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# Post-carotid stent ultrasound provides critical data to avoid rare but serious complications

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## KEYWORDS

Stroke;  
Carotid ultrasound;  
Carotid stenting

**Summary** Carotid stenting is a common procedure for revascularization of carotid artery stenosis. In this study, we evaluated the role of carotid ultrasound post carotid stenting. In a retrospective analysis, we identified 45 patients who received post-stent ultrasound. On routine follow-up we measured a range for peak systolic velocity of 33–150 cm/s and end diastolic velocity 11–52 cm/s. We also identified two cases, where immediate post-stent ultrasound provided critical data that required further intervention, and potentially avoided serious complications.

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## Introduction

Carotid stenting is an accepted form of revascularization in the US and many countries based on the recent results of the CREST trial [1]. The choice of follow-up imaging remains variable for post-stent patients and some patients receiving no post-stent imaging. Ultrasound imaging is a cost effective and simple way to evaluate immediate post-stent patients.

## Methods

We retrospectively reviewed a database for a 2 year period from 2008 to 2010 for patients who had significant carotid stenosis and underwent carotid stenting, and post-stent carotid ultrasound exam. In stent velocities were measured with a General Electric LOGIQ E9 (Milwaukee, WI) with 9 MHz linear probe that was used to evaluate the post stent carotid artery.

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## Results

Forty-five patients (age between 43 and 75 years) were identified, who received post stent ultrasound. We found a mean peak systolic velocity of 83 cm/s and a mean end diastolic velocity of 24 cm/s in this population, with a range peak systolic velocity 33–150 cm/s and end diastolic velocity 11–52 cm/s.

Out of 45, we found 2 cases of immediate complications of stent placement.

## Discussion

**Case 1:** A 77-year-old woman with no focal neurological deficits underwent elective right carotid stenting at an outside institution. Post stent, she complained of neck pain and was lethargic with fluctuating left side weakness. She was transferred to our facility and was found with low flow in the recently stented vessel (**Fig. 1**). The stent appeared to be patent and fully deployed, but on follow-up angiogram was found to be in the dissected false lumen of

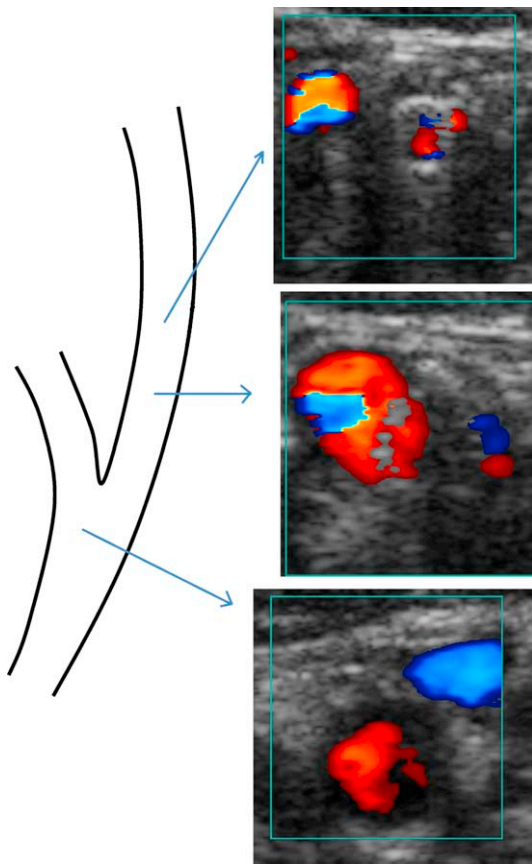


Figure 1 Post Carotid ultrasound. Flow in the right carotid artery did not appear centered in the vessel lumen.

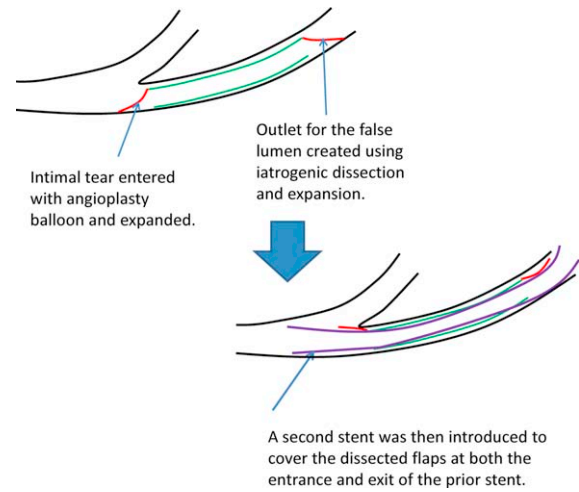


Figure 3 Plan for repair. This treatment approach was used for repair of the stent in the false lumen.

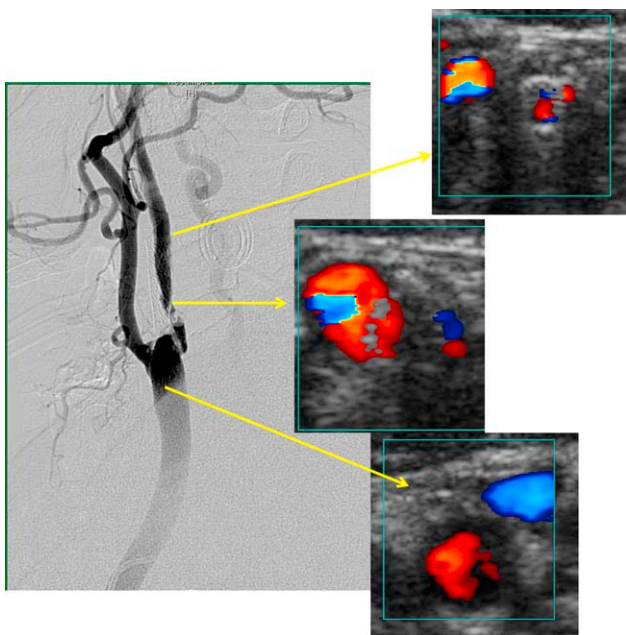


Figure 2 Dissected lumen. The angiogram confirmed that the stent was deployed into a dissected false lumen.

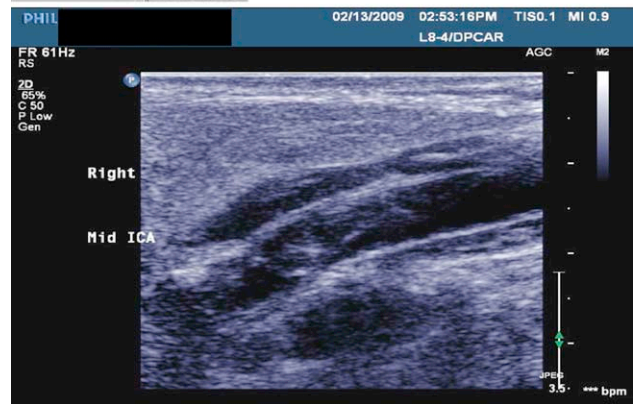
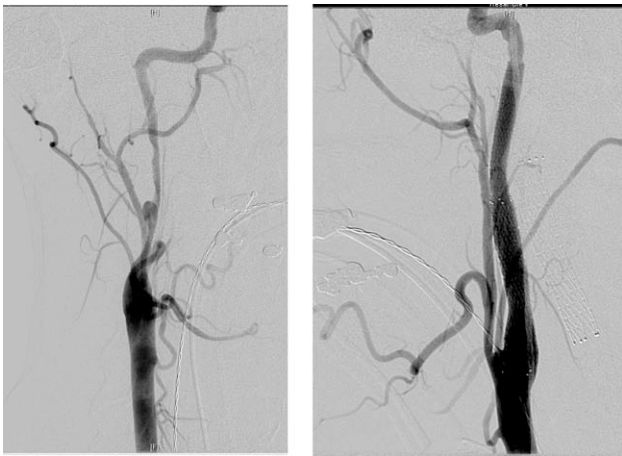


Figure 4 Initial angiogram and post stent ultrasound. The untreated right mid internal carotid artery appeared normal on the routine angiogram, but the post stent ultrasound showed an obvious lumen irregularity.

the carotid (Fig. 2). This was subsequently corrected with no adverse events (Fig. 3).

Case 2: A 40-year-old woman with recent motor vehicle accident and carotid dissection underwent successful stenting of the affected left carotid artery. On her follow-up ultrasound, the stented carotid was normal, but the contralateral (untreated) carotid artery was found to have a new flow-limiting dissection with clot (Fig. 4). This abnormality was not apparent on the initial angiogram during



**Figure 5** Angiogram and stent. The second angiogram showed an obvious dissection and it was corrected with a second stent.

its injection (Fig. 4). A second angiogram was performed and the dissection was easily identified, and this vessel was also stented subsequently without any adverse events (Fig. 5).

## Conclusion

In all patients, post stent ultrasound provides a baseline study for future follow-up. In rare cases, post stent ultrasound can identify potentially serious complications. In our study 2 out of 45 patients (4.4%) were found with a significant abnormality post stenting that could have led to cerebral ischemia. Interestingly, in the CREST study, 4.4% of post stent patients suffered stroke or death. We suggest that post carotid stent ultrasound may yield potentially valuable findings to reduce the risk of imminent stroke.

## Reference

- [1] Brott TG, Hobson RW, Howard G, Roubin GS, Clark WM, Brooks W, et al. Stenting versus endarterectomy for treatment of carotid-artery stenosis. *N Engl J Med* 2010;363:11–23.