

# Cath Lab Digest

A product, news & clinical update for the cardiac catheterization laboratory specialist

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## EDUCATIONAL PROGRAMS

### The Weber State University Cardiac Specialist Program

*“The expertise our graduates provide is uncommon in cath labs yet vital for modern practice,” says Christopher Steelman, MS, RT(R) (CI) (ARRT), RCIS, FACVP, AACC, Associate Professor of Radiologic Sciences at Weber State University and Founding Director of the Cardiac Specialist Program, Ogden, Utah.*

#### Can you share an overview of your institution and program?

The Weber State University School of Radiologic Sciences began in 1966, celebrated its 50th anniversary in 2016, and is 59 years old in 2025. The Cardiac Specialist Program launched in fall 2020. Since then, it has continuously refined its curriculum and strengthened clinical partnerships to stay at the forefront of interventional cardiology. The program has attracted students with a broad range of experience from across the country and around the world.

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## SIRP 2025

### Q&A With Dr. Robert Foster: Shining a Light on Radiation Safety

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## PERIPHERAL IMAGING

### Roadmap Imaging in the Endovascular Treatment of Complex Peripheral Vascular Disease

Ivana Kumar; Anshita Kumari, MBBS; Kusum Lata, MD, FACC, FSCAI



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## CASE STUDY

### When the Guard Gets You With Friendly Fire: Filter Choking and De-Choking During High Plaque Burden Carotid Artery Stenting

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# When the Guard Gets You With Friendly Fire: Filter Choking and De-Choking During High Plaque Burden Carotid Artery Stenting

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## ABSTRACT

**Background:** Carotid artery stenosis is a prevalent vascular condition that increases the risk of stroke, particularly in patients with multivessel coronary artery disease. In those undergoing coronary artery bypass grafting (CABG), significant carotid disease elevates cerebrovascular risk and complicates management. Carotid artery stenting is a viable alternative to endarterectomy, provided the operator is proficient in technique and complication management.

**Case Presentation:** A 70-year-old hypertensive male with NSTEMI underwent coronary angiography, revealing triple-vessel disease sparing the left main. During pre-CABG workup, he was found to have a prior transient ischemic attack and a 95% stenosis of the right internal carotid artery. The heart team recommended carotid revascularization prior to surgery due to intermediate coronary risk and neurological history.

**Procedural Complication and Management:** Right carotid access was obtained with a 7F multipurpose guide. A FilterWire EZ was deployed distally, followed by placement of a 6 mm × 40 mm self-expanding stent at the internal carotid ostium. Post-deployment angiography revealed no distal flow, despite correct stent position and no thrombus or dissection, suggesting filter occlusion from embolic debris. The patient developed transient neurologic symptoms. Airway support was initiated, and an Export catheter was used for aspiration. Intra-arterial nitrate and tirofiban restored flow and resolved symptoms. Post-dilation with a 4.5 mm non-compliant balloon yielded excellent final angiographic results.

**Conclusion:** Carotid stenting remains a safe, effective alternative to endarterectomy. Although complications are rare, operator vigilance and readiness for prompt management are essential to procedural success.

Cerebrovascular disease is a leading cause of death and a leading cause of permanent neurological damage and physical disability. A significant atherosclerotic lesion of the internal carotid artery is a risk factor for stroke, accounting for 10–20% of all ischemic strokes or transient ischemic attacks (TIA).<sup>1</sup> Symptomatic carotid artery disease is defined as the presence of cerebral symptoms associated with ipsilateral carotid lesions. The presence of concomitant carotid vascular disease can be a confounding factor in patients with complex coronary arterial disease undergoing coronary artery bypass graft surgery (CABG). Carotid artery stenting

(CAS) has emerged as an alternative option to carotid endarterectomy (CEA), and has gained in use due to its minimally invasive nature and potential advantages in high-risk patients.<sup>2,3</sup> The goal of carotid intervention is to prevent stroke.

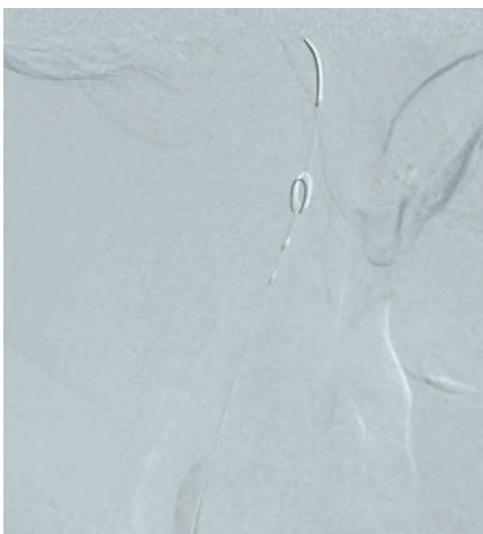
## Case Presentation

A 70-year-old hypertensive male presented with non-ST elevation myocardial infarction. Electrocardiogram showed ST depression. A complete blood count, complete blood chemistry, and PT/INR were in normal range. Lipid profile showed an LDL level of 147 mg/dl, triglycerides of

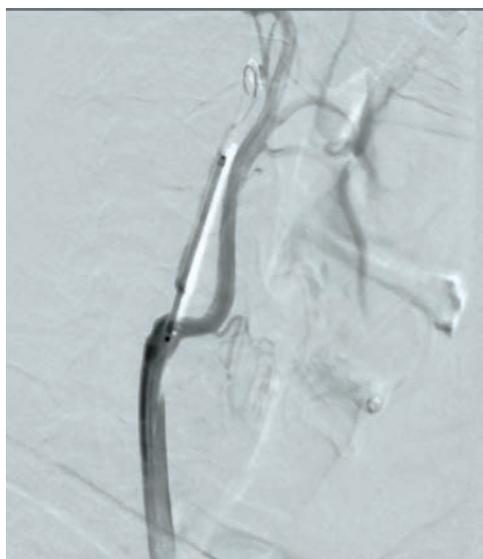


**Figure 1.** Severe stenosis at the ostium of right internal carotid artery (ICA) with no calcification.

260 mg/dl, and HDL of 33 mg/dl. Coronary angiography showed triple-vessel coronary artery disease, sparing the left main stem. The patient was advised to undergo CABG surgery. During the surgical work-up, he was found to have a history of a TIA 3 months prior involving the left side of the body. Carotid Doppler showed a severe 95% ostial stenosis due to mixed plaque in the right internal carotid artery (RICA) and a mild stenosis causing 20% luminal narrowing in the left internal carotid artery. CT brain plain showed no infarction or hemorrhage. A carotid angiography and cerebral DSA showed severe stenosis at the ostium of RICA with no calcification (Figure 1). For the left ICA, both external carotid and vertebral arteries were normal. Cerebral digital subtraction angiography (DSA) showed normal intracranial circulation. A multidisciplinary approach, with a heart team including neurologists, cardiovascular surgeons, and an interventional cardiologist was adopted for this patient during the complete workup. The heart team recommended carotid revascularization prior to surgical coronary revascularization, as the patient was asymptomatic and at an intermediate risk from a coronary viewpoint. After a discussion with the patient and his family about the management options, advantages, and risks, a combined decision for CAS was made, due to its less-invasive nature as compared to CEA.



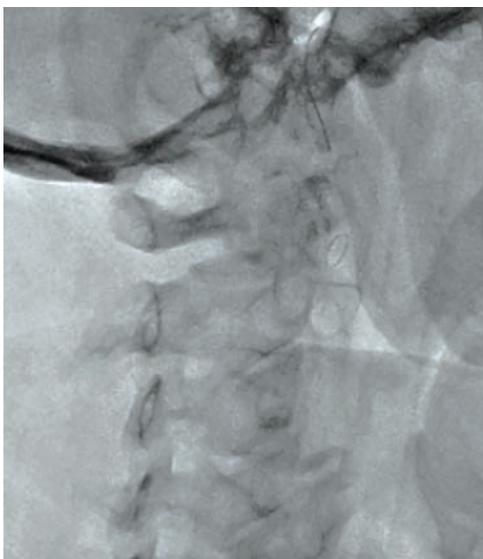
**Figure 2.** Advancement of a FilterWire EZ (Boston Scientific) across the ostial internal carotid artery stenosis, with deployment in the distal part of the extracranial ICA.



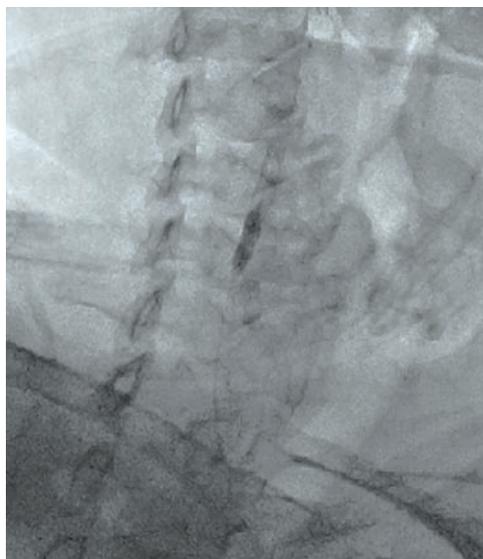
**Figure 3.** A 6 mm x 40 mm self-expanding stent deployed at the right ICA ostium.



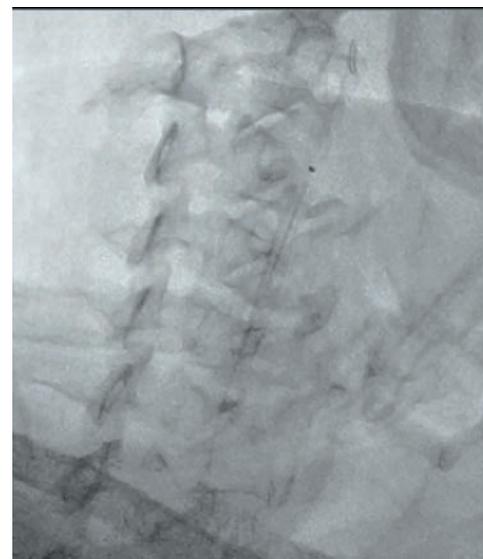
**Figure 4.** Post stent placement, zero flow into the distal right ICA.



**Figure 5.** A 6 French Export catheter (Medtronic) suctioned debris from the distal ICA.



**Figure 6.** Proximal stent half remaining under-expanded was post dilated with a 4.5 mm noncompliant balloon at 12 atmospheres.



**Figure 7.** Post dilatation, good stent expansion and adequate distal flow.

## Procedure

Following aseptic measures and under local anesthesia, a 7 French (Fr) right femoral access was obtained using a routine-length sheath. An .035-inch J-tip guide wire was then parked at the right common carotid artery (RCCA) using a 5 Fr Judkins right catheter, exchanged by a 7 Fr multipurpose guide. This was followed by advancement of a FilterWire EZ (Boston Scientific) across the ostial internal carotid artery stenosis, and deployed in the distal part of the

extracranial ICA (Figure 2). After deployment of the FilterWire EZ, a direct stenting strategy was adopted to minimize thromboembolization. A 6 mm x 40 mm self-expanding stent was deployed at the RICA ostium (Figure 3). To our surprise, the view after stent placement showed zero flow into the distal RICA. (Figure 4) The reason appeared to be choking of the filter due to thromboembolization. The filter appeared to be overwhelmed by the volume of the debris captured. A 6 Fr Export catheter (Medtronic)

was employed to suction debris from the distal ICA (Figure 5). We also administered pharmacotherapy using intra-arterial nitrate boluses and a weight-based tirofiban bolus. After these measures, there was fair flow into the distal ICA. During the period of no flow, the patient had transient hemispheric ischemic signs and an oropharyngeal airway was required, but his vitals remained stable. These symptoms rapidly resolved after establishment of ICA flow. After establishing blood flow, the proximal half of the



**Figure 8A.** Post DSA, excellent flow into the distal carotid.

stent that remained under-expanded was post dilated using a 4.5 mm noncompliant balloon at 12 atmospheres (Figure 6). Post dilatation, the angiographic view demonstrated good stent expansion and adequate distal flow (Figure 7). The distal protection device was then successfully removed using its retrieval sheath. The final DSA angiogram revealed excellent flow into the distal carotid (Figure 8A) and intracranial vasculature (Figure 8B), confirming no intracranial embolization. The guide was then safely removed over the .035-inch guide wire.

The patient tolerated the procedure well and was shifted to the cardiac care unit, where he remained stable, albeit with some irritability, but without any neurological deficit. After 24 hours of observation, he became fully oriented, the irritability was no longer present, and he was mobilized. The patient was started on dual antiplatelet therapy (DAPT), comprised of aspirin 75 mg once daily and clopidogrel 75 mg once daily. No additional medications were administered during the procedure. He was discharged the next day. The patient was evaluated on follow-up at one week and 6 weeks for neurological impairment and medication adherence, along with carotid ultrasound. The follow-up was uneventful, without any adverse or unanticipated event such as access-site complications, stroke, TIA, hemorrhage, hematoma, artery dissection, allergic reaction, restenosis, or device-related complications. After 6 weeks, he was referred to the surgeon for bypass surgery.



**Figure 8B.** Post DSA, intracranial vasculature.

The patient continued his DAPT regimen for a duration of 12 months.\* Following this period, he transitioned to single antiplatelet therapy. On subsequent follow-up, he has remained clinically stable and is doing well.

### Discussion

There are multiple therapeutic intervention modalities for management of carotid stenosis. Since 2000, large-scale studies have taken place comparing CAS versus CEA, including the SAPHIRE, EVA-3S, SPACE, ICSS, and CREST trials.<sup>4-8</sup> Carotid vascular disease is not uncommon in patients with multivessel coronary artery disease. The surgical management of coronary artery disease can be confounded in patients with significant carotid vascular disease. CEA carries a high mortality when combined with CABG during the same procedure.<sup>9</sup> CEA before CABG puts the patients at a higher risk of myocardial infarction, while CABG before CEA potentially increases the incidence of stroke.<sup>9</sup> Revascularization by CAS immediately followed by CABG in high surgical-risk patients is a feasible and promising therapeutic strategy.<sup>9,10</sup> In these patients, carotid stenting can be a safe and valuable therapeutic option. Distal protection is strongly indicated (class IIa)<sup>11</sup> while performing CAS. A meta-analysis of 24 studies reported that embolic protection device use was related to approximately a 41% decrease in embolic stroke occurrence (relative risk 0.59;  $P < .001$ ).<sup>12</sup> The distal protection device captures the debris that breaks away while intervening in

the diseased plaque, preventing embolization into brain circulation. Rarely, the debris can be overwhelming, choking the distal protection device and paradoxically leading to zero flow into ipsilateral hemisphere. Filter choking can be catastrophic if not immediately addressed. After identifying this complication in our case, the use of an Export aspiration catheter effectively lowered the burden of debris in the distal ICA. Of note, a literature search of Medline/PubMed did not find any case report over the past decade that described this complication.

### Conclusion

Complications during carotid intervention are uncommon, but one should know and be prepared to handle a complication should one occur. Herein, we have described a rare case of distal embolic protection filter choking and de-choking while performing carotid artery stenting. The case was managed safely and successfully, and the patient went home without any neurological deficit. ■

\*The DAPT regimen after carotid stenting in this case included: (1) aspirin 75mg once a day, which the patient was already taking before the procedure. It was continued without interruption until the last follow-up; (2) Clopidogrel 75mg once a day, which the patient took the day before carotid stenting and then continued post procedure for next 5 weeks and 2 days. Clopidogrel was then held for a period of 5 days, pre-CABG, and continued post CABG for 12 months.

References are available with the article by Anjum et al online:



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