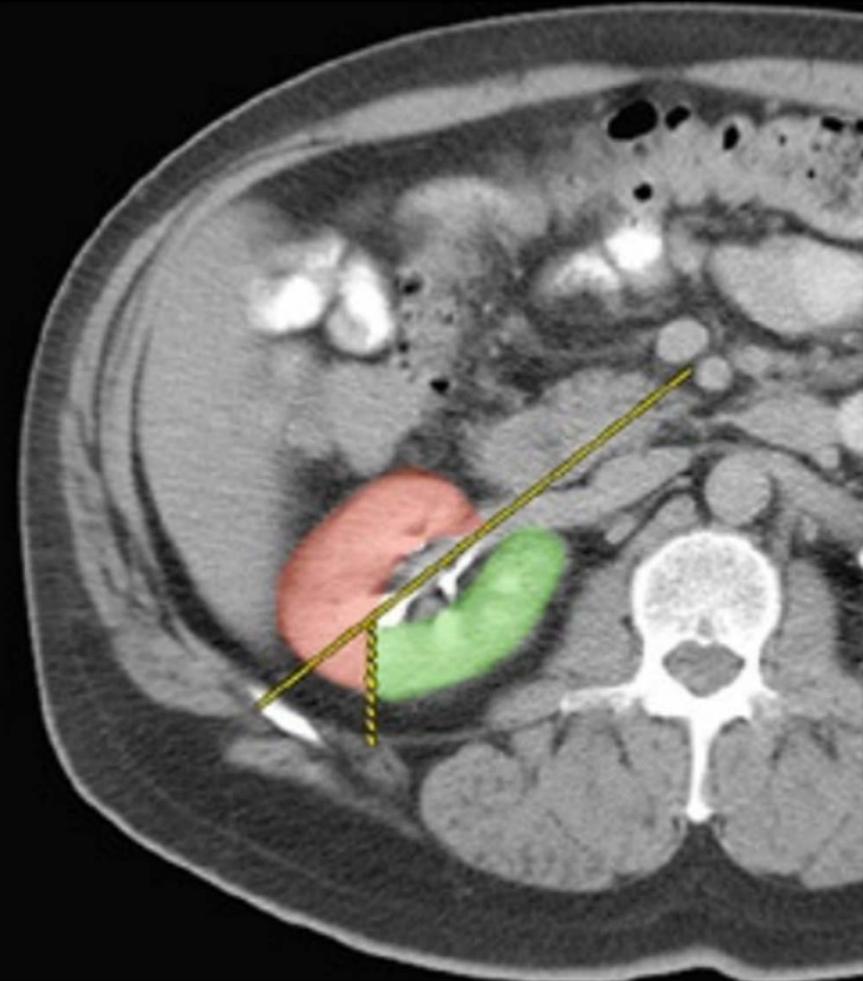


Relevant Anatomy for PCN Insertion

The optimal entry plane:
posterolaterally, at the
junction of the anterior
two-thirds and posterior
one-third of the renal
parenchyma

green = posterior
segmental artery

red = anterior
segmental artery



Major Complications of PCN

<u>Complication</u>	<u>Reported Rate</u>	<u>Threshold</u>
Septic shock (fever, chills with Hypotension, requiring major Increase in level of care)	1% to 3%	4%
Septic shock (in setting of pyonephrosis)	7% to 9%	10%
Hemorrhage (requiring transfusion)		
PCN alone	1% to 4%	4%
With PCNL	12% to 14%	15%
Bowel transgression	0.2%	<1%
Pleural complications (pneumothorax, Empyema, hydrothorax, hemothorax)		
PCN along	0.1% to 0.2%	<1%
with PCNL or endopyelotomy	8.7% to 12%	15%
via intercostal puncture or upper pole puncture		
Individual threshold*	4% to 7%	5%

*complications that result in unexpected transfer to an intensive care unit, emergency surgery, or delayed discharge from the hospital

Hemorrhagic Complications of PCN

- **Arterial injury suspected:** arteriovenous fistula, pseudoaneurysm, arterial transection
 - Renal angiogram is performed with subselective coil embolization
 - If no active bleed, repeat angiogram after removal of catheter over wire
 - If repeat angiogram demonstrates no hemorrhage, consider accessory renal arteries or venous injury

Hemorrhagic Complications of PCN

- **Venous injury suspected:** typically small arcuate or interlobular vessels are injured
 - Clamp the PCN to allow thrombosis
 - Exchange for larger diameter PCN catheter to tamponade bleeding
 - Balloon catheter if there is persistent venous bleeding
 - Consider venogram if large-volume hemorrhage

Venous Injury during PCN

Limited case series of similar venous injuries:

Right renal vein: 1 case

- Removed under fluoroscopic guidance (1)

Left renal vein: 2 cases

- 1 removed without imaging guidance (2)
- 1 removed under sonographic guidance with surgery on standby (3)

Venous Injury during PCN

Limited case series of similar venous injuries:

Renal vein and into IVC: 5 cases

- 2 removed under under fluoroscopic guidance in the OR under GA with surgery on standby (1, 2)
- 1 removed under CT guidance (2)
- 1 removed under sonographic guidance (3)
- 1 removed during open surgical pyelotomy (4)

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2. Chen X et al, Int Braz J Urol. 2014; 40: 690-6.

3. Li D et al, J Urol. 2013;82(1):248-252.

4. Kotb A et al, Can Urol Assoc J 2013;7(7-8): e505-7.

Venous Injury during PCN

Limited case series of similar venous injuries:

Directly into IVC: 1 case

- Removed under fluoroscopic guidance (1)

Right atrium: 1 case

- Removed under fluoroscopic guidance in the IR suite with anesthesia and surgery on standby (2)

References

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