Contrast-free Evaluation and Intervention of Hemodialysis Access guided by Intravascular Ultrasound: A Case Series

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Clinical Presentation

Two patients, a 42-year-old male and a 47-year-old male, underwent a total of three procedures to address HD access issues in a left upper extremity arteriovenous graft and left thigh loop graft, respectively. Both patients had severe (anaphylaxis) allergies to iodinated contrast and the decision was made to perform contrast-free evaluation of, and intervention on their HD access using transcutaneous ultrasound, fluoroscopy, and intravascular ultrasound (IVUS).

Procedural Steps

- All procedures began with antegrade access central to the arterial anastomosis.
- Pullback IVUS assessment was performed from the central venous system to sheath access to identify stenoses and measure cross-sectional areas (Figure 1, 3A).
- Areas of narrowing underwent over-the-wire balloon angioplasty performed under direct transcutaneous ultrasound visualization (Figure 2).
- Post intervention IVUS assessment performed to assess and quantify luminal gain in treated stenoses (Figure 3B)
- Physical exam assessment of palpable thrill

Results

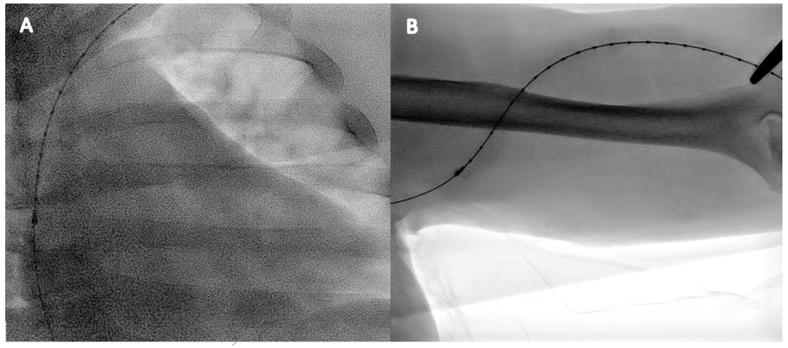

Figure 1) Fluoroscopic images showing pullback IVUS evaluation from the central SVC (A) to the upper extremity arteriovenous graft (B).

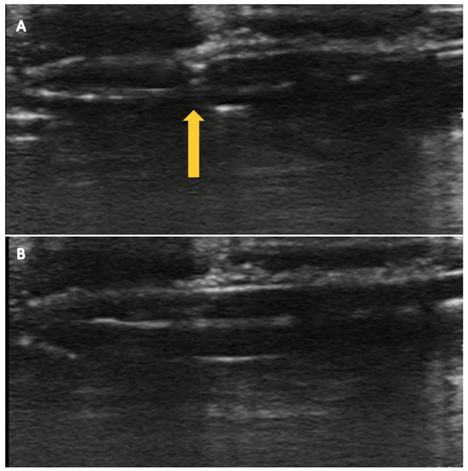

Figure 2) Transcutaneous ultrasound images demonstrating real-time visualization of angioplasty balloon inflation. A) Location of focal stenosis indicated by balloon waist formation (Arrow) B) Full balloon inflation confirms complete effacement of the stenosis.

Results Continued

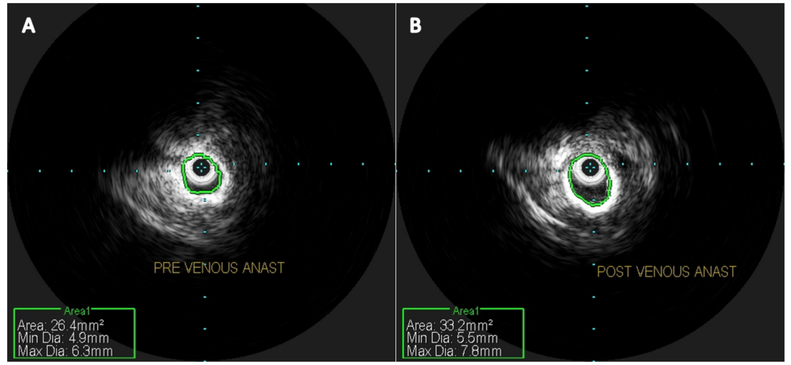

Figure 3) IVUS images pre- and post-angioplasty of the venous anastomosis stenosis in the left upper extremity AV graft. IVUS demonstrated an increase in cross-sectional area from 29.4 mm2 pre angioplasty (A) to 33.2 mm^2 post angioplasty (B).

Conclusions

- IVUS is safe and effective at guiding HD access interventions in patients with contraindications to iodinated contrast administration.
- IVUS can provide advanced information such as differentiation of intraluminal pathology and specific cross-sectional area data.
- Additional studies with long-term follow-up are needed to clearly define the role of IVUS as a primary imaging modality for vascular access interventions in the presence or absence of contrast administration.