

Quality Improvement of Transcatheter Aortic Valve Replacement With Femoral Access: Identifying The Femoral Artery Bifurcation Using CT and 3D Modeling

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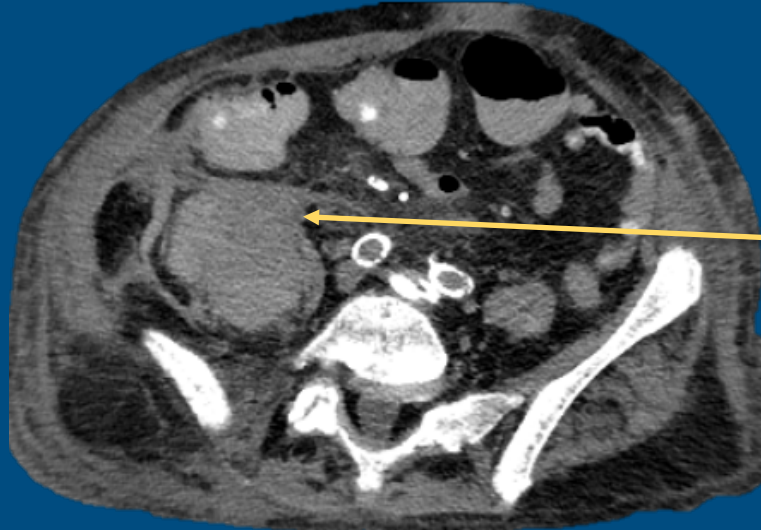
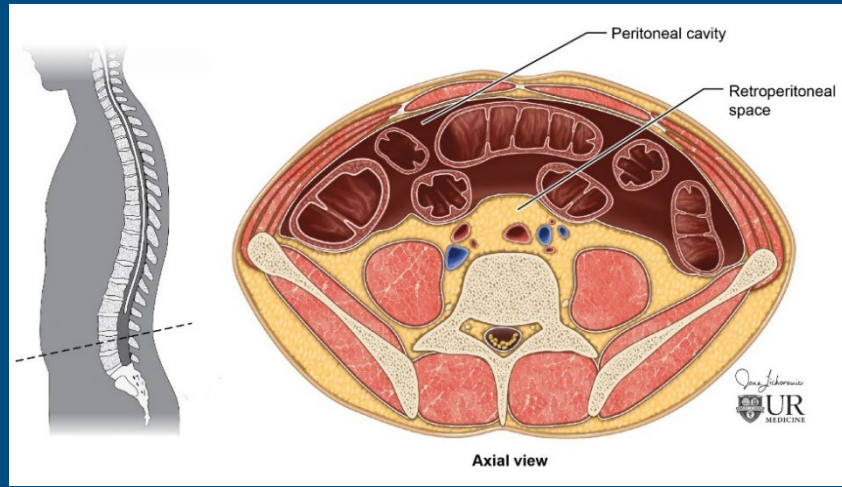
Disclosures

The authors and their spouses have no financial or non-financial relationships to disclose.

We will not be discussing any unlabeled/investigational uses of medical devices or pharmaceuticals during this presentation.

Background

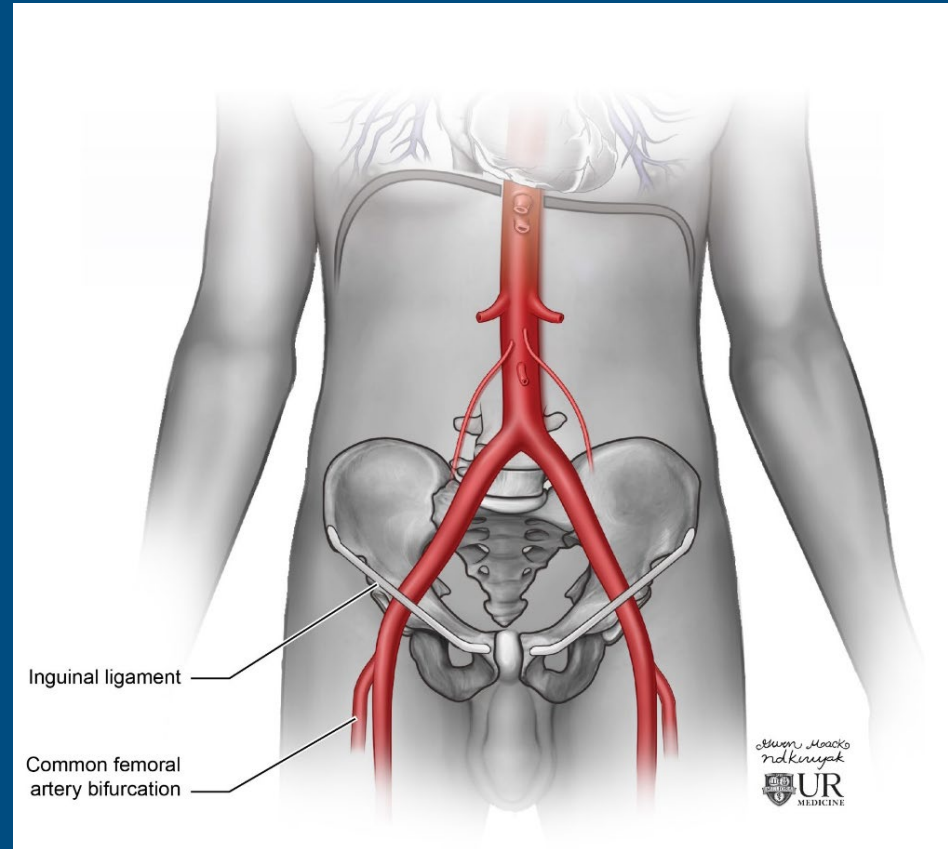
- **Retroperitoneal hemorrhage (RPH)** is a potentially fatal complication of transfemoral cardiac catheterization, with an **incidence** ranging from **0.15-6%**.
- Although the reported incidence appears small, considering the large number of percutaneous coronary interventions (PCIs) and diagnostic catheterizations performed in the United States, the absolute number of RPH cases is in the thousands
- **RPH** carries a **mortality risk** of **4-12%** and is associated with significant morbidity, including an increase in hospital stay and the need for blood transfusions. Reducing its incidence is crucial.



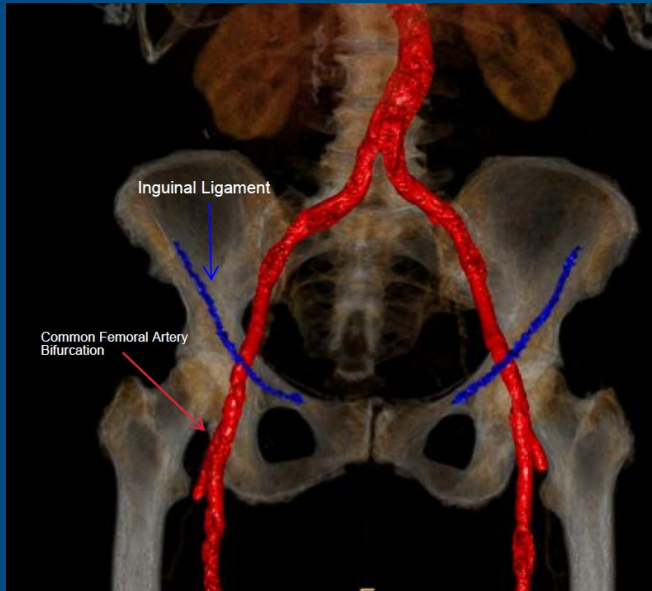
Axial CT image demonstrates a retroperitoneal hematoma involving the right psoas muscle (←→)

Background

- **Transcatheter Aortic Valve Replacement (TAVR)** is a minimally invasive treatment used to treat severe aortic stenosis with valve replacement
- **Protocol Goal:** Allow interventionalists to identify patients with a high femoral bifurcation relative to the inguinal ligament to avoid suboptimal vascular access and potential RPH
- The rationale was to add another piece of information and secondary safety check to avoid this significant adverse event.



Protocol



3D volume rendered image demonstrating the inguinal ligaments and the femoral artery relationship.

- Radiologists identify the location of the femoral artery bifurcation relative to the inguinal ligament on the preoperative TAVR planning CT angiogram.
- The imaging 3D lab generates a volume rendered image and the information would be noted on the imaging report for the interventional cardiologist.
- The interventional cardiologist looks for an optimal area, if any, for large bore access (14 French sheath).
- If optimal access is not found, the opposite leg, carotid, and/or radial access are considered
- This 3D model and radiologist input is discussed during a pre-procedure review meeting and before the procedure itself as another visual check.
- Note: The 3D lab currently works independently to generate the volume rendered image. The radiologists taught the technologists this anatomy and now serve as their quality check.

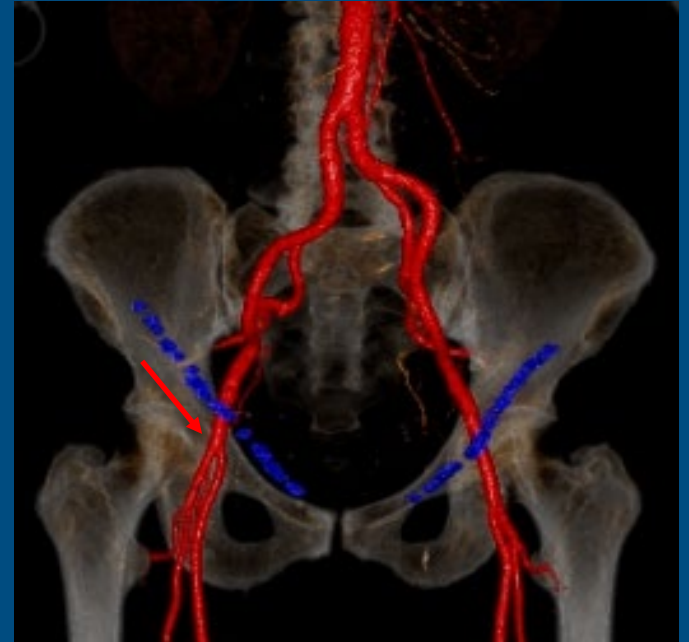
Results

Total Number of Femoral Access TAVR and RPH By Year		
Year	Total Procedures	Number of RPH
2012	12	0
2013	14	0
2014	38	1
2015	56	0
2016	91	0
2017	119	0
2018	136	1
2019	184	0
2020	157	1
2021	185	0
2022	199	1
2023	57	0

- The implementation of the protocol led to **greater confidence** with femoral vessel access among cardiac proceduralists **by adding an extra check** to the existing methods of physical exam and ultrasound to prevent retroperitoneal bleeds.
- From **2012-2016**: 211 femoral access TAVR procedures; **0.47% RPH rate**
- From **2017-2023** (after protocol implementation): 1037 femoral access TAVR procedures; **0.29% RPH rate**
- When interviewed, an interventional cardiologist mentioned the 3D model and radiologist CT report have increased confidence when to use femoral access.

Discussion

- A drop from 0.47% to 0.29% incidence of RPH shows a significant decrease in the last 6 years since the protocol was adopted.
- The consensus from the interventional cardiology division is that the extra safety check is both appreciated and often used to alter TAVR procedure access.
- The model has led to procedural changes during pre-procedural meetings and before the procedure itself.
- This protocol can serve as a model for improving planning and reducing complications during vascular procedures at other institutions.



3D volume rendered image demonstrating a high bifurcation of the right femoral artery (**red arrow**). The inguinal ligament is demarcated in blue.

Conclusion

By ensuring **clear communication** between radiologists and proceduralists and creating 3D visual models as reference, patients can receive safer care with more safety measures to prevent retroperitoneal bleeds in TAVR procedures.

This required **education and a team approach** to successfully minimize a potential serious event following vascular access in the TAVR patient population.

References

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Thank you for your time

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