Management of a Chronic Carotid Artery Pseudoaneurysm

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Abstract
An 82-year-old female with a history of right carotid endarterectomy with patch closure 12 years prior presents with a pulsatile right neck mass with skin erosion and bleeding. The patient had been previously evaluated but refused the surgical intervention because a median sternotomy was recommended to obtain adequate proximal control. Her aneurysm was successfully repaired using a combination of open and endovascular method. The repair was performed through a right-hand side anterior sternocleidomastoid neck incision, and proximal vascular control was obtained with an 8.5-mm balloon positioned under fluoroscopic guidance via a femoral puncture.

Keywords
carotid, pseudoaneurysm, endovascular

Case
An 82-year-old female with a history of right carotid endarterectomy with patch closure 12 years prior presents with a chronic pulsatile right neck mass that recently developed skin erosion and bleeding (Figure 1). The patient had been recommended operative intervention, via median sternotomy, to obtain adequate proximal control of the common carotid artery. The patient refused this recommendation. During the interim, she sustained a right hemispheric stroke and had mild residual left sided weakness.

The patient was brought to the operating room and a carotid angiogram was performed via a right femoral puncture. Under fluoroscopic guidance, a 0.035-inch guidewire (Boston Scientific, Natick, Massachusetts) was used to place an 8.5-mm balloon in the proximal common carotid artery. The pseudoaneurysm was approached through the previous incision anterior to the sternocleidomastoid, and the 8.5-mm balloon was inflated to maintain proximal control. A Pruitt-Inahara (LeMaitre, Burlington, Massachusetts) shunt was placed in the common and internal carotid arteries and the balloon was slowly deflated (Figure 2). After confirmation of shunt blood flow, the internal and external carotid arteries were further dissected and the previously placed patch material was removed. Several interrupted sutures were used to join the internal and external carotid arteries as a common orifice, which was then used to perform a primary anastomosis to the common carotid artery. Two Jackson-Pratt drains were placed and the wound was primarily closed. The patient had no postoperative neurologic changes and was subsequently discharged home in good condition.

Discussion
Carotid artery pseudoaneurysms represent a rare occurrence in carotid artery disease, which can occur secondary to infection, suture line failure, trauma, prolonged (>2 hours) endarterectomy, postoperative hypertension, and type of patch angioplasty. Traditional open surgical approaches include resection with end-to-end reconstruction and partial aneurysmorrhaphy, interposition reversed saphenous vein graft, pseudoaneurysm excision with patch angioplasty (synthetic, bioprosthesis, or vein), or internal carotid artery ligation. El-Sabrout and associates reported one of the largest retrospective reviews of 4991 carotid endarterectomies over 35 years, with a postoperative occurrence of 37 pseudoaneurysms.1 All repairs of the pseudoaneurysms performed in this series were performed open—13 were repaired with partial aneurysmectomy and patch angioplasty, 11 with resection and graft replacement, 4 with debridement and primary closure, 5 with unspecified method, and in 10 the internal carotid artery was ligated. Ligation of the internal carotid artery was associated with a 50% death and stroke rate.

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The pseudoaneurysm in this patient’s neck had been expanding for several years, and the patient had been instructed in discussions with other consultants that operative intervention would require a median sternotomy to obtain adequate proximal control. The patient had previously undergone a sternotomy and therefore refused this intervention because she understood the quoted high-risk morbidity associated with a repeat sternotomy in the setting of her other comorbidities. During her period of nonoperative observation, her pseudoaneurysm not only continued to expand but was also the culprit of a right hemispheric stroke. She now presented with overlying skin erosion and bleeding, both signifying impending rupture. Continued nonoperative observation would likely result in a catastrophic outcome.

More recent technological advances that would avoid the median sternotomy include endovascular therapies including stent-graft exclusion or coil embolization. Although endovascular stent-graft treatment of carotid aneurysms has been studied in high-risk patients, endovascular treatment of pseudoaneurysms has only been reported in the literature as case reports. In this patient, a pure endovascular repair would not have been sufficient because placing a covered stent would not relieve the mass effect of the large pseudoaneurysm. Other concerns have arisen in using stent grafts in pseudoaneurysms, which include inability to remove the potential infectious graft material, lodgment of unstable thrombus, and unknown long-term durability of the stent graft. One case report on the management of a complex pseudoaneurysm reports the use of a median sternotomy to obtain adequate proximal control. Interestingly, an endovascular stent graft was considered but was discarded due to the anatomical complexity of the pseudoaneurysm.

None of the series of carotid pseudoaneurysm repairs report endovascular repairs as the most frequently used approach, nor do any of them report a combined endovascular and open repair. Apaydin and associates report a technique of using a Foley catheter balloon to obtain vascular control for pseudoaneurysms of the thoracic aorta, but the use of an endovascular balloon to obtain adequate proximal control for an open carotid endarterectomy has not been described. This case highlights the successful combination of both endovascular and open techniques to adequately repair a large pseudoaneurysm of the extracranial carotid artery. The advantage of this approach is the ability to perform a neurologic examination after endovascular balloon inflation to transiently simulate carotid artery ligation while the patient is awake. If the patient’s neurologic status were to remain unchanged, safe internal carotid artery ligation could be considered if primary carotid artery reconstruction could not safely be performed.

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