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Inferior vena cava thrombosis as a potential source of embolic stroke in a patient with a patent foramen ovale

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Introduction

Embolic stroke of undetermined source (ESUS) is defined as non-lacunar ischaemic stroke where other aetiologies have been excluded.(1) Patent foramen ovale (PFO) may contribute to ESUS through in situ or paradoxical embolisation. PFO closure in selected ESUS patients <60 years is associated with reduced recurrent stroke risk. (2, 3) We report a case of ESUS and PFO with spontaneous inferior vena cava (IVC) thrombosis.

Case

A 31-year-old female presented with twelve hours of headache and right-sided hemianopia. Past history included migraine but no cardiovascular risk factors. Physical examination confirmed a right homonymous hemianopia. Computed tomography imaging demonstrated an acute left occipital infarct with non-occlusive basilar artery thrombus, extending into the left proximal posterior cerebral artery (PCA) with left distal PCA occlusion. Endovascular clot retrieval was performed with successful proximal PCA reperfusion.

MRI brain demonstrated a left occipital infarct (Figure 1A). Echocardiography detected a PFO with large bidirectional shunt following intravenous injection with agitated saline during Valsalva (Figure 1B-D). Screening lower limb ultrasound was normal. There were no identifiable deep venous thrombosis (DVT) risk factors. Thrombophilia, antiphospholipid and autoimmune screens were normal. Although IVC imaging is not standard practice, clinical suspicion for occult DVT in this ESUS patient with a large bidirectional shunt PFO was high. An additional IVC Doppler ultrasound was performed and demonstrated a 20x10x15mm non-occlusive hyperechoic eccentric thrombus in the infrarenal inferior vena cava (IVC), suggestive of a chronic thrombus (Figure 1E). Anticoagulation with apixaban was commenced and PFO closure was delayed. A three-month follow-up ultrasound showed resolution of the IVC thrombus. PFO closure was successfully performed.

Discussion

This is, to our knowledge, the first reported case of spontaneous IVC thrombosis in a patient with ESUS and PFO. The proposed mechanism of stroke in patients with PFO is in-situ thrombosis embolism or paradoxical venous thromboembolism.

IVC thrombosis is rare, occurring in approximately 5% of autopsies following pulmonary emboli deaths(4) and is thought to share common risk factors with DVT. In ESUS patients <60 years with PFO, the prevalence of DVT is approximately 7% with MR venography of the pelvis and lower extremity doppler ultrasonography screening.(5) IVC doppler venous studies are not routinely performed in ESUS patients(1) and IVC thrombosis screening guidelines are not established. In patients with lower extremity DVT, IVC thrombosis screening is only recommended for those with high-risk anatomical features, severe post-thrombotic syndrome or IVC filter in-situ.(5)

Diagnosis of IVC thrombosis has consequences for patient management and carries higher morbidity and mortality than lower limb DVT,(6) yet limited evidence exists to guide IVC thrombosis investigation and treatment. In ESUS with PFO, IVC thrombosis detection prompts consideration of anticoagulation, risk of recurrent paradoxical embolic stroke and delay of PFO closure in selected patients due to the risk of iatrogenic thromboembolism during closure.

Conclusions

This is the first reported case of spontaneous IVC thrombosis in a patient with ESUS and PFO. Anticoagulation and procedural safety of transcatheter PFO closure required careful consideration in this setting. The presence of IVC thrombosis in the absence of other DVT in

our patient, identifies a gap in knowledge regarding IVC thrombus prevalence, risk factors and clinical significance in ESUS and PFO patients. Although DVT prevalence in ESUS patients with PFO is low, clinicians could consider screening patients planned for PFO closure as positive detection may alter management. Further studies are required to determine the cost-benefit and clinical utility of IVC thrombosis screening in this population.

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Figure 1. Imaging evidence of inferior vena cava thrombus and patent foramen ovale.

(A) MRI diffusion-weighted image (DWI) of the brain shows acute left occipital infarct. (B) Transoesophageal echocardiogram shows a patent foramen ovale. (C) Agitated saline "bubbles" entering the PFO. (D) "Bubbles" in the left atrium. (E) Ultrasound scan of the IVC demonstrates a 20x10x15mm non-occlusive hyperechoic eccentric infrarenal IVC thrombus.

RA (right atrium); LA (left atrium); IAS (interatrial septum); PFO (patent foramen ovale).

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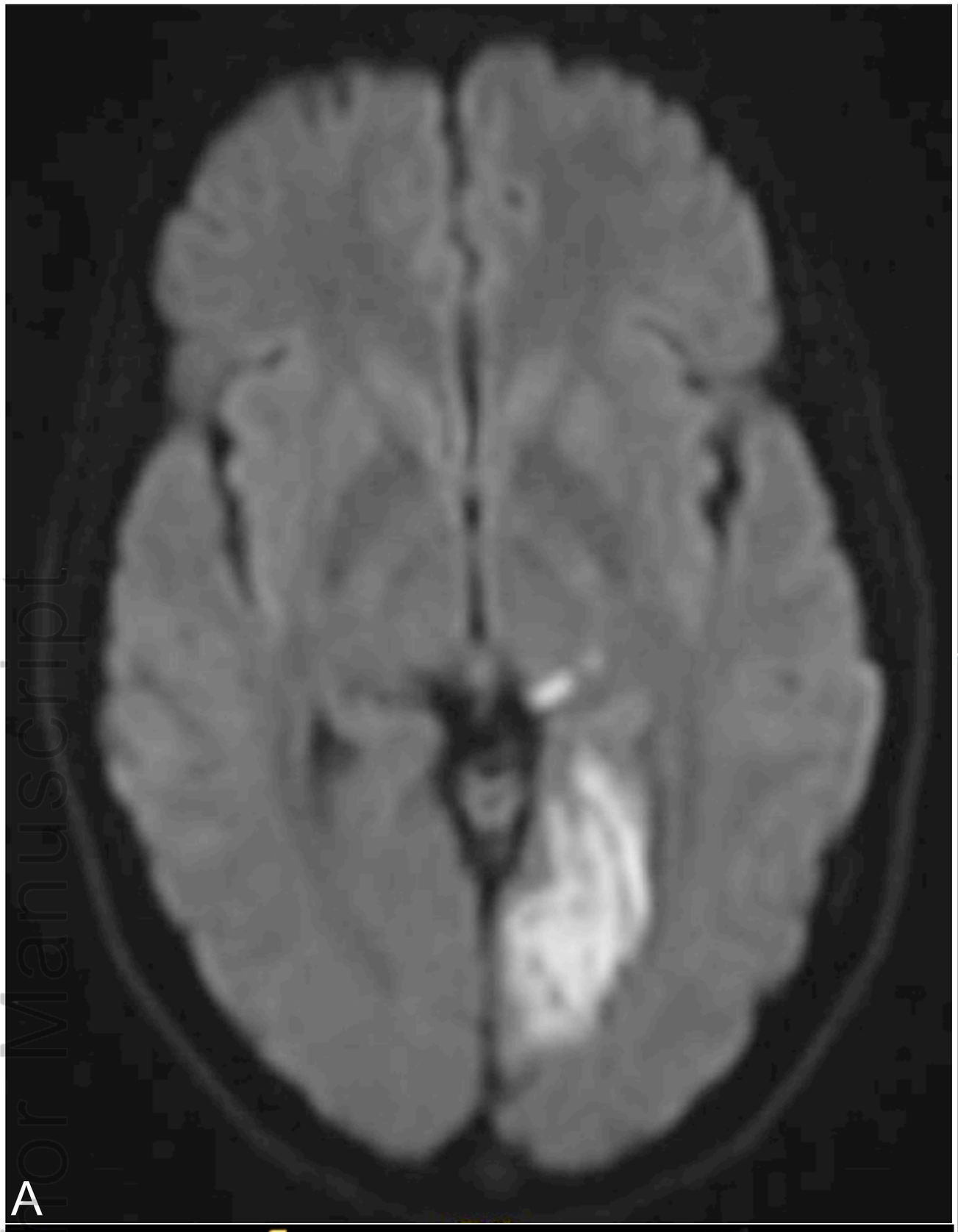
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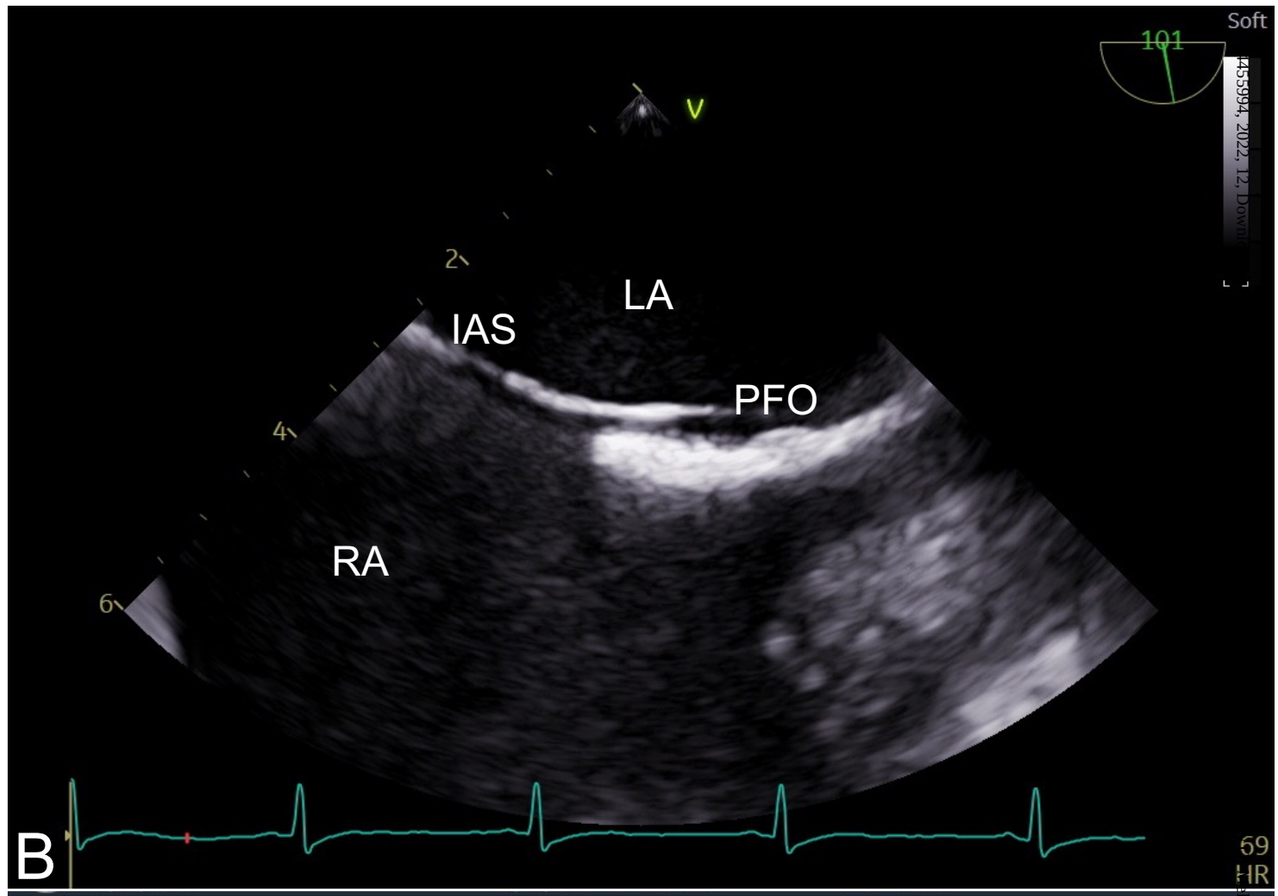
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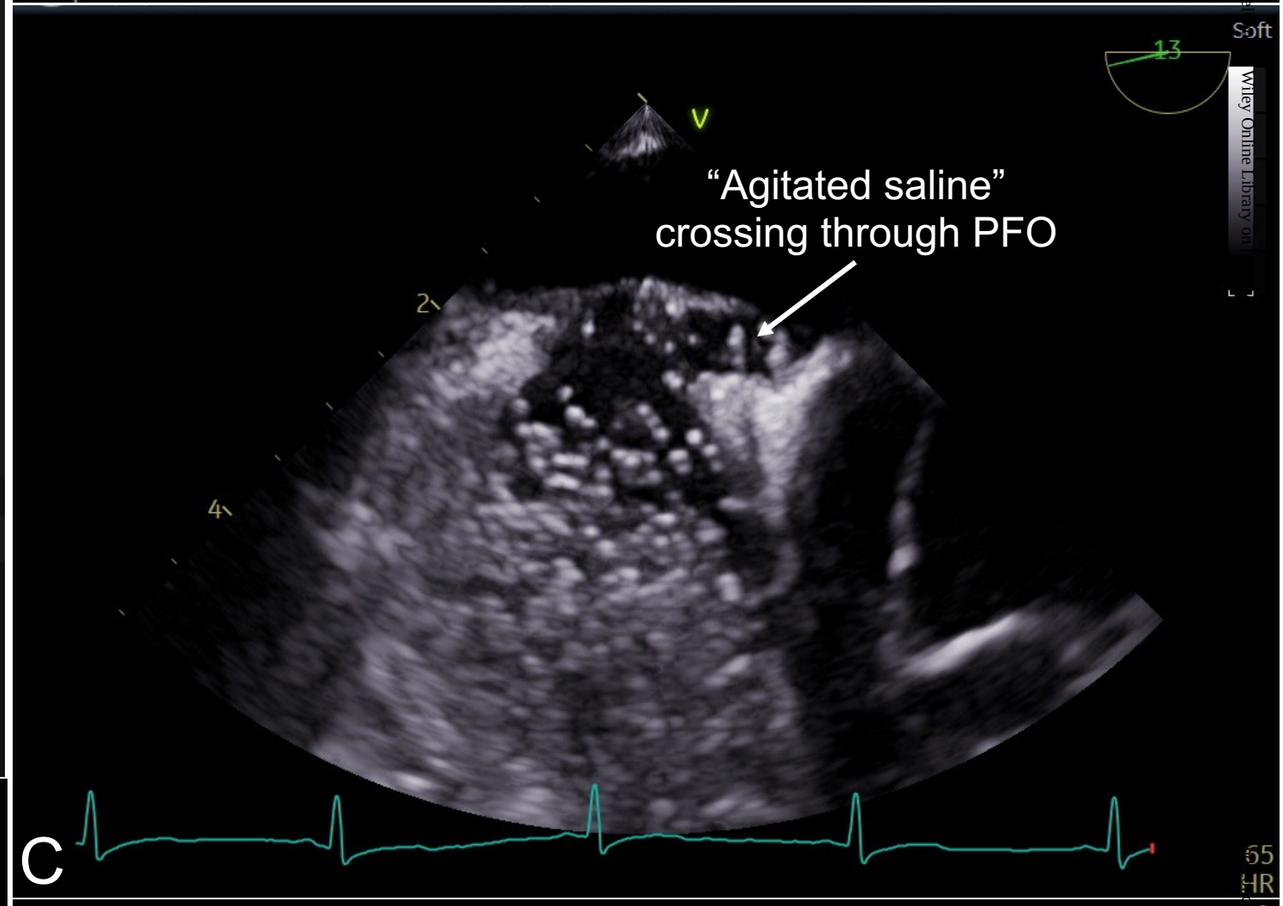
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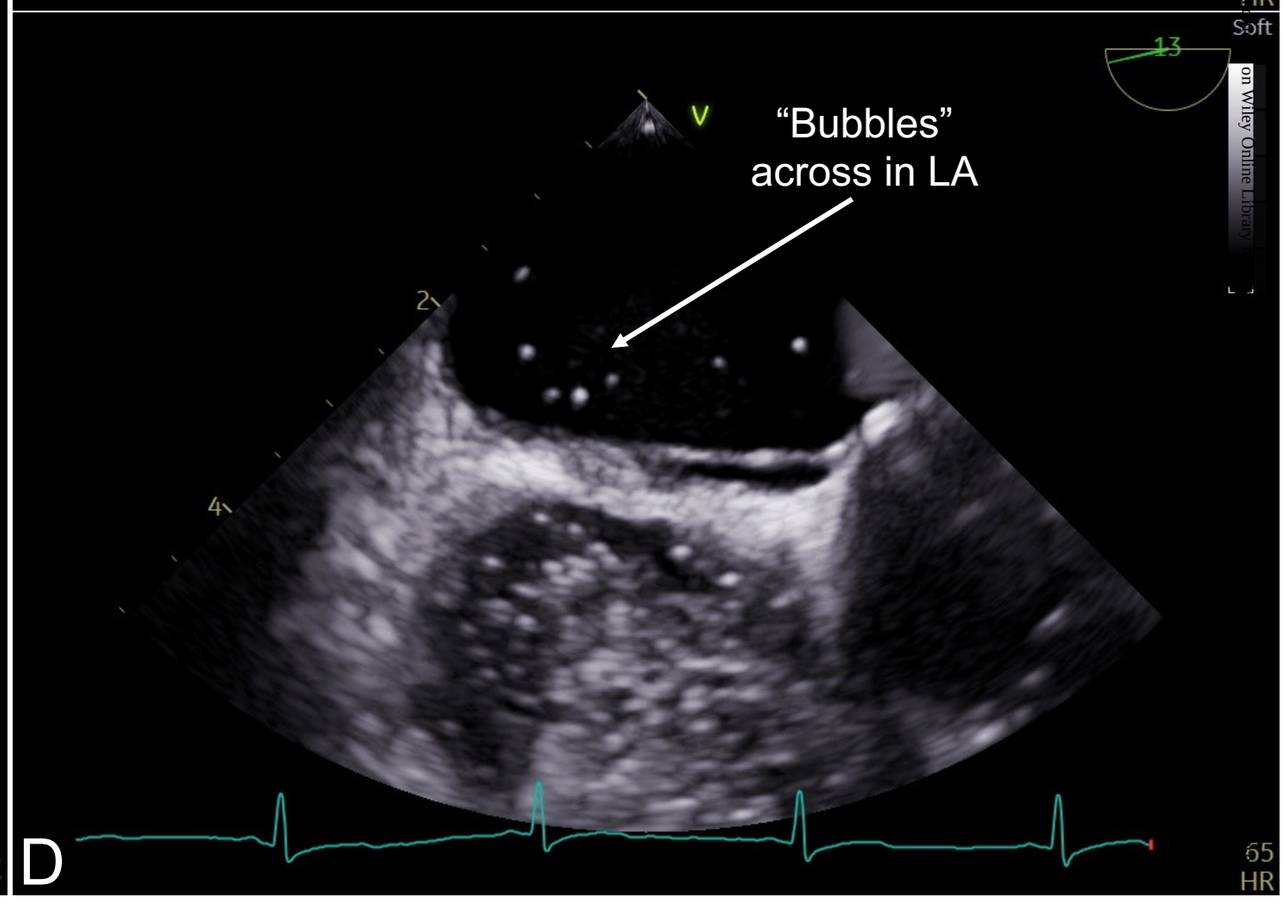
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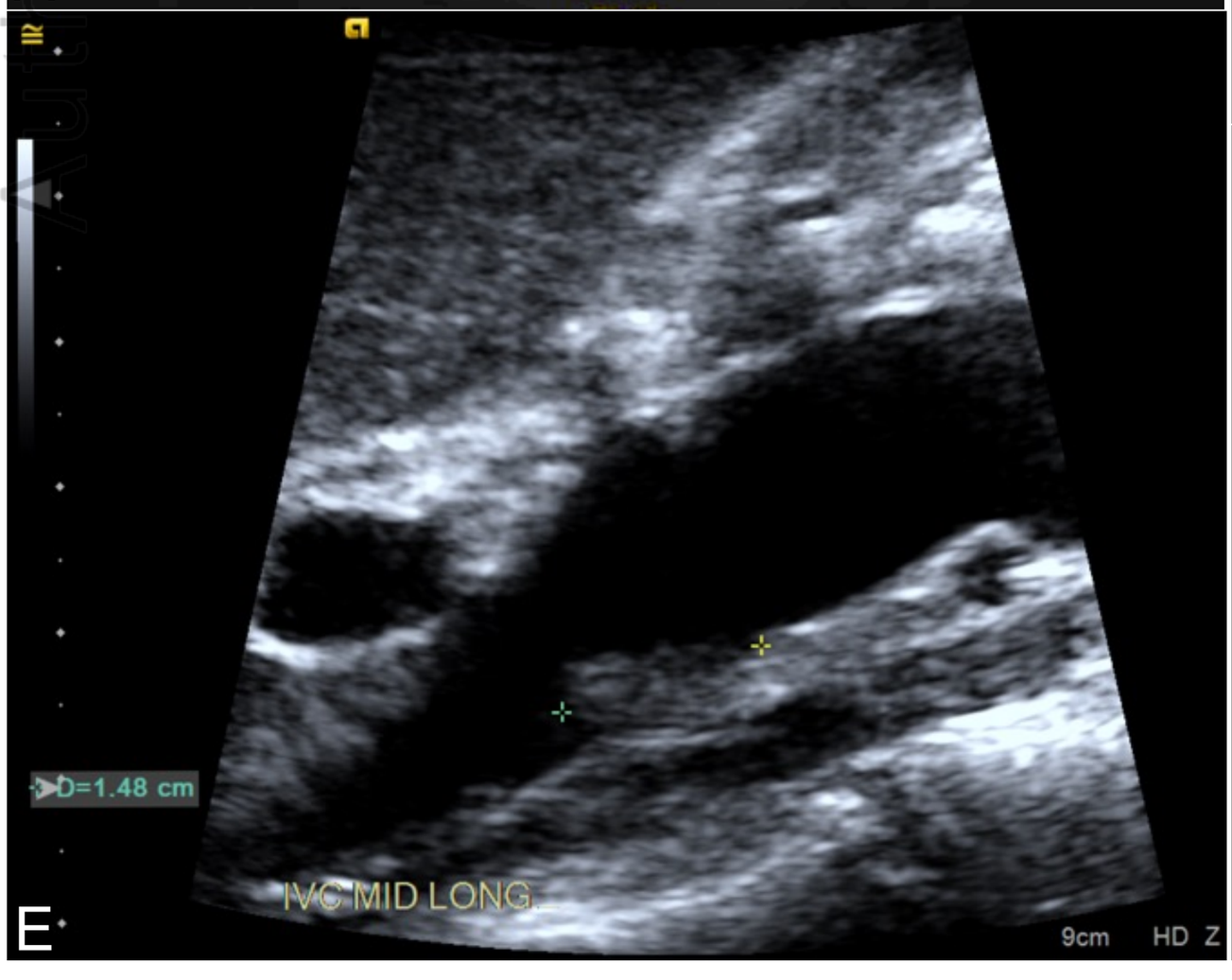
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Author contribution: L.S. and J.L. conceived of the report. L.W. wrote the first version of the manuscript. L.W, L.S, J.L, and S.P. provided images and created the figure. L.S, S.P, and S.S. were responsible for patient care. All authors contributed to revision of the final manuscript.

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