because of a lack of surgeon expertise with advanced techniques. However, I respectfully suggest that they missed the main purpose of our research question and the central message of our report.

An ongoing clinical dilemma is how aggressive one should be about retrieving asymptomatic IVCFs. To address that question, we described our findings after systematically following up patients whose filters had not been successfully removed.[1] We found that asymptomatic patients rarely developed new symptoms or filter-related complications during a median 2-year follow-up period. We are familiar with advanced retrieval techniques, such as endobronchial forceps, balloon venoplasty, and filter lasso. In an earlier study, we found that these techniques increased the success rate but also the procedure time and cost.[2] We also reported our algorithm for open removal of IVCF via mini-laparotomy.[3] With both percutaneous and open techniques, we agree that almost all IVCFs can be removed. Thus, we agree with Dr Desai that the effect of the dwell time on the IVCF retrieval rates can be ameliorated by using more aggressive techniques. The purpose of our research was to determine whether, in asymptomatic patients, the increase in success using more aggressive techniques is worth the increase in procedure time and costs. This question exemplifies one of the most profound responsibilities of being a surgeon. Just because one can perform a procedure, does that mean one always should?

During the course of the study period, our IVCF retrieval rates decreased from 89% to 84%, in part, from of this realization. After opening thousands of dollars' worth of devices and placing 18F and, sometimes, 22F sheaths in veins to remove stubborn filters in patients who were feeling fine and without convincing improvements in the outcomes data, we wondered whether we were more stubborn than the embedded filters. Are we using so-called advanced techniques for better patient outcomes or for bragging rights? Therefore, we disagree with Drs Desai and Labropoulos that "limited access or familiarity with advanced retrieval techniques" were the reason most filters were left in place. Until we have data to suggest otherwise, we are just not convinced that for these select asymptomatic patients the benefit of IVCF removal with extended procedures outweighs the costs, effort, and discomfort.

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Imaging subclavian vein thrombosis by duplex ultrasound: Getting it right

We were surprised to read Brownie et al[1] report a high (21%) false-negative rate for duplex ultrasound imaging of subclavian vein thrombosis and are concerned that this may reflect poor imaging technique rather than a problem with duplex ultrasound imaging itself. Only 31% of the vascular laboratories submitting examination findings to the study team were approved by the Intersocietal Accreditation Commission. Was there any attempt to agree on an imaging protocol used across all study sites? How did the authors standardize for experience of staff performing the duplex ultrasound examination?

In any robust duplex ultrasound protocol, subclavian vein waveform should be phasic, spontaneous, and respond to augmentation, and it should be compared with the contralateral side.[2] The likelihood of missing nonvisualized thrombus at the origin of the subclavian vein, under the clavicle, would be reduced by coupling waveform analysis with direct visualization. Brownie et al[1] reported that false-negative duplex ultrasound reports were associated with long segment of occluded subclavian vein. This may be because the technician is mistaking a collateral for the subclavian vein, an error that should be avoided if waveform analysis is compared with the contralateral vein.

The mean time between duplex ultrasound and venography was an extraordinary 48.9 days, with only 27% having both investigations within 48 hours. This could clearly introduce substantial errors.

When there is a high clinical suspicion of subclavian vein thrombosis (Wells score >2) and negative duplex ultrasound imaging, repeated duplex ultrasound 1 week later is advocated by the National Institute of Care and Health Excellence, which is reiterated in recommendation 1.2 of the Society for Vascular Surgery acute deep venous thrombosis guideline that advocates adjunctive computed tomography or magnetic resonance venography.[3,4] It is not clear whether the patients of Brownie et al ever underwent repeated duplex ultrasound a week later or why urgent computed tomography or magnetic resonance

venography was not arranged with a high clinical suspicion and negative duplex ultrasound imaging. It would be reasonable to expect nonvisualized deep venous thrombosis to propagate and to be visible on repeated duplex ultrasound imaging. By following National Institute of Health and Care Excellence guidelines, the authors should have achieved definitive imaging, even if this involves venography, within 1 week rather than 7.

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Reply

We appreciate the letter by Rogers and colleagues regarding our recent article.[1] The authors express concern that the high false-negative rate (21%) for duplex ultrasound imaging in the initial diagnosis of subclavian vein (SCV) thrombosis may have reflected poor imaging techniques rather than inherent limitations of duplex ultrasound imaging. It is necessary to reiterate that our study was a retrospective analysis of 214 patients with venographically proven SCV thrombosis due to venous thoracic outlet syndrome (TOS) who had undergone duplex ultrasound imaging as the initial diagnostic study on clinical presentation, rather than a prospective screening study in which we oversaw or standardized the conduct of duplex ultrasound imaging. This was therefore a study of real-world results and consequences for patients with suspected primary SCV thrombosis, comparing those who had had positive vs false-negative duplex ultrasound findings based on the way that ultrasound is used across diverse clinical settings.

Rogers and colleagues correctly point out that duplex ultrasound protocols to detect SCV thrombosis should include waveform analysis along with attempted visualization of the SCV (to which we would add arm-elevated positional maneuvers). Although we agree that these techniques can optimize diagnostic accuracy, there are still intrinsic technical limitations with ultrasound imaging of the central SCV and several pitfalls in the way that such studies are interpreted, reported, and acted on.[2] Importantly, a duplex ultrasound examination with findings positive for SCV thrombosis will typically prompt anticoagulation treatment, venography, catheter-directed thrombolysis, and subsequent surgical management for venous TOS.[3-7] Our study shows that diagnostic delay associated with a false-negative duplex ultrasound finding is linked with thrombus progression, chronic long-segment SCV occlusion, and more challenging surgical treatment.

The authors suggest that negative duplex ultrasound imaging should be followed by a repeated study 1 week later, based on clinical guidelines developed for lower extremity (iliofemoral) deep venous thrombosis.[8,9] Given that the pathophysiology, anatomy, and clinical management of SCV thrombosis and venous TOS are different from those of iliofemoral deep venous thrombosis, these guidelines cannot be extrapolated with confidence to the upper extremity.[3-7] Indeed, implicit in this