

Aortic Graft Ultrasound: Case Presentations

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Aortic endograft ultrasound

- Measurement of aneurysm sac, bilateral iliacs
 - Maximal dimensions in transverse orientation
- Color Doppler imaging of main body graft and bilateral iliac limbs flow
 - Document velocities (rule out graft thrombosis/stenosis)
- Color Doppler imaging of sac
 - Rule out endoleaks, +/- contrast-enhanced US

Morgan et al. J Ultrasound
Med 2021 : 9999:1–5

Aortic endograft ultrasound

- 20% of endovascular aortic repairs have postoperative endoleak (MC = type 2)
- CTA = gold standard
- Surveillance recommendations per SVS:
 - CTA for first year (1, +/- 6, and 12 months)
 - If no issues, yearly surveillance via color duplex US

Chaikof et al. J Vasc Surg
2018; 67:P2-77

Endoleak detection

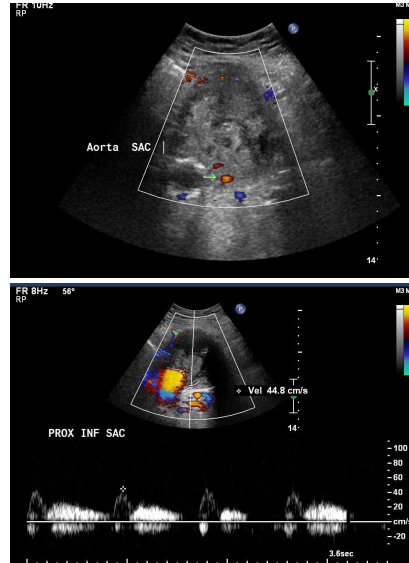
- Growth of aneurysm sac
- Gray scale images to detect hypoechoic areas within the sac, suggestive of fresh thrombus/ blood pooling



Polak et al. Ultrasound assessment following endovascular aortic repair.
In: introduction to Vascular Ultrasonography. 7th ed, 2020

Endoleak detection

- Color flow outside the graft within the aneurysm sac
- Doppler: phasic arterial waveform or to-and-fro waveform



CASE STUDIES



Case 1

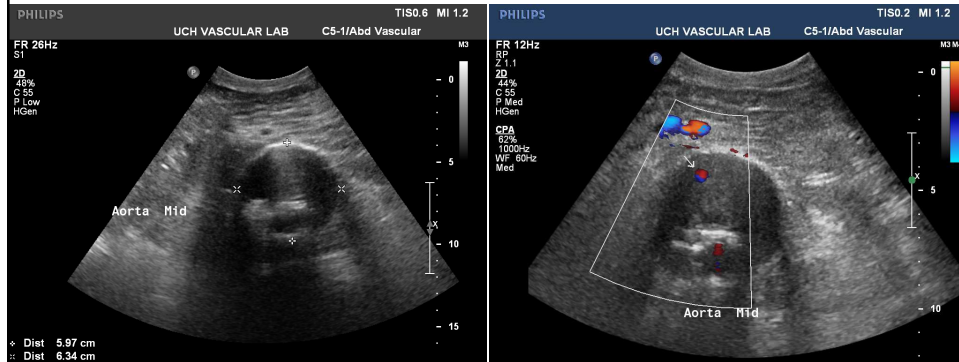
- 85M with hypertension, aortic stenosis, CKD, and history of EVAR (Endologix) 5 years prior presenting for continued surveillance.

Initial surveillance duplex US



Aneurysm sac max diameter of 5.6 cm, no visualized endoleak. Patent graft without thrombosis or stenosis.

Yearly surveillance duplex US

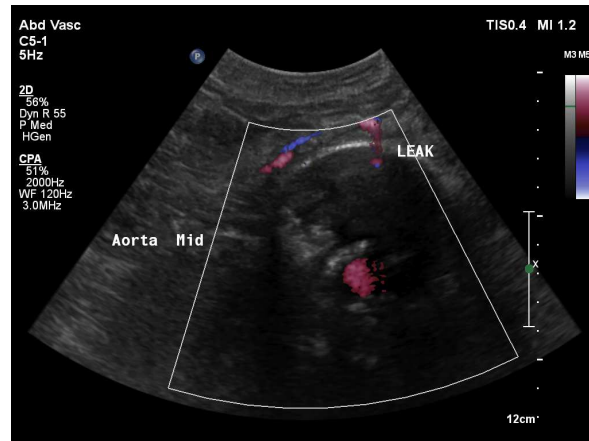


Growth of aneurysm sac to max diameter of 6.3 cm. Endoleak visualized in the anterior portion of the sac.

Case 1

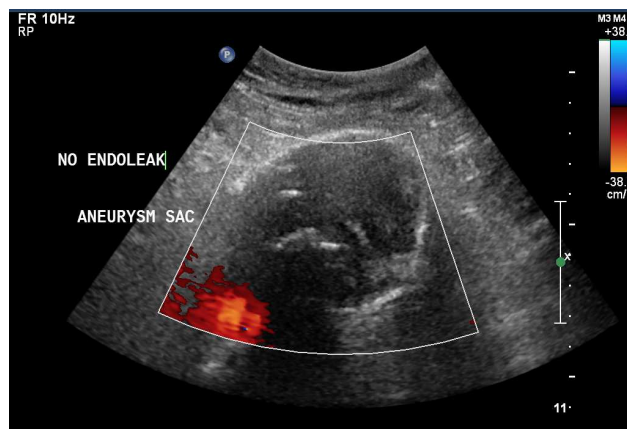
- Patient is taken to the OR for intervention. Despite multiple angiograms, no endoleak is visualized.
- The patient then undergoes relining of his EVAR due to his significant aneurysm growth.
- Initial postoperative CTA shows no endoleak.

Follow-up duplex US



IMA resulting in persistent type 2 endoleak.

Post-embolization duplex US



Taken to OR for coil embolization of IMA with resolution of endoleak and stabilization of the aneurysm sac.

Case 2

- 99M with CAD, CABG, prior EVAR (~5+ years ago but unknown per patient) with vague abdominal pain.

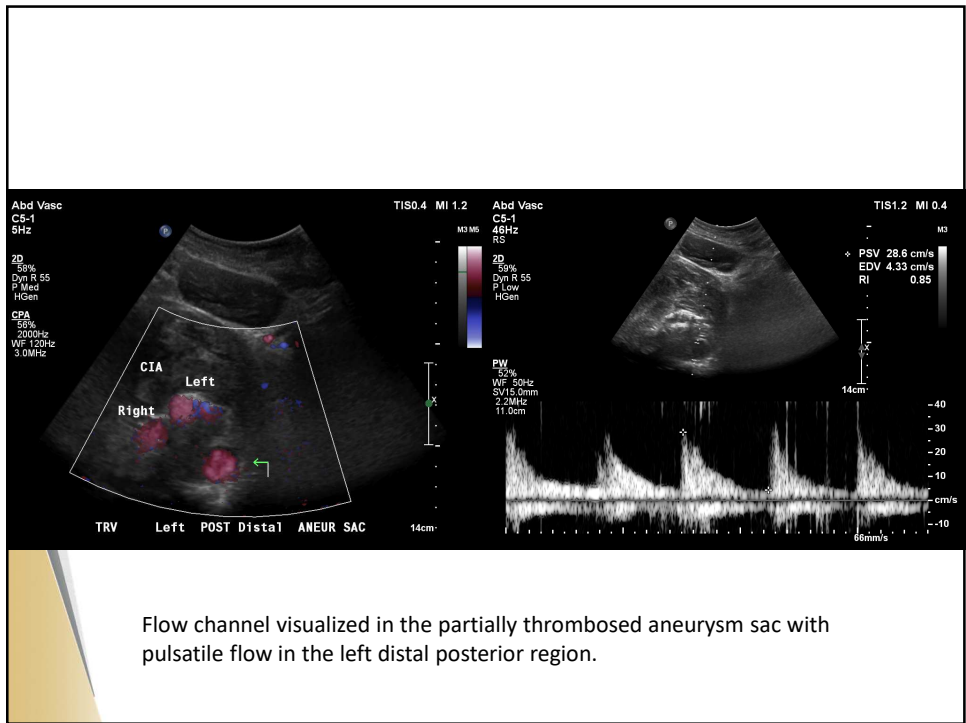
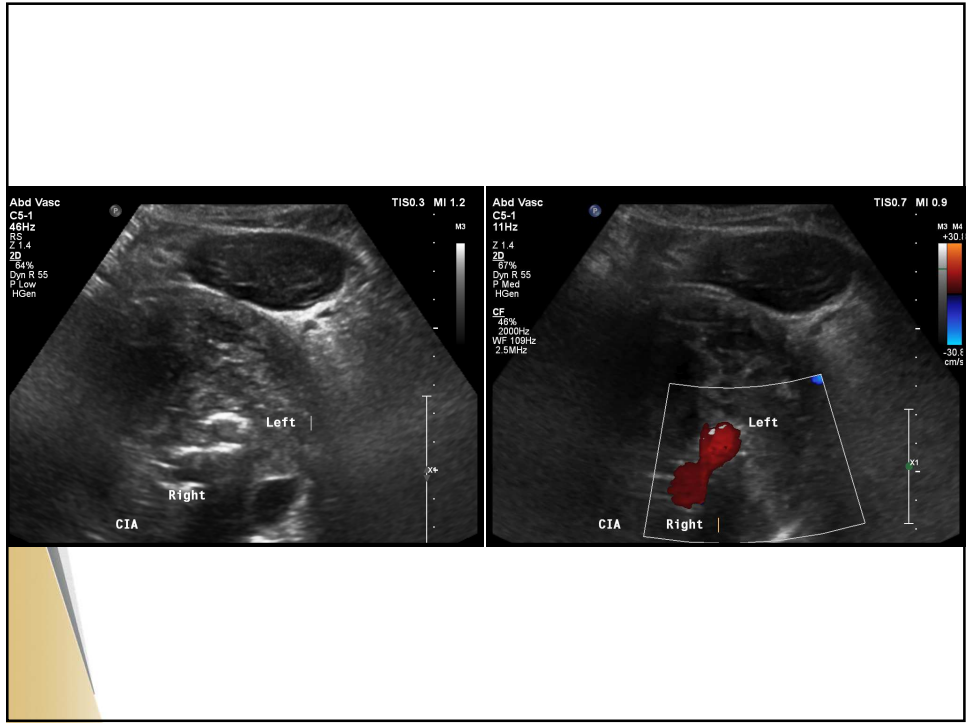
Duplex US images



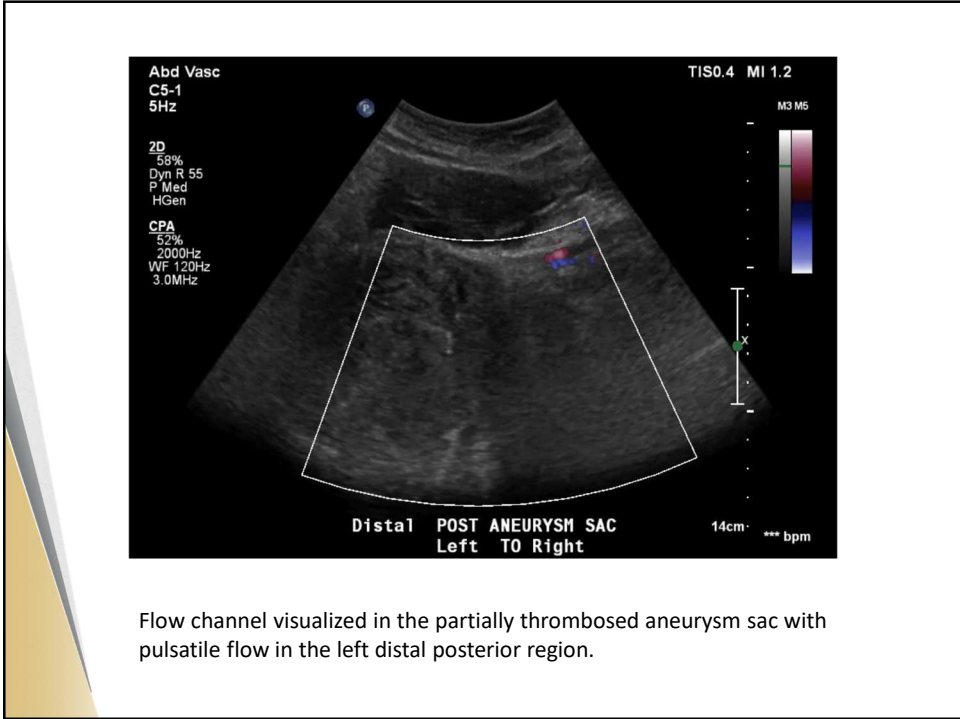
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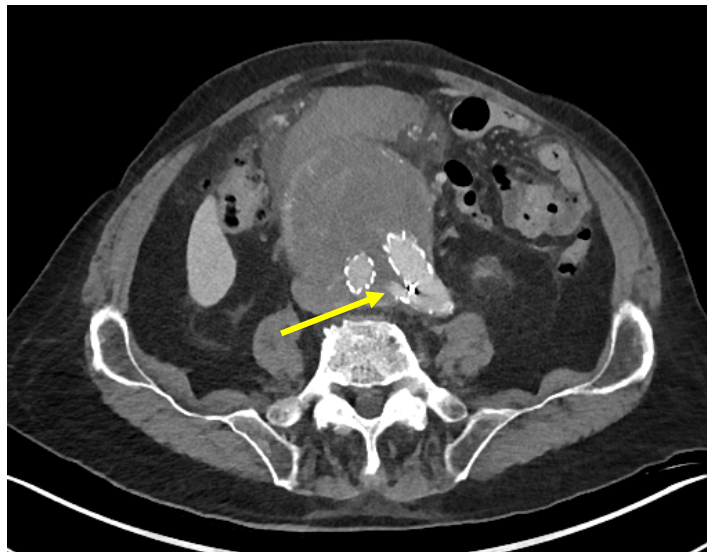
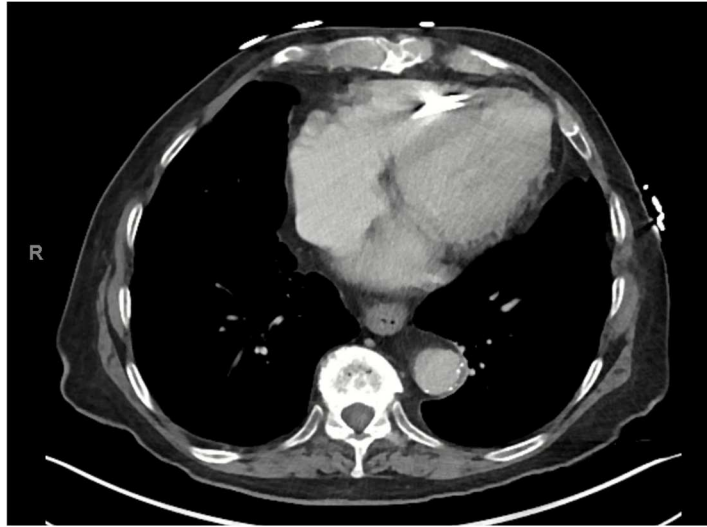


Flow channel visualized in the partially thrombosed aneurysm sac with pulsatile flow in the left distal posterior region.



Flow channel visualized in the partially thrombosed aneurysm sac with pulsatile flow in the left distal posterior region.

CTA images



Subsequent CTA demonstrates type 1B endoleak originating from the left iliac limb.

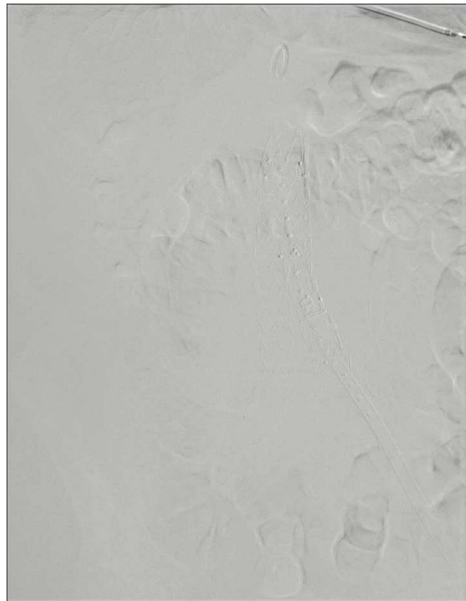
Intraoperative images



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Intraoperative angiogram confirming endoleak from left iliac limb. Extended limb to iliac bifurcation with resolution of endoleak.

1 month postoperative CTA



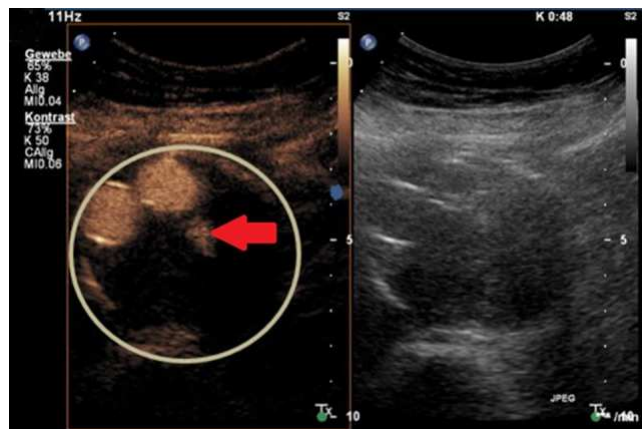
Contrast-enhanced US

- Uses microbubbles of gas that oscillate in response to ultrasound waves → echo
 - Off-label use per FDA for detection of endoleaks
 - Can cause allergic reactions, cardiac events
- Endoleak detection
 - Color duplex US: 82% sensitivity, 93% specificity¹
 - Contrast-enhanced US: 94% sensitivity, 95% specificity¹
 - Contrast-enhanced US non-inferior to gold standard CTA²

¹Abraham et al. Cochrane Database of Systematic Reviews 2017.

²Harky et al. J Ultrasound 2019; 22:65-75

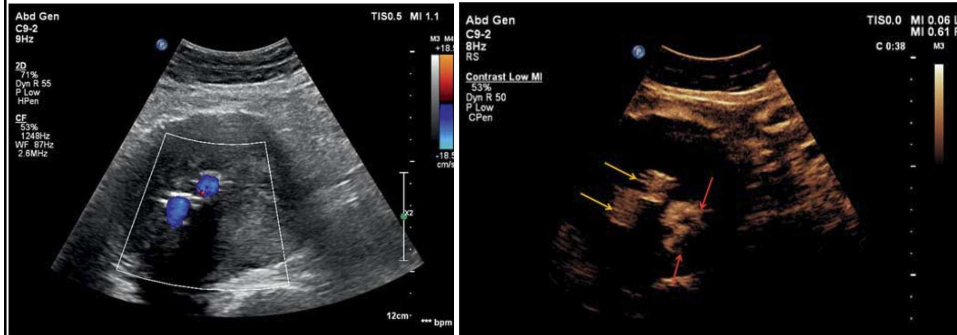
Contrast-enhanced US



Simultaneous contrast-enhanced conventional B-mode imaging of a type 2 endoleak from a lumbar artery.

Harky et al. J Ultrasound 2019; 22:65-75

Contrast-enhanced US



Contrast-enhanced and color duplex US of same patient, showing evidence of endoleak that was not visible on color Doppler.

De Figueiredo et al. Vasa 2018; 48:17-22.

Thank You!

Questions:

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