Cracking Carotid Calcification:
Intravascular Use of Shockwave Lithotripsy

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Introduction

Carotid artery atherosclerotic disease and stenosis is a risk factor for development of transient ischemic attack and stroke. Calcific lesions present several challenges to percutaneous intervention including difficulty crossing the lesion, reduced stent apposition and expansion, increased rates of restenosis, as well as artery dissection. Intravascular lithotripsy (IVL) is an emerging technology used to treat calcifications, with previous studies demonstrating efficacy in both peripheral vascular disease and coronary artery disease, though there is currently little literature surrounding the use of IVL in the carotid arteries.

Case Description

- 79 year-old female
- PMH: seizures, multiple CVAs, CAD, CHF, TAA, Afib, suspected cerebral amyloidosis
- Presents with episodic tremulousness, facial droop, and altered mental status
- Referred to vascular surgery for bilateral carotid artery stenosis
- Team suspects recurrent TIAs, and opts for plan attempting to maximize neuroprotection. Timeline of management procedures:
  1. Right transcarotid artery revascularization (TCAR)
  2. Left TCAR
  3. Revision of Right TCAR

Management of Stenosed Right Carotid Artery

Figure 1: Intraoperative angiograms taken during initial TCAR procedure of the right carotid artery. Left: Angiogram performed prior to revascularization. Right: Angiogram taken post-revascularization demonstrating improved flow through the common carotid artery.

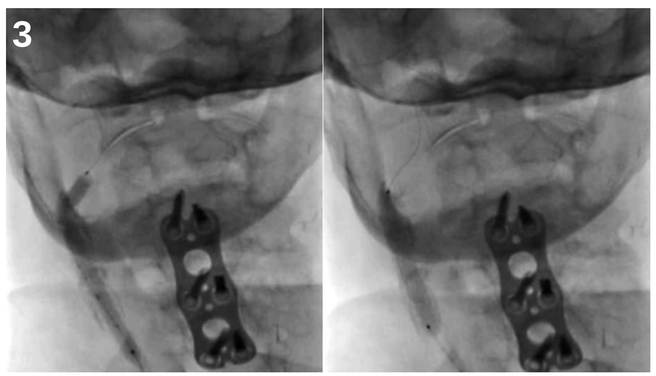

Figure 3: Intraoperative images captured during revascularization of the collapsed right carotid artery stent. Left: IVL was used to pre-dilate the lesion by use of a Shockwave Balloon. Right: Subsequent angioplasty was performed with inflation of a Chocolate balloon, which uses a scaffold to sequentially inflate and minimize risk of complications in a heavily calcified lesion.

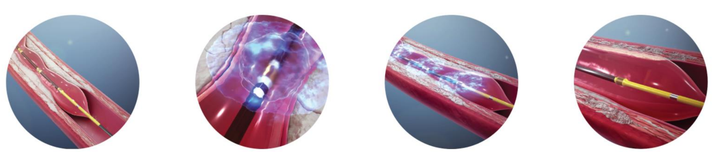

Figure 2: Three months following R TCAR, patient underwent L TCAR. Ten days after that procedure, she experienced a new episode of tremulousness. Left: CT angiogram taken prior to initial R TCAR. Right: CT angiogram at three months demonstrating significant calcifications compressing the previously placed stent to a diameter of less than 1 mm.

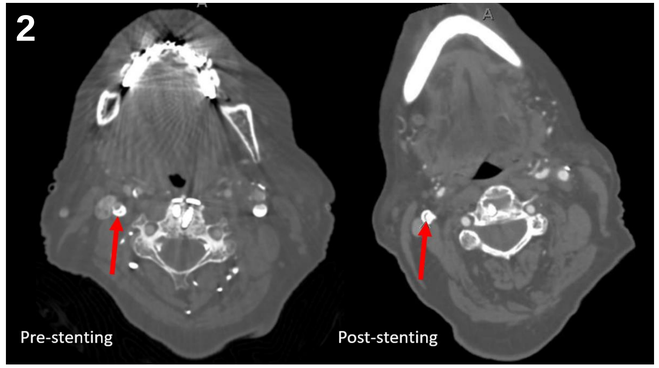

Figure 4: Intraoperative operative angiograms captured during revascularization of the collapsed R carotid artery stent. Left: Angiogram taken prior to revascularization demonstrating limited blood flow across the collapsed stent. Right: Angiogram captured following Shockwave lithotripsy and Chocolate balloon inflation demonstrating improved blood flow across the previously placed stent. Post-operative carotid ultrasound at four weeks demonstrated sustained patency.

Figure 5: Shockwave Balloon intravascular lithotripsy. The balloon is passed on a guidewire across the lesion. An electrical discharge vaporizes fluid in the balloon, emitting sonic waves that travel through soft tissue and selectively break up calcifications.

Intravascular Lithotripsy Studies

- DISRUPT PAD I-II[1,2]
  - 35 patients, 60 patients respectively
  - Demonstrated safety and efficacy of IVL in complex femoropopliteal lesions
- DISRUPT PAD III[3]
  - 200 patients
  - “Real world use,” equally effective outcomes
- DISRUPT CAD[4]
  - 60 patients
  - Demonstrated initial feasibility and safety of IVL in coronary arteries
- Various case reports in the carotid arteries[5]
  - Includes a retrospective review of 21 cases reporting effective employment of IVL in the carotid arteries

Conclusion

Shockwave intravascular lithotripsy in conjunction with Chocolate balloon angioplasty can be used to successfully manage heavily calcified plaques in re-stenosed carotid artery atherosclerotic lesions, particularly in patients who are poor surgical candidates or who require a greater degree of neuroprotection.

Disclosures

We have no disclosures to make.

References

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