Advanced Imaging Techniques in the Treatment of Type II Endoleaks

Thaddeus Maguire, MD, Brandon Key, MD, Robert A. Hieb, MD, RVT, FSIR

Medical College of Wisconsin, Dept. of Radiology, Dviision of Vascular & Interventional Radiology, Milwaukee, WI

Type II Endoleaks

- Most common type of endoleak (10-25%)
- Altered pressure gradients in covered aortic branch vessels reverse flow and perfuse the aneurysm sac
  - Commonly Inferior mesenteric & iliolumbar arteries. Gonadal, accessory renal and median sacral also reported.

- Type IIA : Pulsatile, to-and-fro flow in and out of sac from a solitary vessel
- Type IIB : More complex, AVM-like. Inflow & outflow tributaries with “nidus” in the sac. Aim to embolize all components

- Majority will spontaneously resolve, often low-risk
  - Spontaneous rupture in presence of ONLY a Type II endoleak is <1%
- BUT sac enlargement can contribute to a high-risk secondary Type I or III
- Treatment algorithms vary, but many agree treatment warranted when:
  - Continued overall aneurysm sac enlargement
  - Persistent leak >12 months

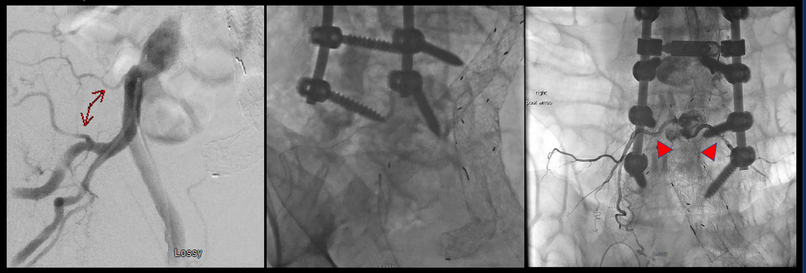
Treatment Approaches

- Trans-Arterial : Via collateral route e.g. SMA to IMA or hypogastric to iliolumbar. Can be more technically demanding & requires arterial puncture bedrest.
- Trans-Lumbar : Direct puncture with patient prone.
- Trans-Caval : Femoral venous access. Most prefer only when the sac abuts IVC
- *Trans-Aortic : Direct puncture through endograft material, less common

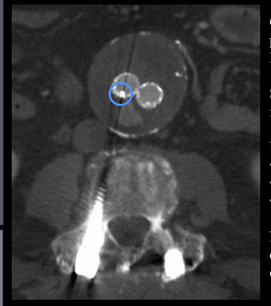
- Typically use mechanical and/or liquid embolic

Transarterial

68 year old man with EVAR 2 years prior. Delayed Type II from IMA with sac enlargement to greater than pre-EVAR dimensions. *Top row :* Trans-arterial approach to IMA via SMA and marginal artery, using 6F Benchmark guide catheter and microcatheter, treated with Onyx and coiling of IMA origin. 6 month followup CT demonstrated resolution, however, had developed a new inferior iliolumbar Type II endoleak, with continued sac enlargement noted 6 months later.
Bottom row : Iliolumbars from hypogastric denoted by red arrows. Angled 5F glide catheter, Echelon 14 microcatheter through dominant iliolumbar branch from superior gluteal. Onyx 18 followed by 34, refluxed into bilateral lumbar tributaries (red arrowheads).



Traditional Radiologic Landmark Planning

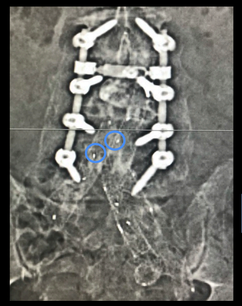


Correlate radiologic landmarks on pre-procedural imaging to aid in orientation and localization of endoleak

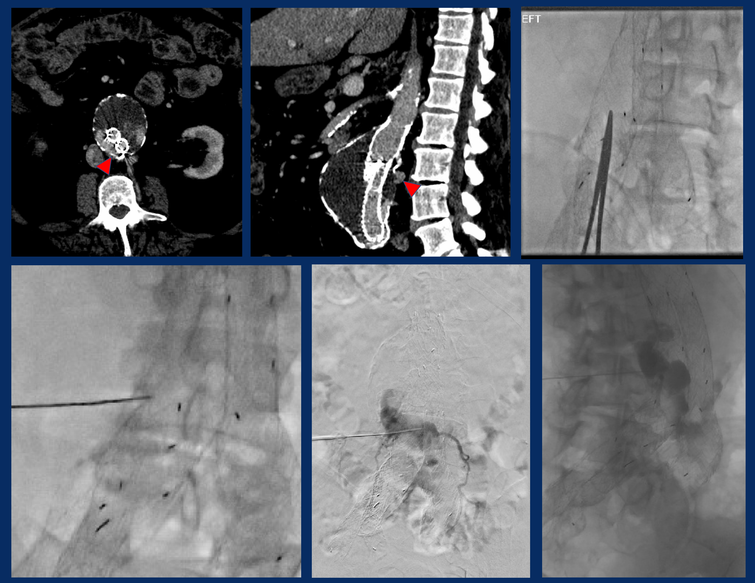
Scout radiograph approximates the eventual intra-procedural fluoroscopy

Use fixed structures
- Bones
- Surgical implants / hardware
- Overlap markers on endografts

Note the presence of endoleak on CT (left) corresponding to markers and pedicle screw on Scout (right) denoted by blue circles



Translumbar - Conventional

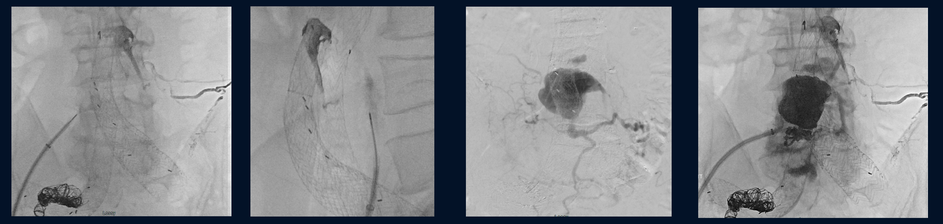


74 year old man with EVAR 3 years prior, returns with Type II originating from lumbar arterial branches (red arrowheads).

20G Inrad needle advanced at targeted radiopaque markers at lower L4 level using fluoroscopic landmarks from a left parasagittal approach. Blood return when stylet removed.

Position of needle confirmed with contrast injection. Needle primed with DMSO. Onyx embolization performed directly through needle.
Followup CT confirms penetration of Onyx into prior lumbar arterial tributary.

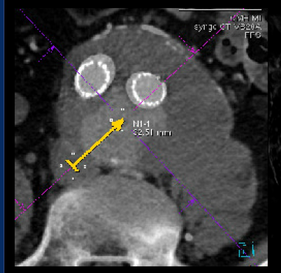
Transcaval - Conventional

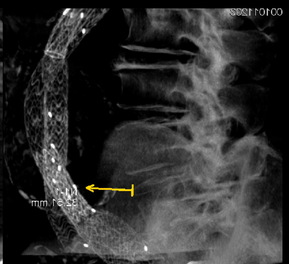


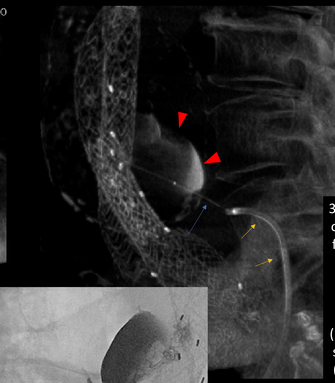
75 year old man with EVAR + R hypograstric coiling & EIA extension 1 year prior. Multifocal Type II noted at 3 month followup. Underwent transarterial treatment of IMA and lumbar in superior portion of sac. Developed new inferior lumbar Type II and sac enlargement 6 months later.
Above : Right CFV access, 12F base sheath. Roche Uchida TIPS set with secondary curve applied to access needle. Needle thrown posteriorly at level of landmark on endograft, coaxial needle withdrawn, 5F catheter remains in leak & Onyx embolization

Augmented Needle Guidance Fluoroscopy

Needle guidance overlays an active map onto live fluoroscopy. With commercially available software, such as syngo iGuide from Siemens, this can be created by the operator during the procedure by acquiring a Cone Beam CT and then identifying both a target and a starting point on the workstation.
Above : Translumbar approach with iGuide display on left. Helps ensure a precise tract, avoid obstruction and non-target puncture
Below : Transcaval approach. Internal guidance overlay from IVC to aorta (yellow arrow). 10F right CFV base sheath, coaxial 6.5F Tourguide sheath, loaded with crossing catheter and 0.014” crossing wire. Weighted tip of the wire was cut off & backend was clamped to Bovie pen. Tourguide aimed using iGuide map, wire advanced while Bovie activated, crossing catheter followed and contrast confirmed puncture into endoleak cavity. Onyx embolization performed.







3D reconstruction of access created from Cone Beam CT. Leak cavity (Red arrow heads), microcatheter (blue arrows) and steerable sheath (orange arrows).