

IVUS: should it be used more extensively in deep venous reconstructive surgery

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Faculty Disclosure

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Stockholder/Founder - Veniti, Inc
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Veniti, Inc.
Speaker - Cook Medical

Wallstents and nitenol stents in these studies are used “off-label,” e.g., the use for iliac venous stenting is not described on the product’s label.

What is IVUS?

- Catheter based intravascular ultrasound
- Appr. 10 MHz frequency is necessary to achieve adequate penetration (>3cm)



How to use it?

- U/S guided percutaneous vein access below for example a suspected obstruction
- Guidewire and sheath inserted
- Coaxial or monorail tracking
- Catheter advance to highest point of interest and then images acquired during withdrawal

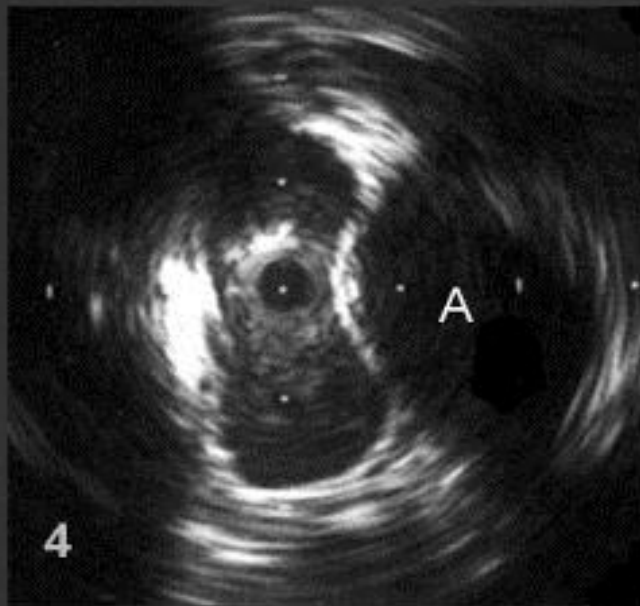
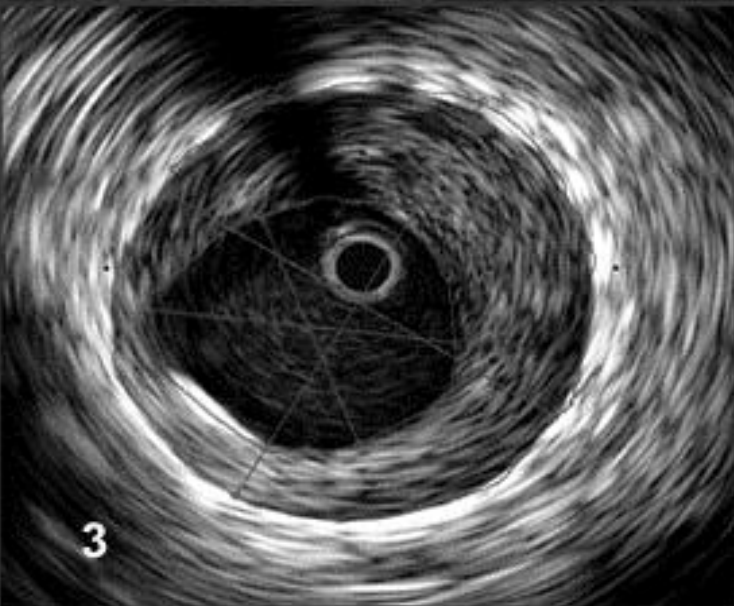
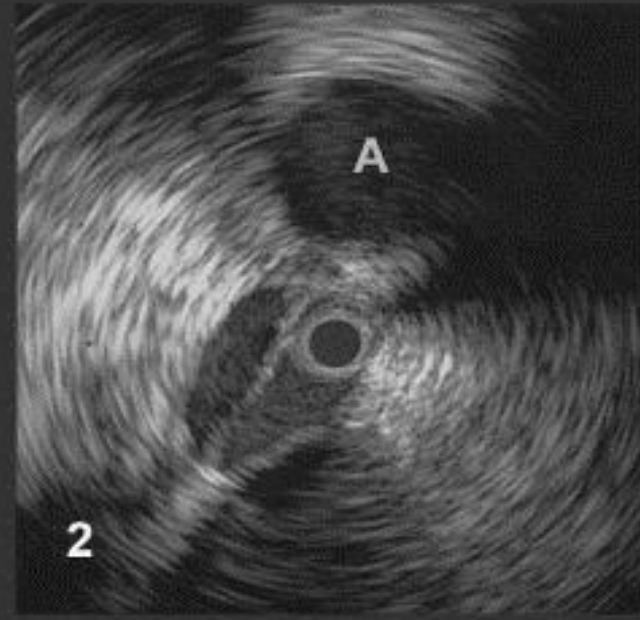
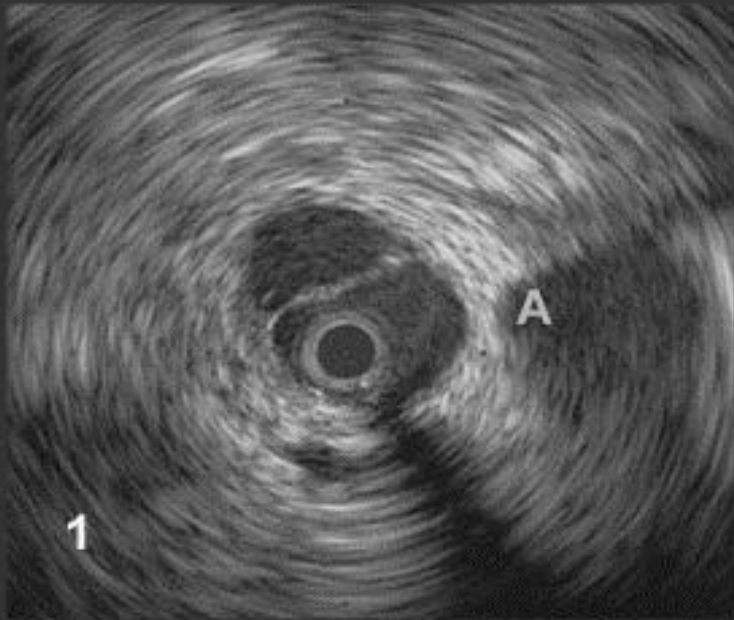


What's unique with IVUS?

- Visualizes vessel lumen from inside out and penetrates adjacent structures, not a “shadow-o-gram” like venogram
- Gives full 360° view of crosscut vessel lumen
- Locates side branch or collateral vessels
- Reveals character of wall and external structures, incl. accompanying and crossing arteries



Intraluminal lesions are well visualized



Advantages of IVUS

- No need for injection of contrast dye
- Decreases the exposure to irradiation
- Better imaging in morbidly obese patients
- Can be used outside the angio room with or without adjuvant fluoroscopy
- Potentially procedures can be guided by IVUS alone

Role of IVUS in Venous Disease

Good for

1. Diagnosis of pelvic outflow obstruction
2. Guiding femoro–ilio–caval stenting
3. Guiding placement of IVC filters
4. Revealing residual wall thrombus and external compression after early clot removal

Bad for

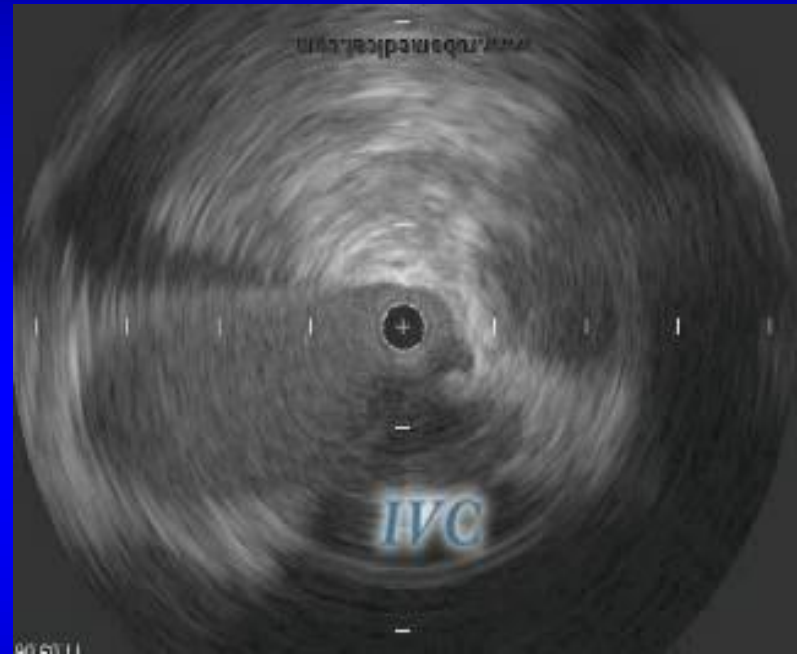
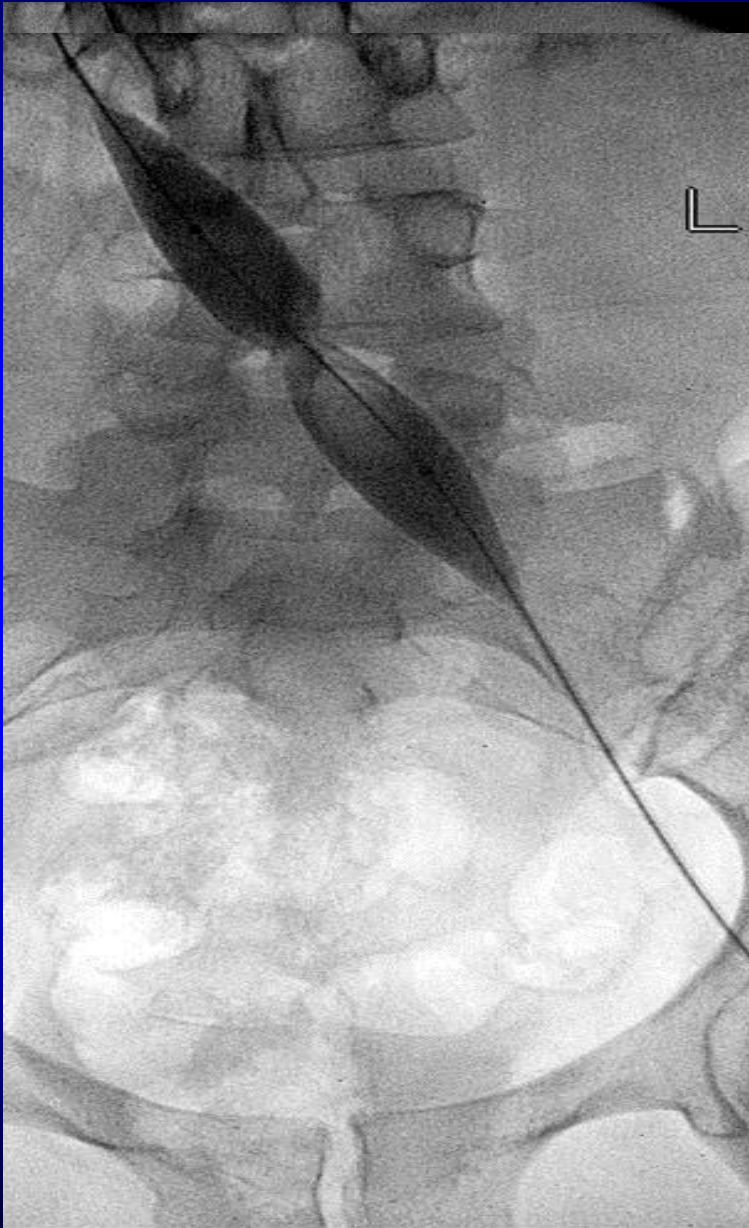
- Visualization of valve leaflets

Aspects on Chronic venous obstruction

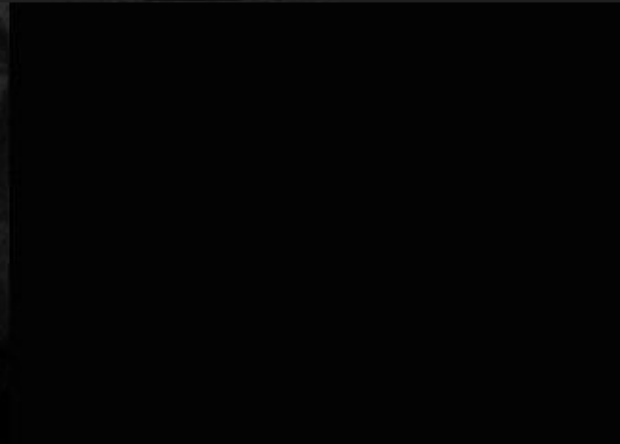
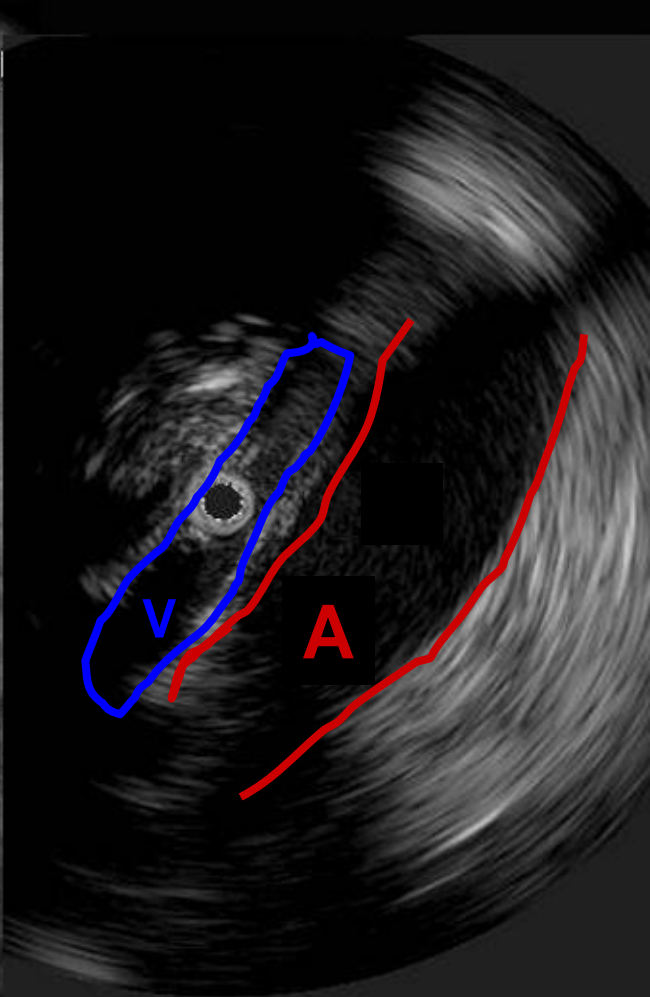
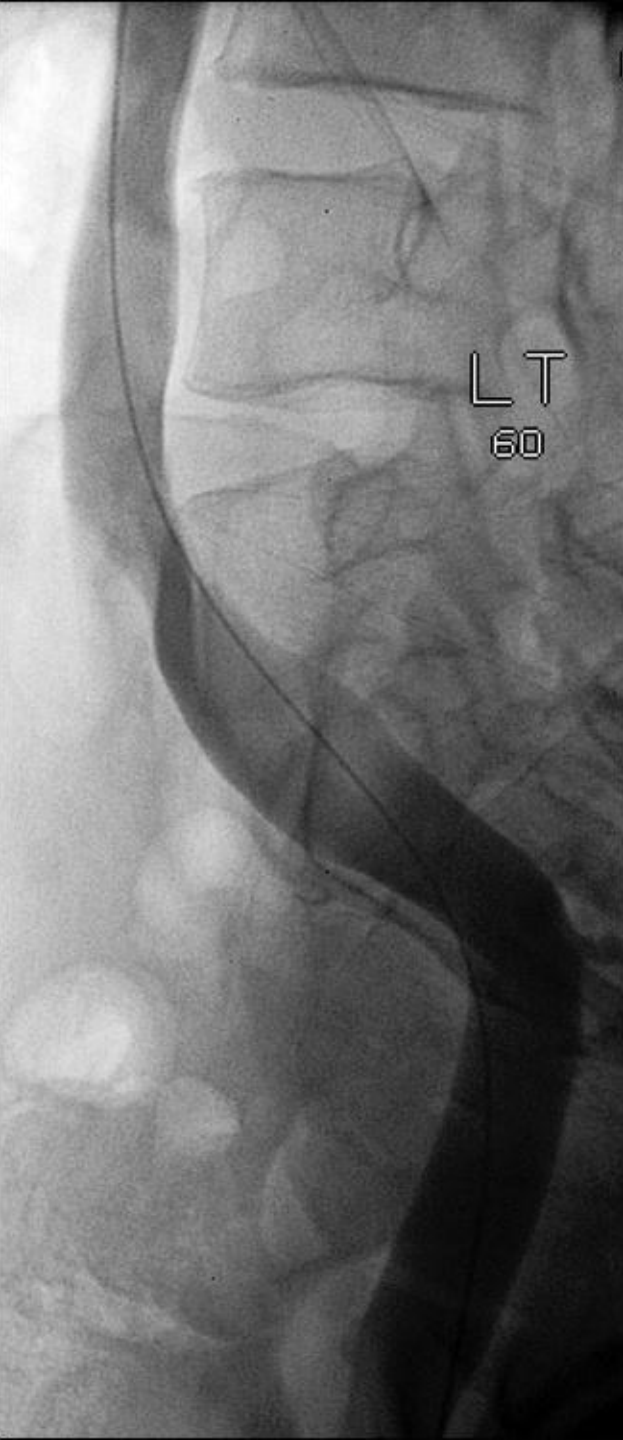
- No hemodynamic tests to assess hemodynamically significant stenosis are available.
IVUS can provide exact degree and extent of obstruction!
 - Unknown extent of obstruction is hemodynamically significant
- **Standard for imaging venous obstruction.**
Compression lesions occur in different planes.
- Detection by single- or multi-plane venography, MR-V, CT-V and IVUS
- Morphological stenosis >50% significant

Intravascular Ultrasound

(NIVL = nonthrombotic iliac vein lesion)



NIVL
left



IVUS vs. Transfemoral Venogram: (comparison of diameter stenosis)

IVUS >70% (n=304) >50% (n=104); Venogram - AP view only

Normal venogram findings in 17-25%

Venogram underestimated the degree of stenosis by 30%

Inaccurate location or extent on venogram in 41%

- sensitivity 43-45% - negative predictive value 49%-56%

[Hingorani et al, J Vasc Surg 2011;52:804]

[Neglén and Raju, J Vasc Surg 2002;35:694-700]

IVUS >50% (n=37); Venogram – multiple oblique images

51% positive IVUS (7/19 <50% on venogram)

- sensitivity 63% -negative predictive value 68%

[Unpublished personal data]

IVUS does modify stent placement

IVUS show 46% of compression lesions involve both the CIV and EIV

[Raju, Neglen. J Vasc Surg 2006;44:136-144]

IVUS of 16 limbs with iliac compression revealed findings not seen on venogram:

- 68% had lesions extended into EIV or CFV

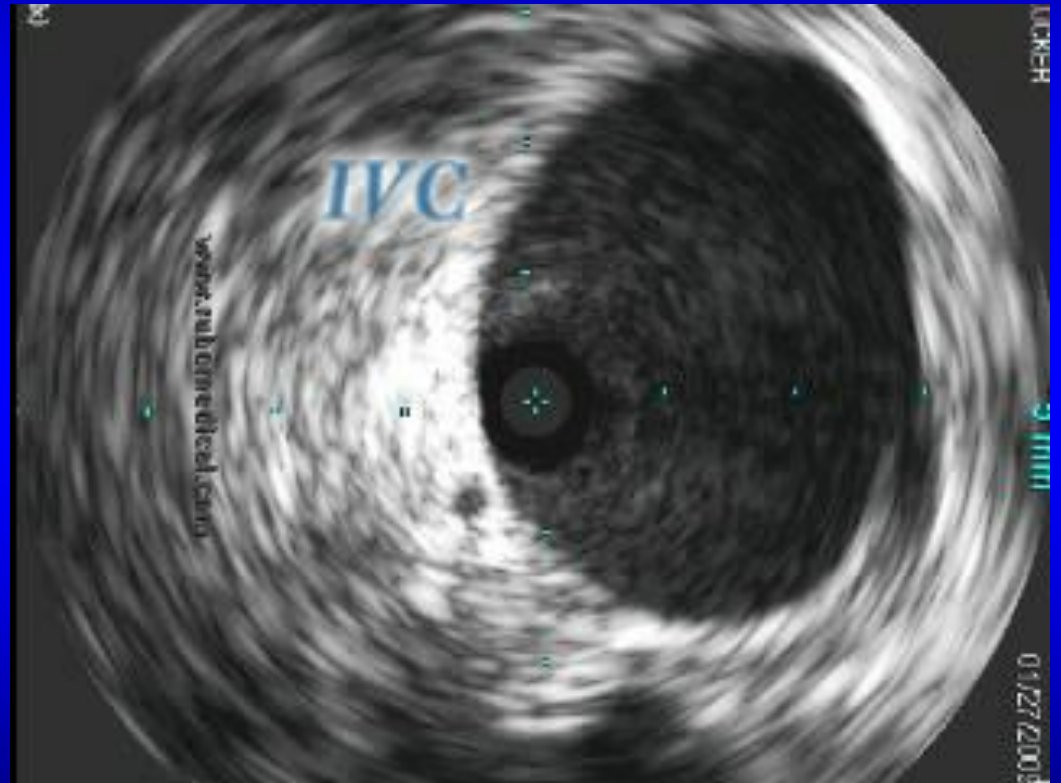
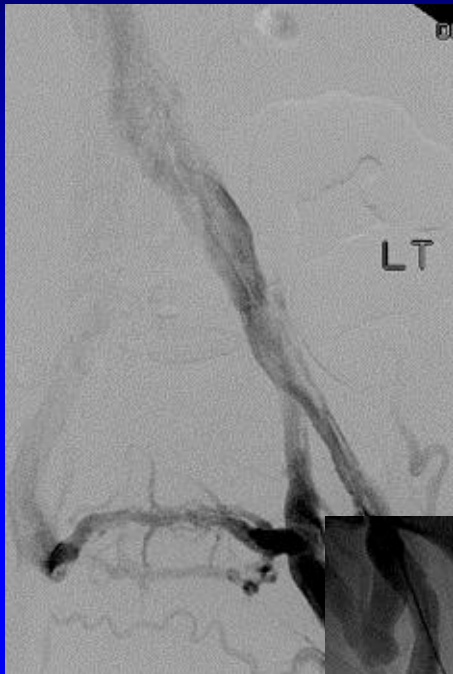
- 25% had non-occlusive thrombi

- 44% had synechia

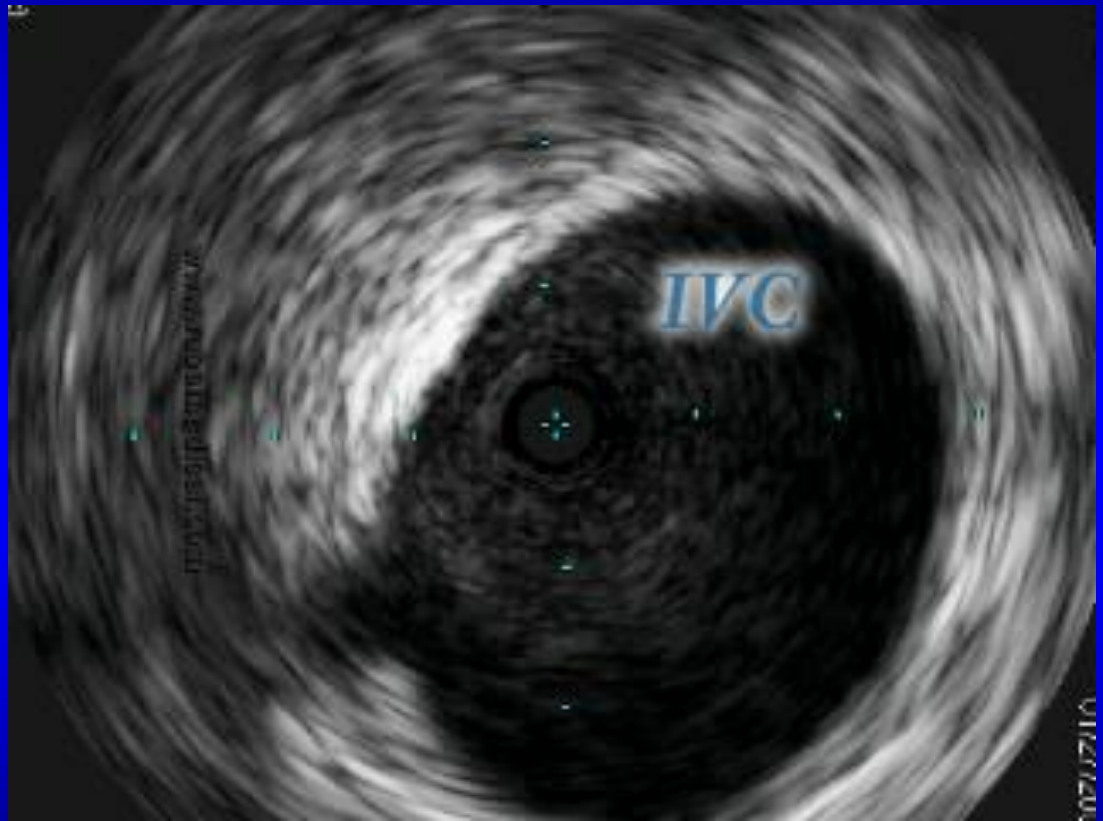
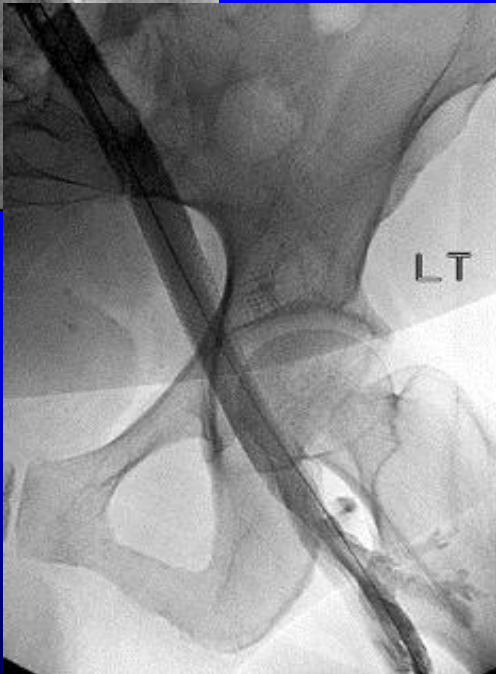
IVUS modified the intervention in 50% of limbs

[Forauer et al. J Vasc Intervent Radiol 2002;13:523-7]

Identifying the proximal and distal stent landing zones



Non-occlusive Postthrombotic Obstruction



Post-stenting

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