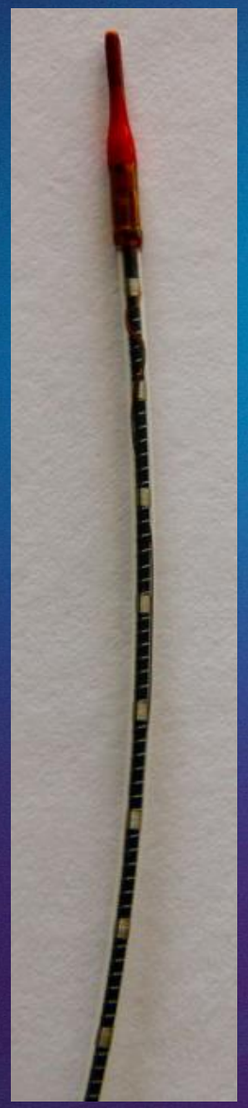
Optimizing Fusion Imaging



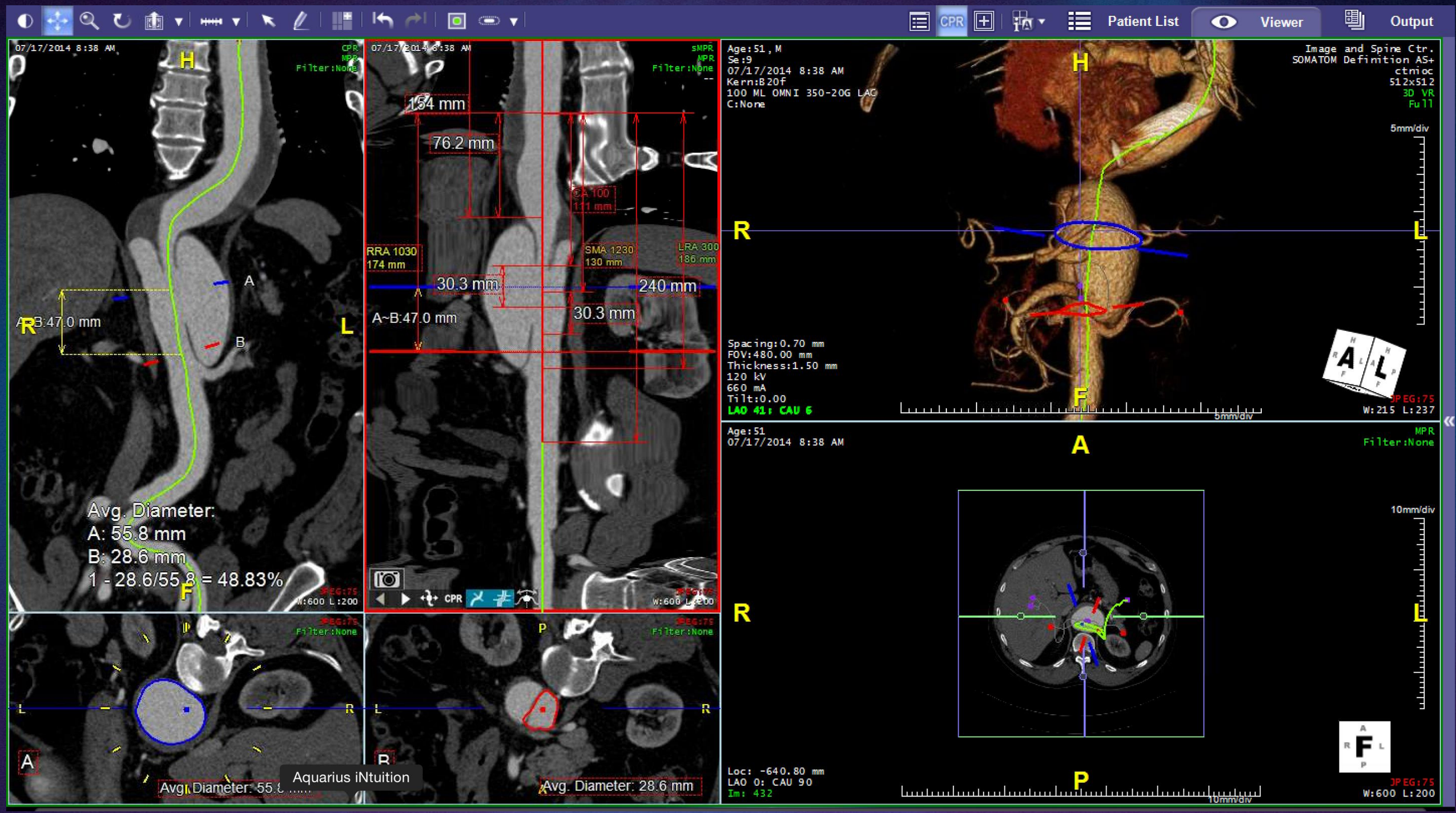
Mark A. Farber, MD FACS
Director, Aortic Center
Professor of Surgery and Radiology
University of North Carolina
Chapel Hill, NC

UNC
CENTER FOR HEART & VASCULAR CARE

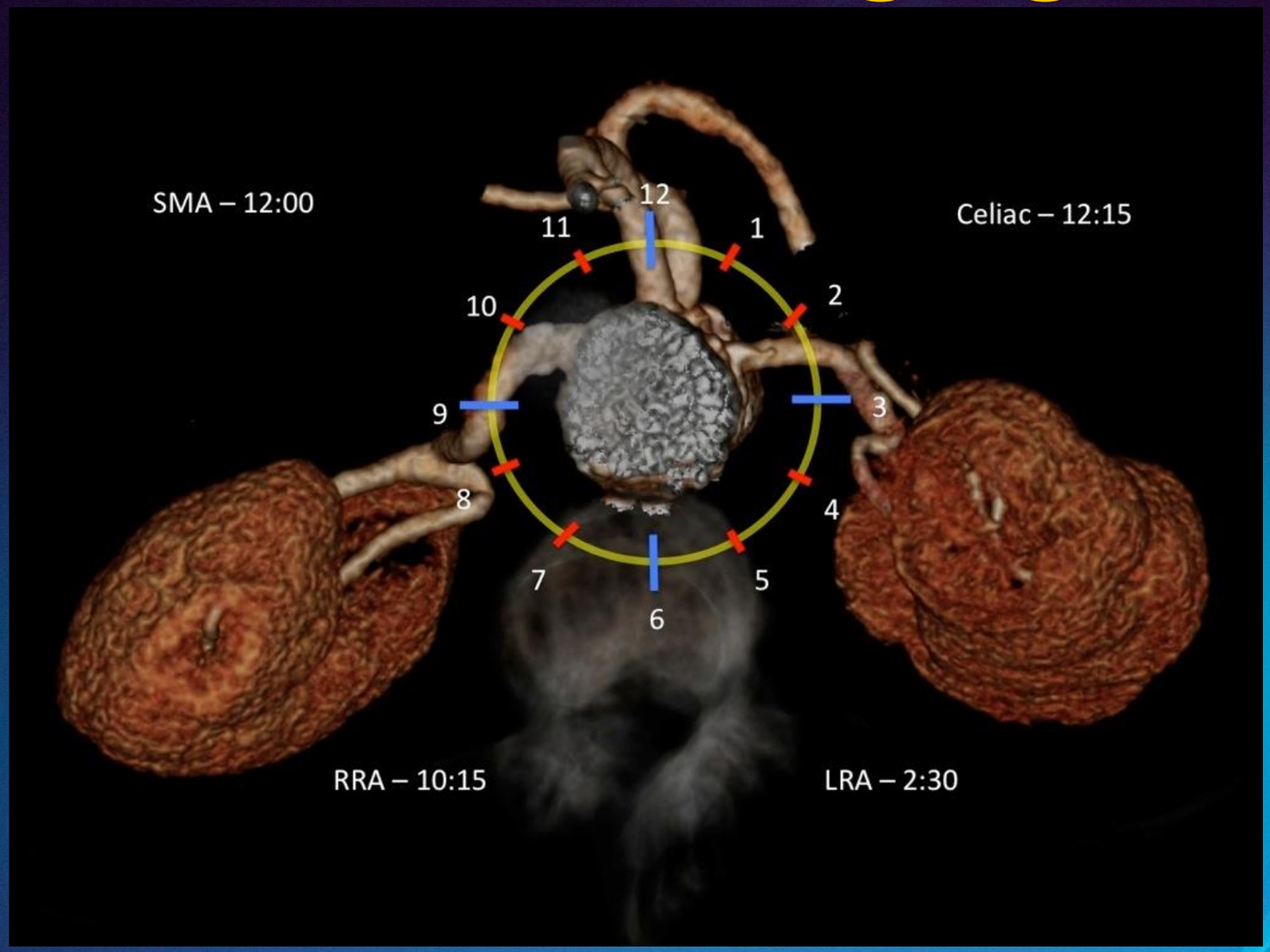
Disclosures

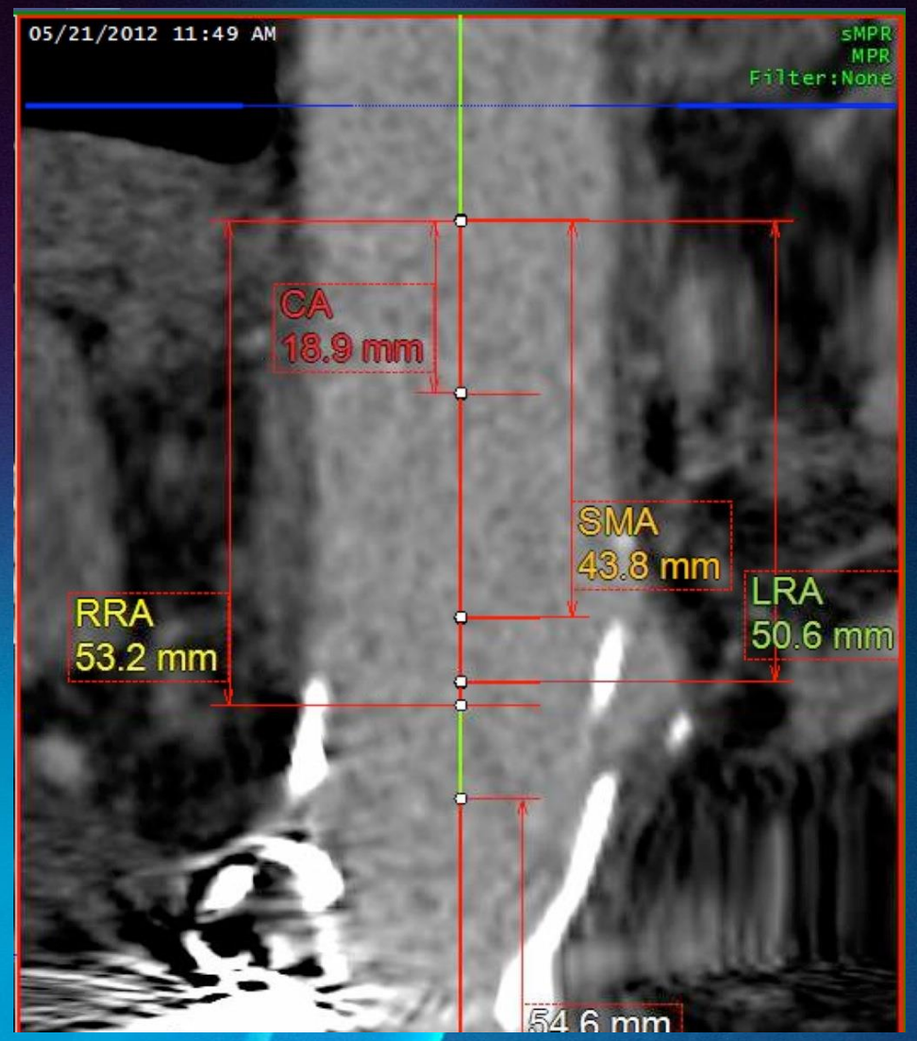
- ***Consultant for:***
  - WL Gore
  - Cook
  - Bolton Medical
  - Endologix
- ***Research Support***
  - Cook

3D Lab Interpretation



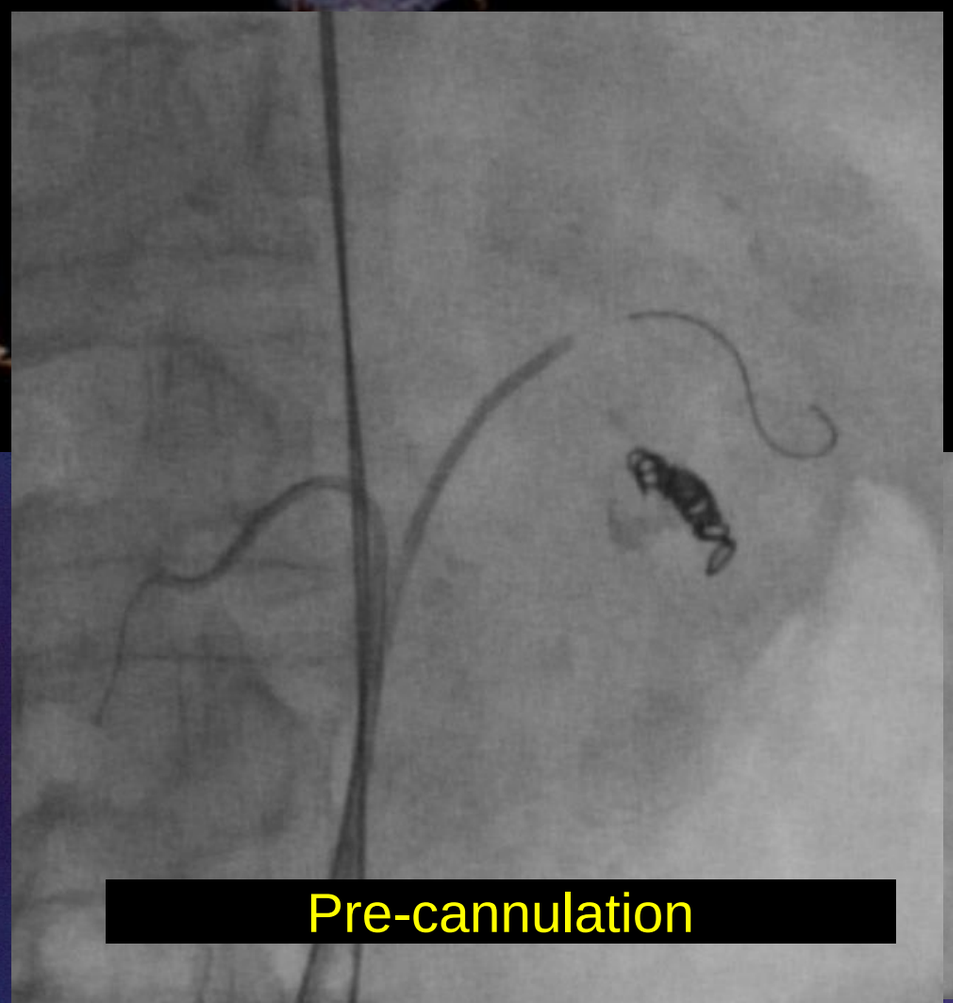
Precise Imaging



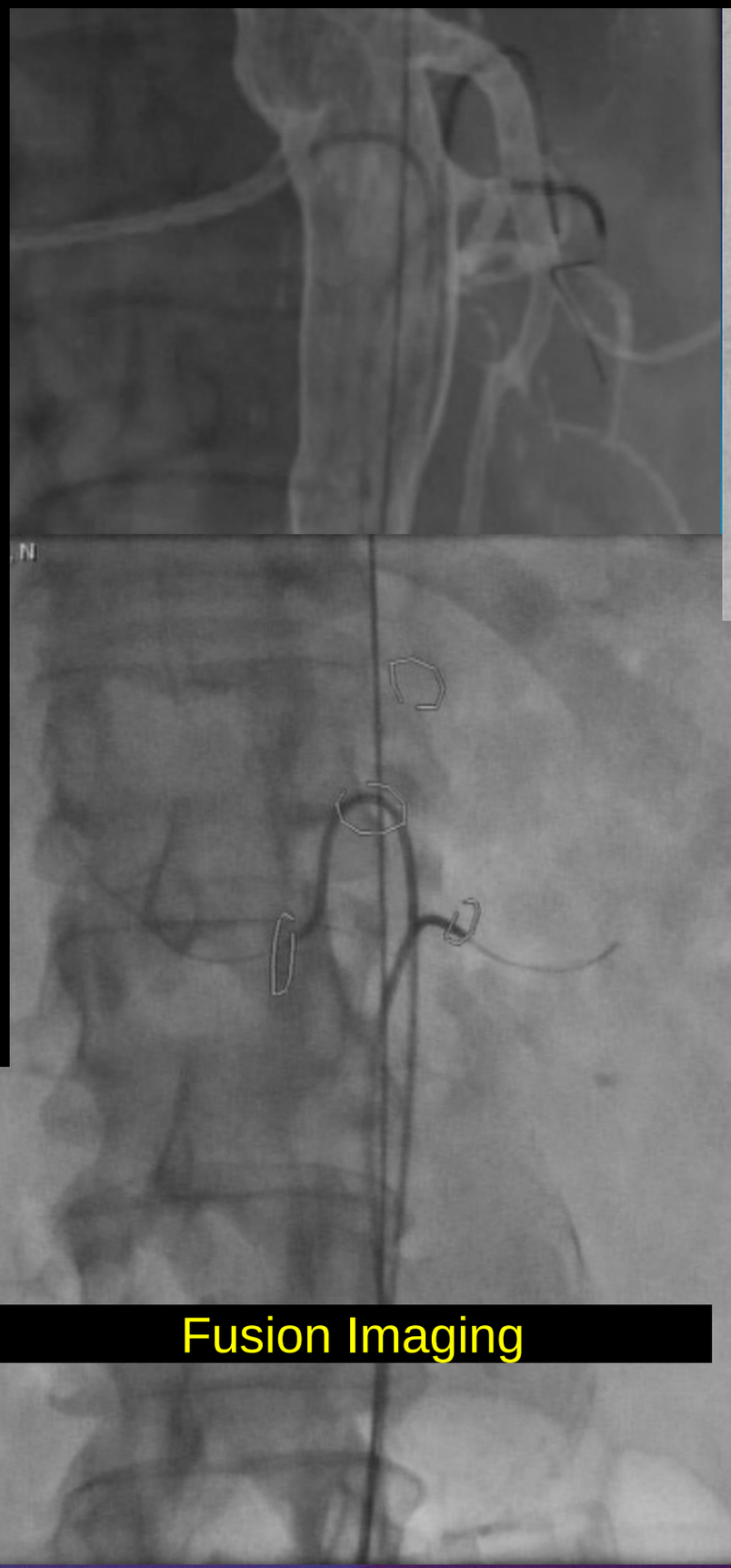


- Detailed imaging is critical
  - Avoids complications
    - Inter-observer variation is usually $\leq 15^0$ and ≤ 1 mm
  - Larger variations can lead to target vessel complications
- Important to examine and modify centerline

Intra-Operatively



Pre-cannulation



Fusion Imaging

Contrast Angiography

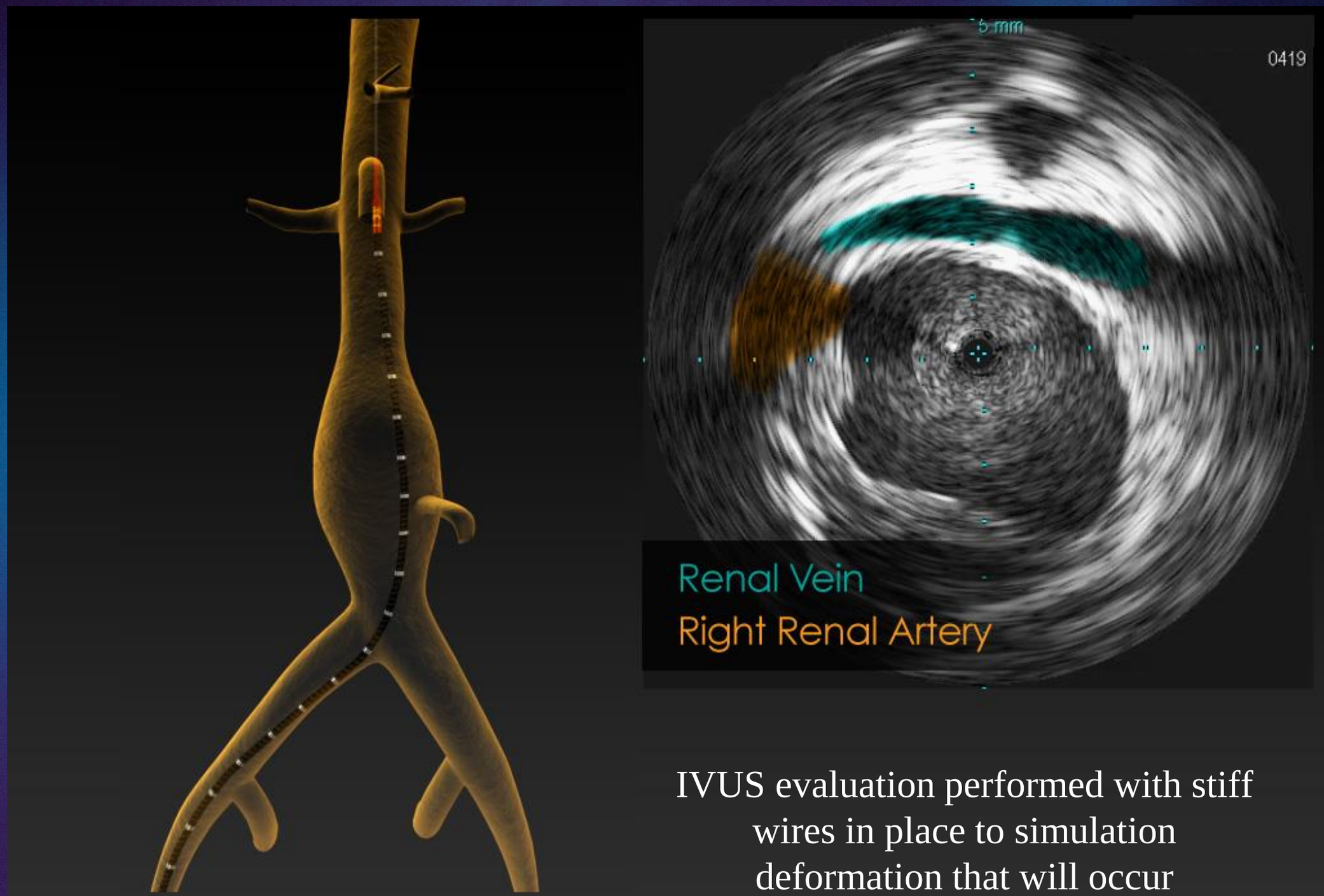
Target Vessel Identification

Technique	Advantages	Disadvantages
Contrast Angiography	No additional manipulations of vessel	More contrast Not dynamic
Pre-cannulation	Reduces Contrast Straightens Vessel Helps reduce cannulation time/XRT dose	Potential increase risk of target vessel injury
CT Angiography/Fusion Imaging	Reduces Contrast Reduces cannulation time/XRT dose	Requires special equipment Some additional time Vessel Deformation
IVUS	No contrast No vessel manipulation	Requires reference imaging

- Additional contrast minimization with dilute contrast (50%)

FEVAR Implantation

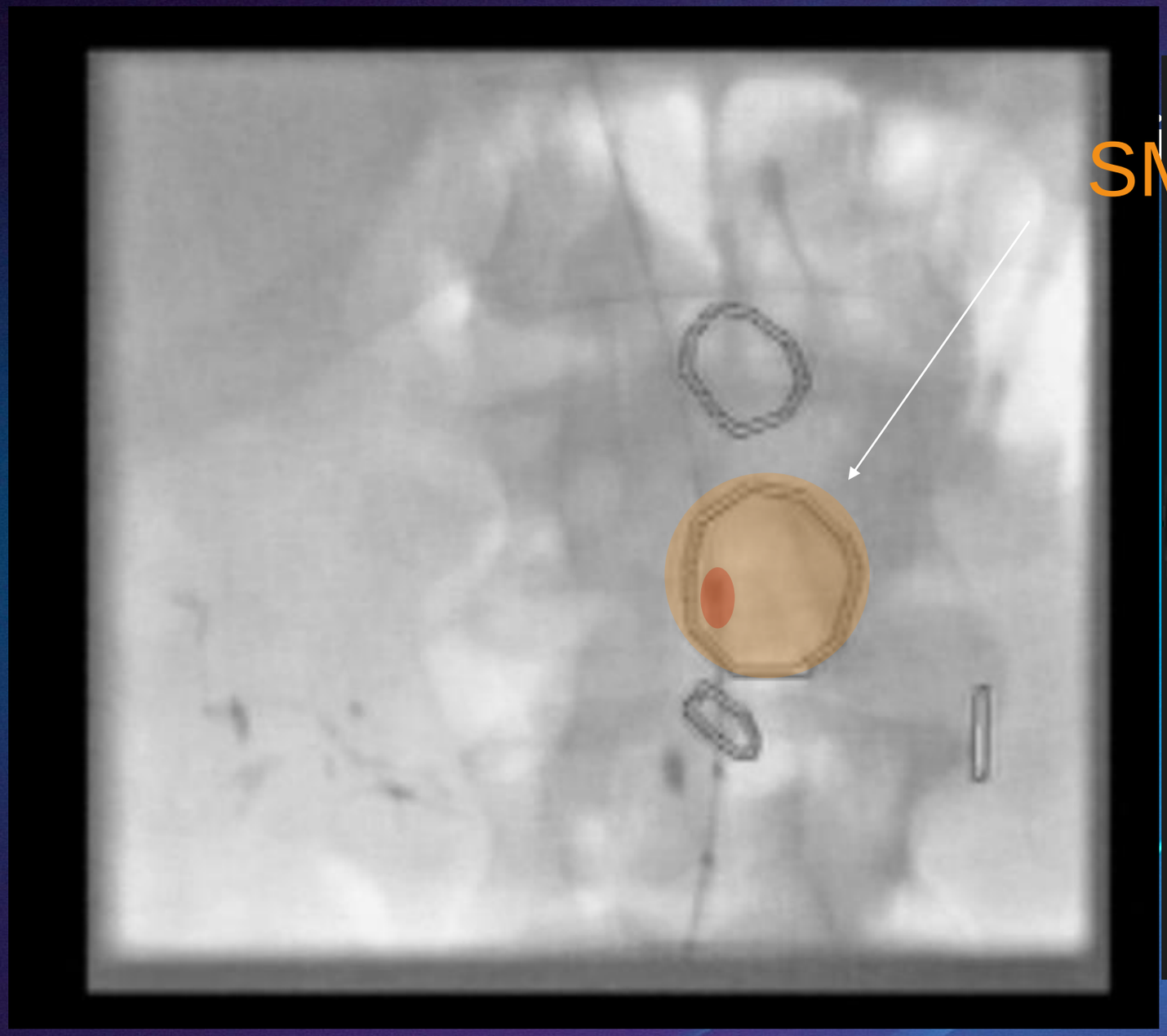
IVUS/Fusion

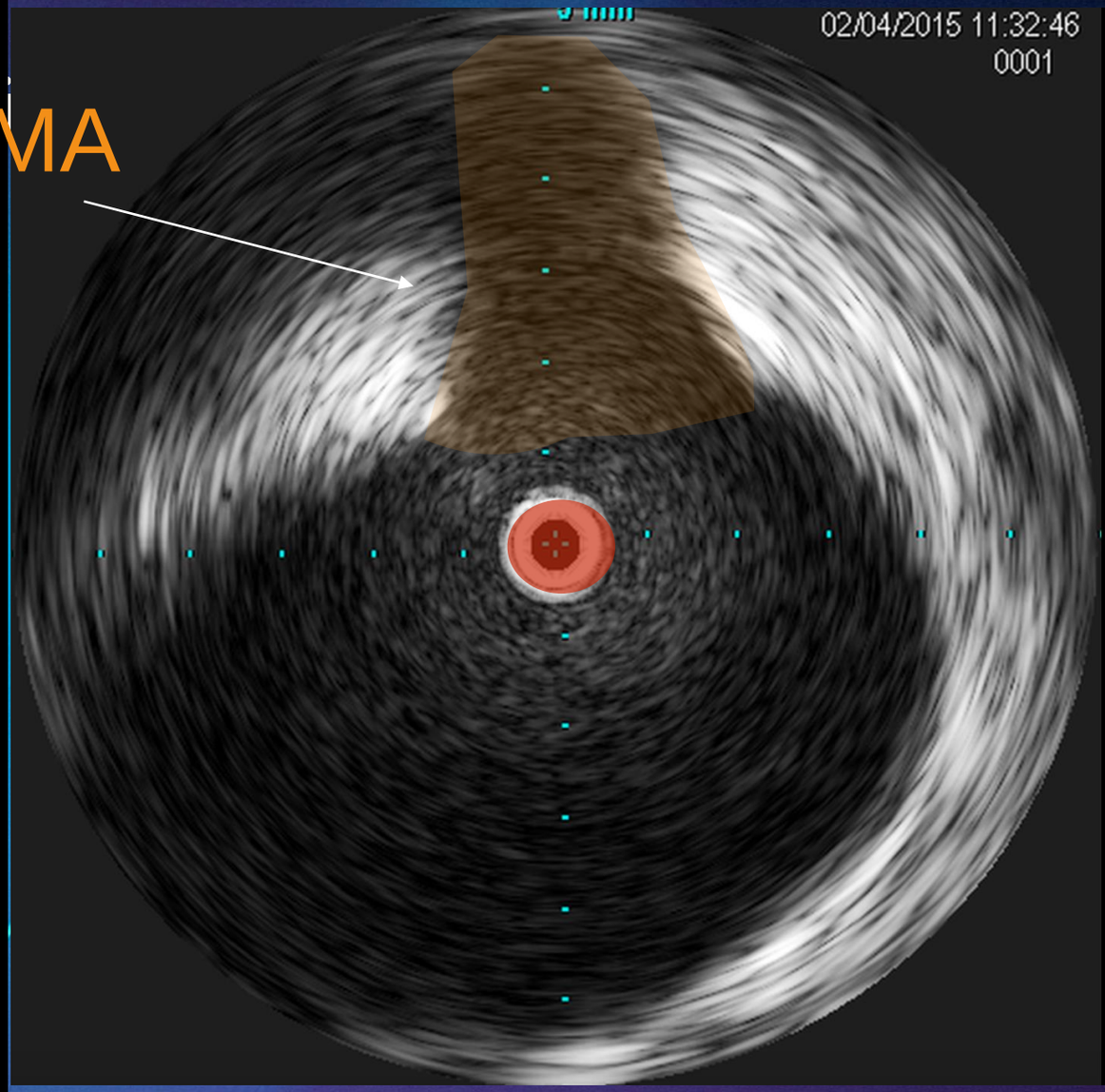


IVUS evaluation performed with stiff wires in place to simulation deformation that will occur

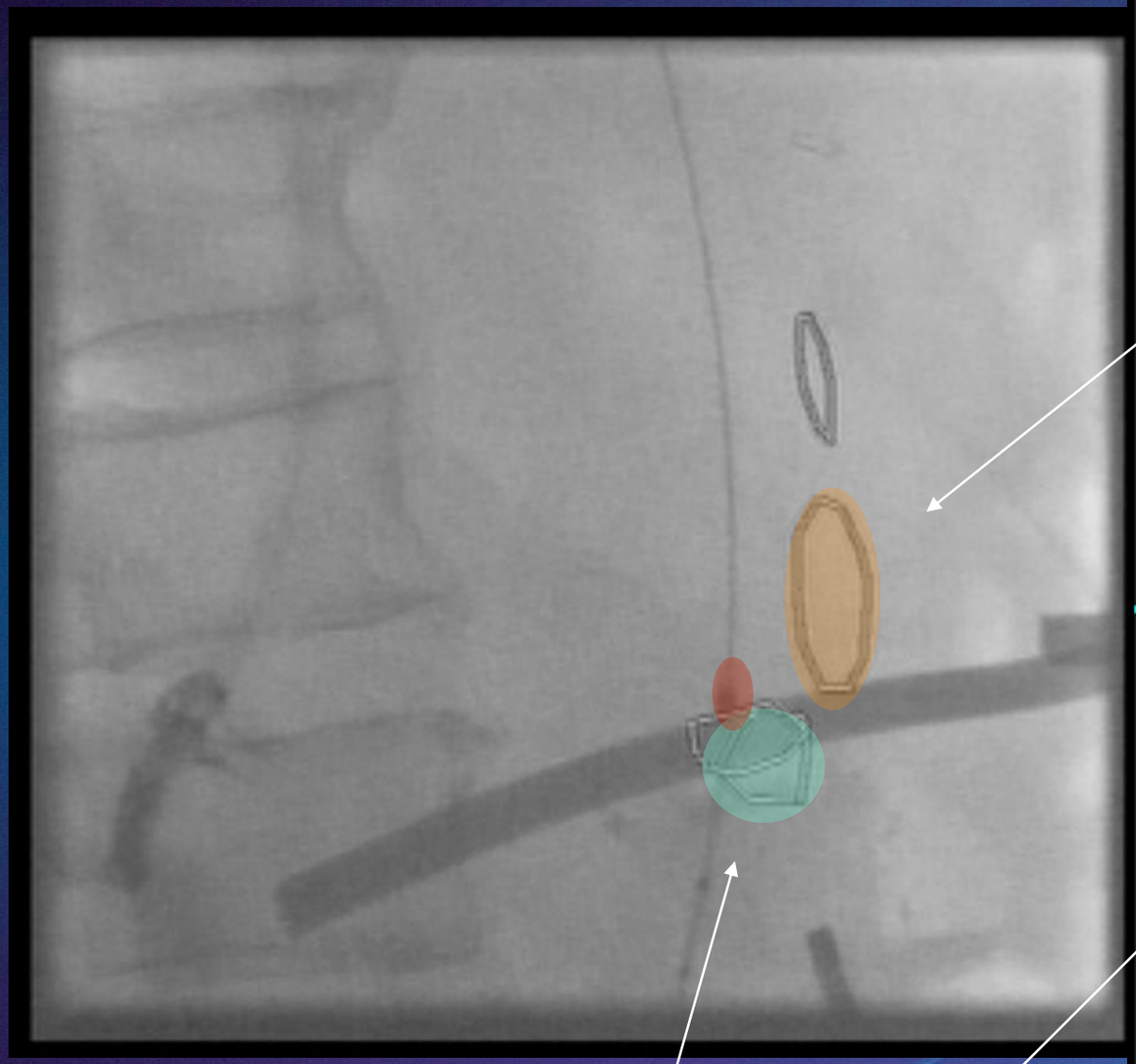
\

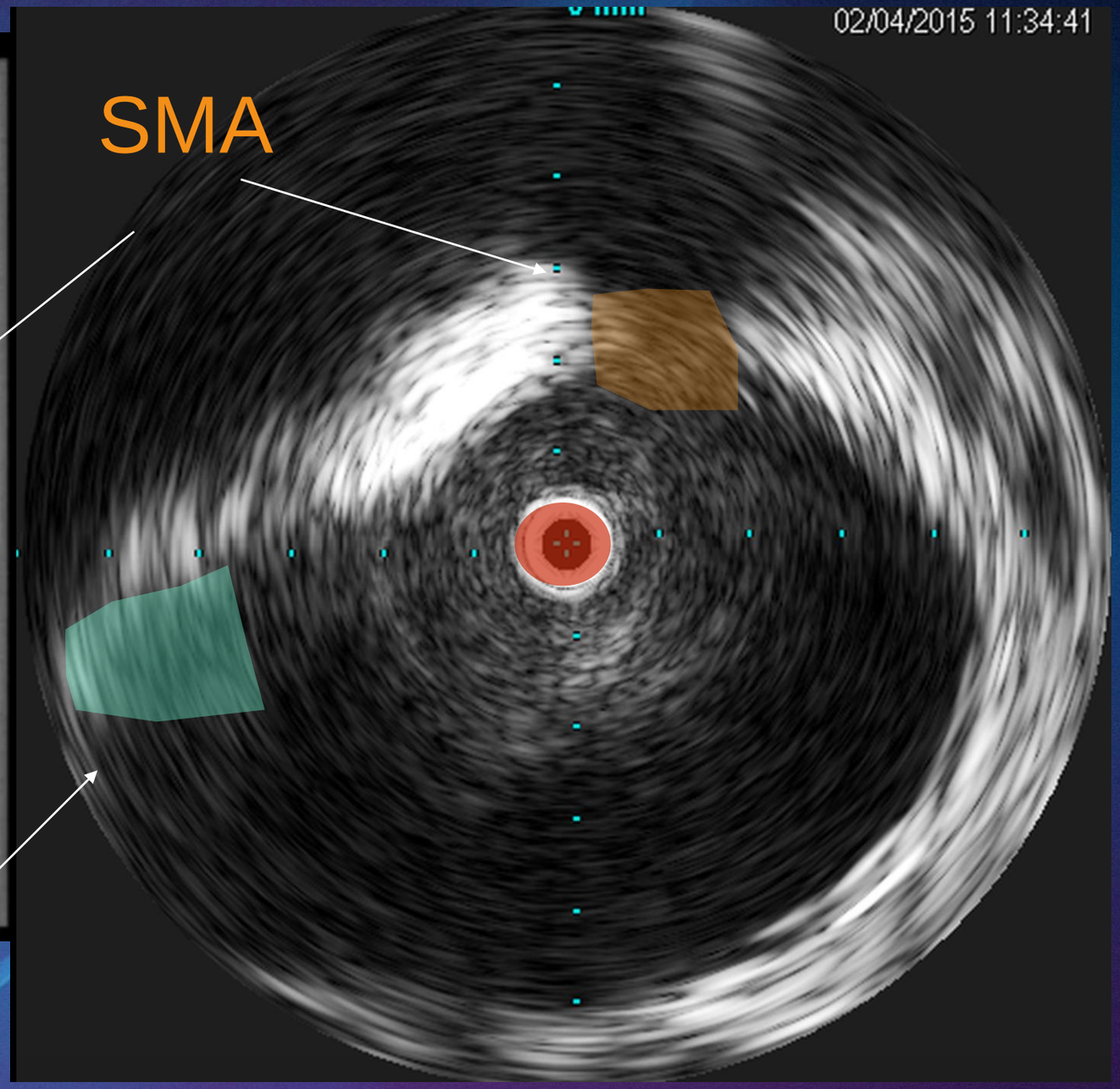
AP View
IVUS/Fusion





Lateral View
IVUS/Fusion



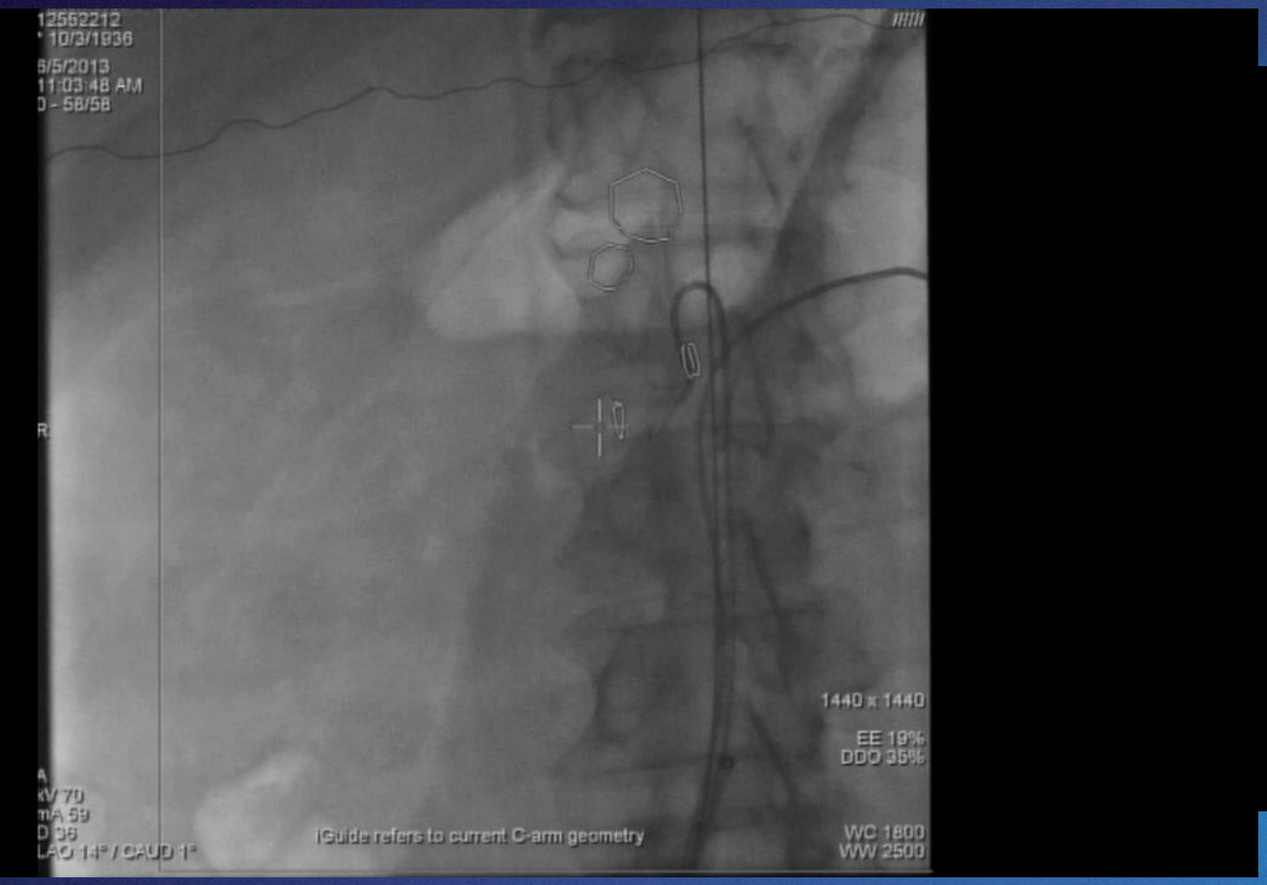


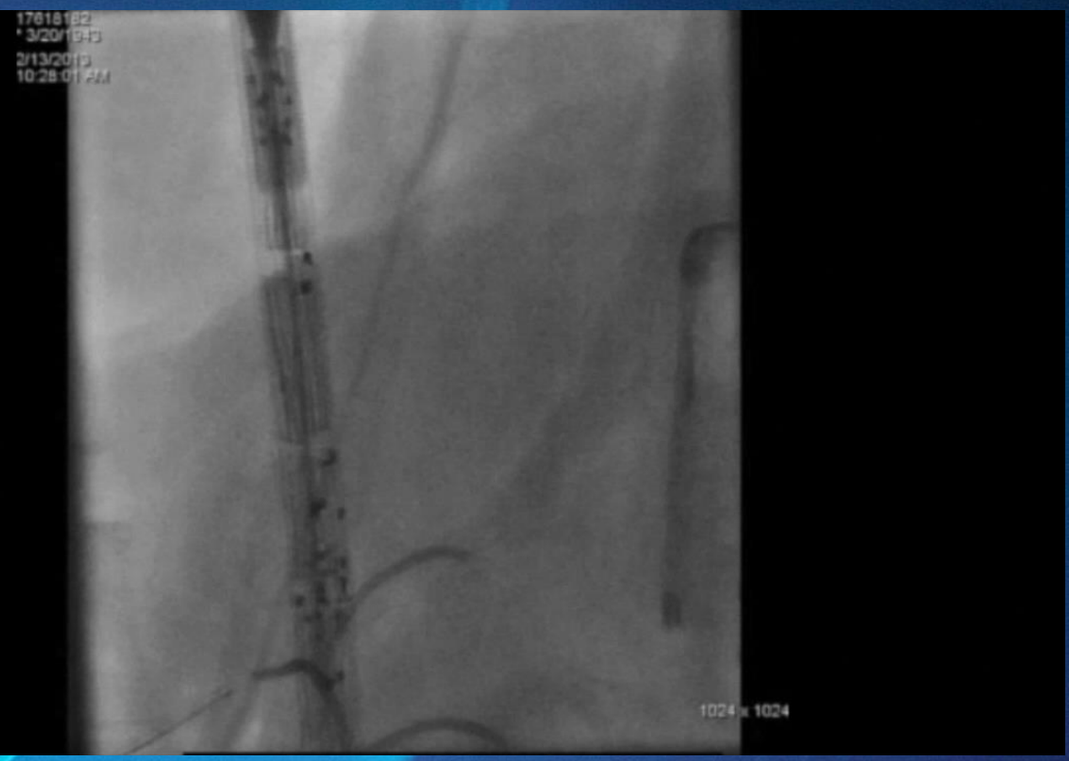
Right Renal Artery

Parallax Correction

- Parallel can be an issue in large aneurysms
- Managed by performing imaging or near orthogonal planes and in regions of the aorta that are not aneurysmal

Intra-Operative Guidance





Identification of Vessel Origins

3D Aortic Overlay

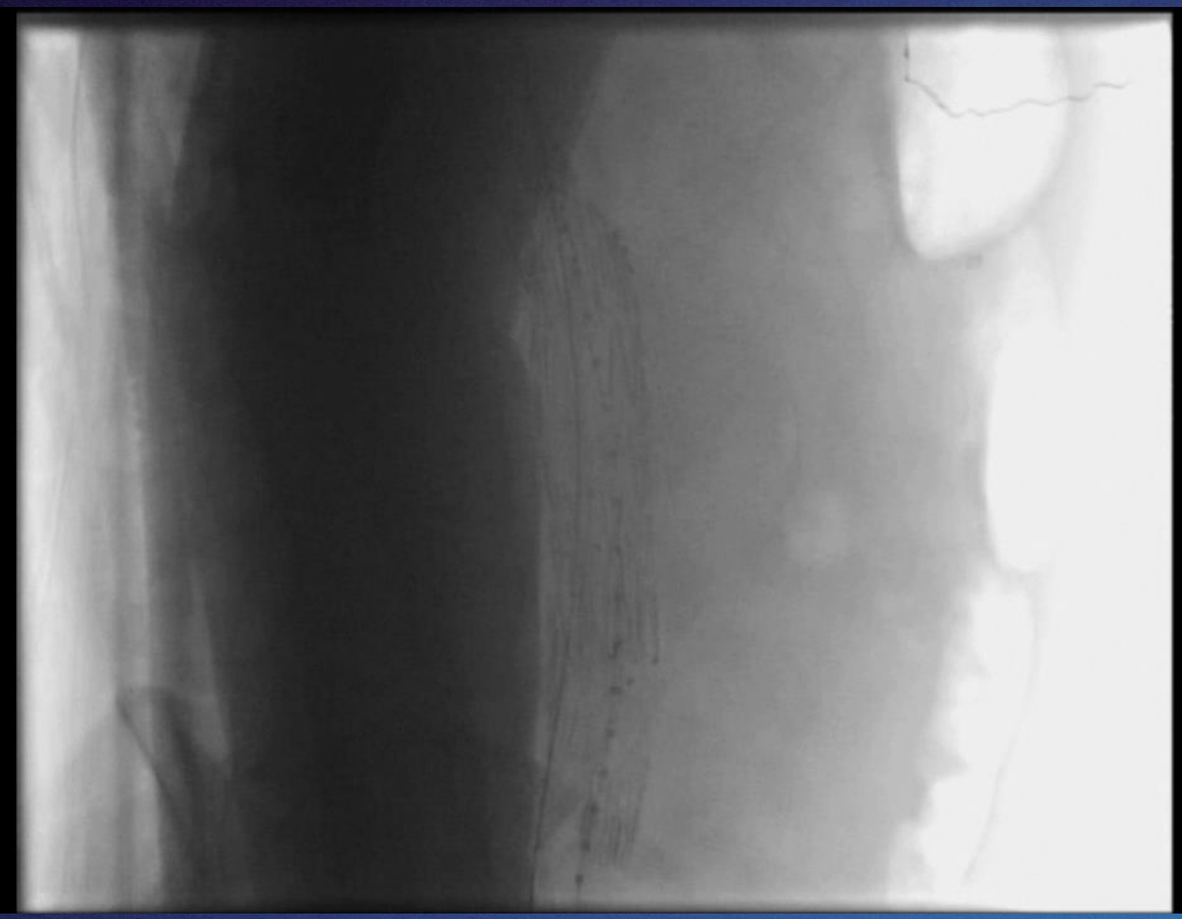
Improvement in Fusion Technology

- Original fusion manipulation required rotational angiography for registration (3D)
- Advancement in technique allow for registration with two fluoroscopic images at least 30 degrees offset (2D)

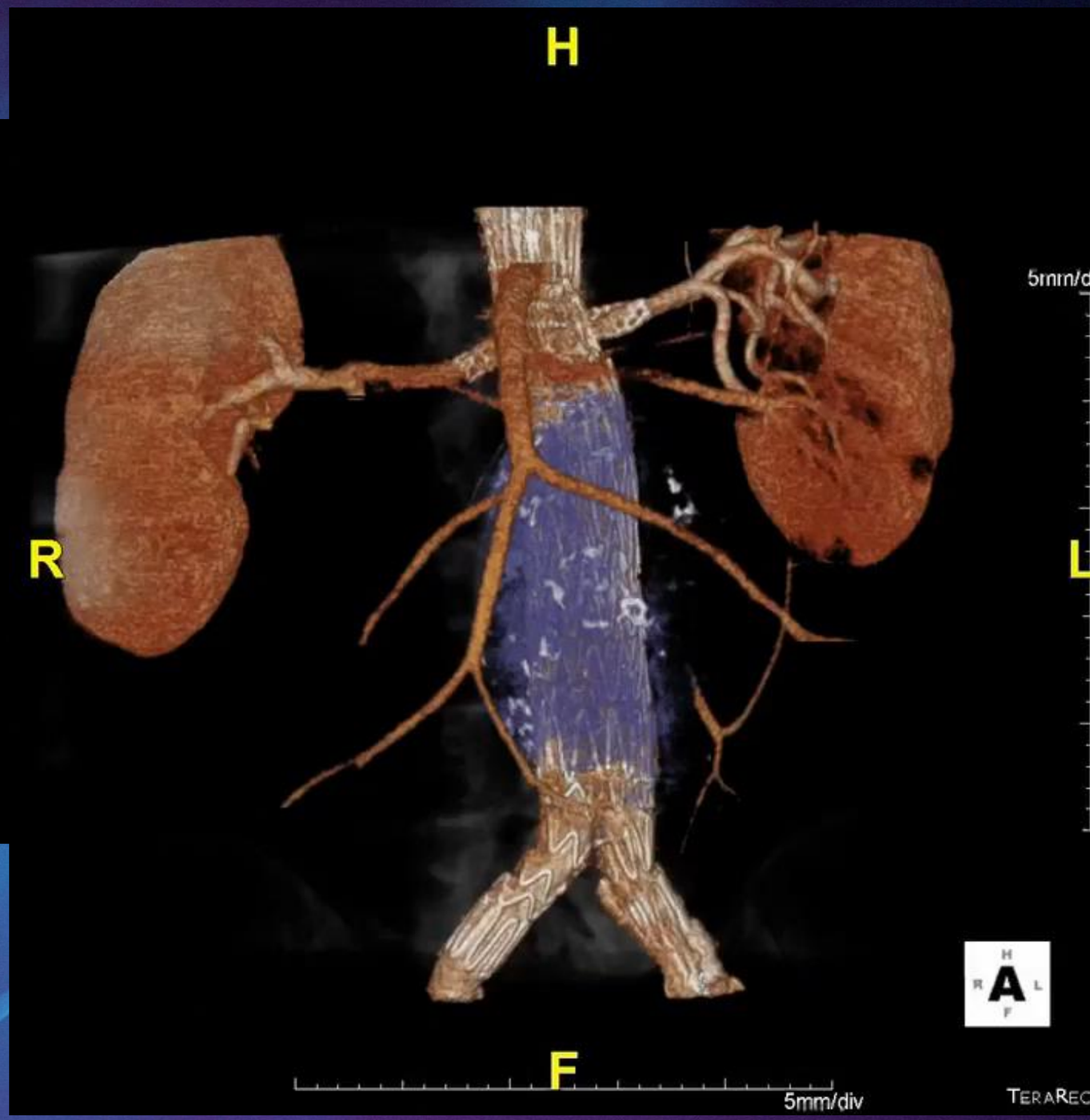
Optimization thru multiple techniques

- Primary modality is performed thru traditional fusion (2D/3D)
- Accuracy improved by implementing IVUS for verification
  - Adds costs
  - Marker catheter used for gate confirmation and dissection evaluation
- For isolated difficult vessels, pre cannulation may be necessary

Completion Assessment



Dyna CT

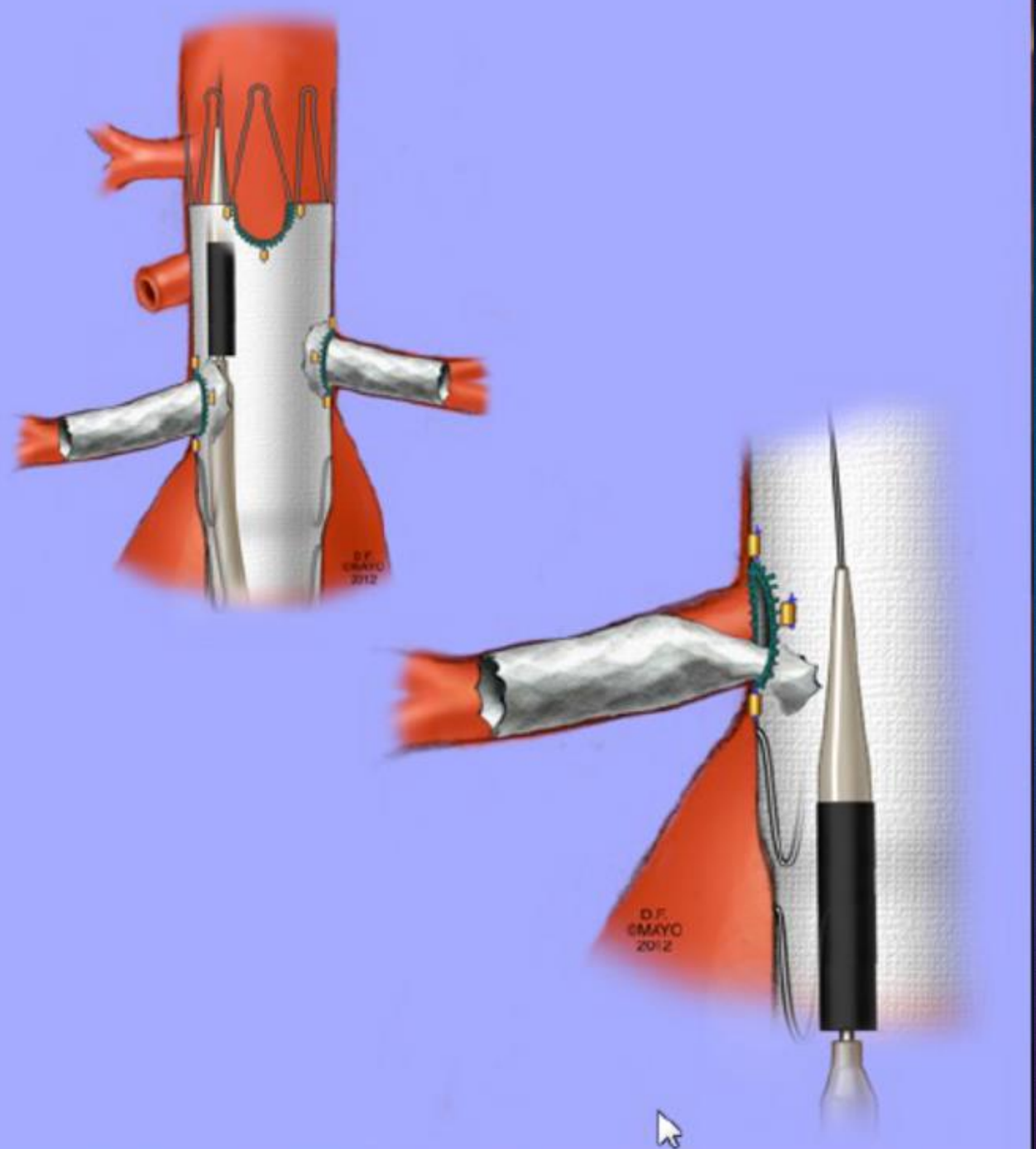


Imported to Terarecon

Device Complications

Stent Crushing

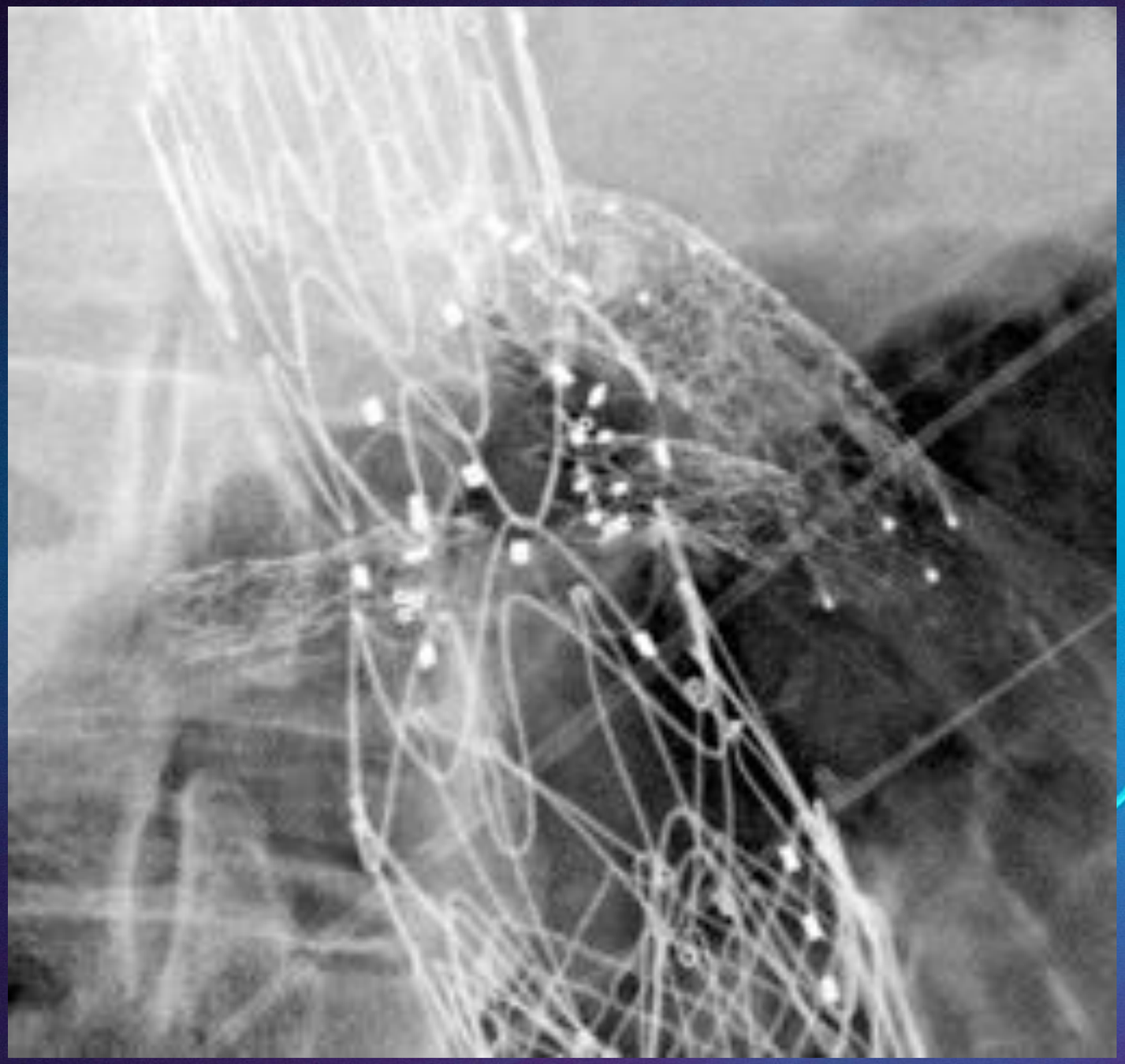
Courtesy: G. Oderich



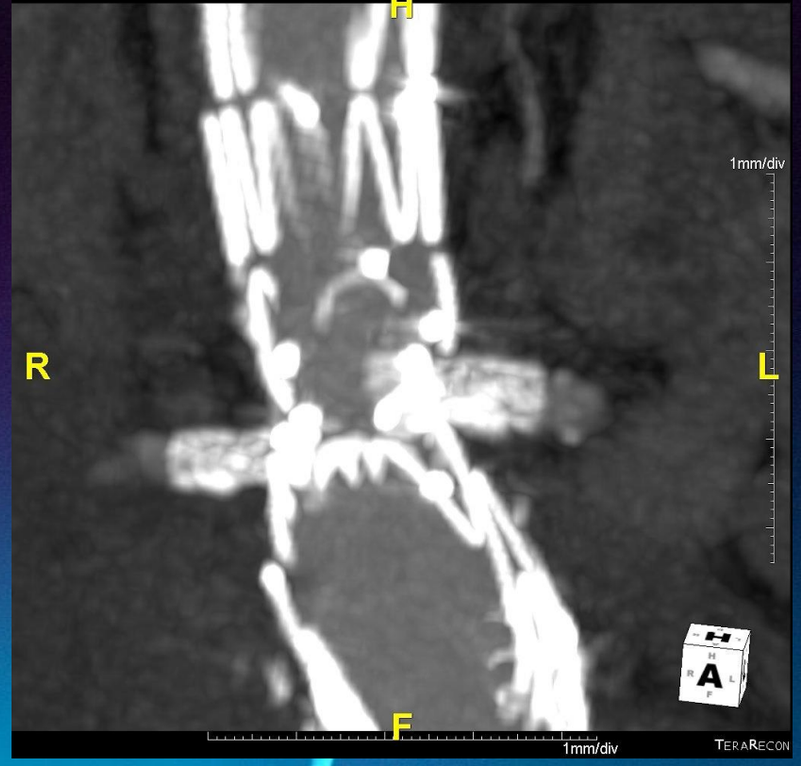
Generally occurs on contralateral renal or SMA

Complications

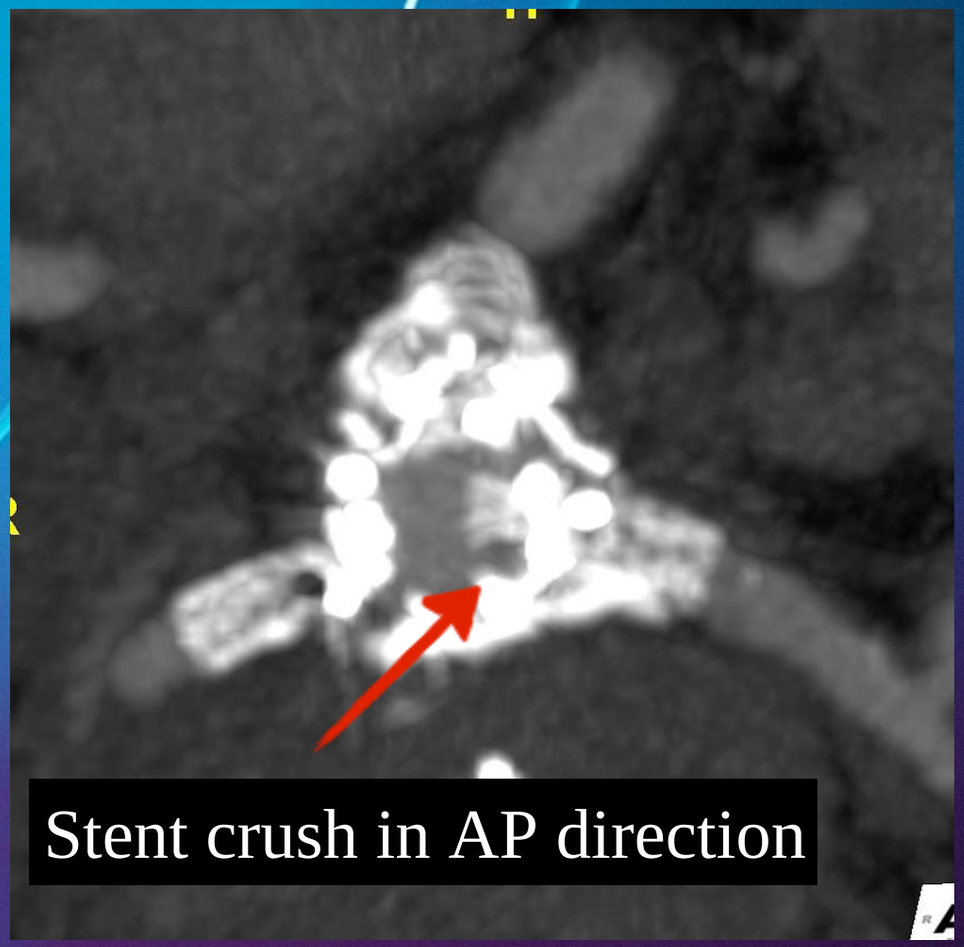
AP stent compression



AP View



AP View



Caudal

Conclusions

- Advancements in fusion technology aid tremendously in device implantation
  - Limits the need for precannulation and contrast usage
- Imaging modalities and techniques have advanced significantly since the initial release of the technology
  - Combining modalities allows for optimization
- Advanced imaging techniques implemented pre-operatively, intra-operative can reduce the number of secondary interventions required
  - reducing radiation and contrast usage
  - improving outcomes