

Recurrent pseudoaneurysm after carotid endarterectomy

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ABSTRACT

Pseudoaneurysms and patch infections are known complications of carotid endarterectomy with patch angioplasty. Although they are rare occurrences, they carry high morbidity and almost uniformly require surgical intervention. Infectious pathogens are often gram-positive bacteria, most commonly *Staphylococcus* species, whereas gram-negative infections are less frequently observed. We present a case of recurrent pseudoaneurysm in a patient who had a carotid endarterectomy with bovine pericardial patch angioplasty complicated by *Pasteurella multocida* infection. This case demonstrates the need for recognition and consideration of a broad differential of pathogens in evaluating and treating vascular infections. (J Vasc Surg Cases and Innovative Techniques 2019;5:128-31.)

Keywords: Carotid endarterectomy; Infection; Bovine patch; Angioplasty; Pseudoaneurysm; Complication

Carotid patch infection and pseudoaneurysms are rare complications of carotid endarterectomy with patch angioplasty. Carotid patch infection and pseudoaneurysm reportedly occur at a rate of <1%.^{1,2} Infection can occur from adjacent tissue, intraoperative contamination of the patch, or seeding from a distal source.² Risk factors for infection include diabetes, operative duration, and performance of concurrent procedures.² Although they are rare complications, carotid patch infection and pseudoaneurysm confer significant morbidity. We present a case of carotid pseudoaneurysm infection with *Pasteurella multocida*. We obtained consent from the patient to publish her case details and images.

CASE REPORT

A 91-year-old woman presented to our clinic with a 2-day history of an enlarging left-sided neck mass and hoarseness. She denied any history of diabetes, steroid use, and active tobacco use. The patient had an extensive vascular surgical history. Sixteen months before presentation, she underwent a left carotid endarterectomy with bovine pericardial patch angioplasty for a high-grade left carotid stenosis and left hemispheric stroke. Fourteen months after this procedure, the patient developed a small pseudoaneurysm that measured 1.2 × 1.4 cm (Fig 1), requiring excision and repeated bovine pericardial patch angioplasty. Because of the patient's denial of any infectious

symptoms, the lack of clinical signs, and the normal-appearing tissue at the time of the operation, the pseudoaneurysm was thought to be caused by a technical error, and no infectious workup was pursued. The subsequent redo left carotid endarterectomy with bovine pericardial patch angioplasty was complicated by the development of a hematoma in the operating room, requiring wound re-exploration before leaving the operating room. The patient was discharged after a short hospital stay and seemed to be recovering appropriately on her initial postoperative visits. However, 2 months after this operation, the patient presented with hoarseness and an enlarging pulsatile left neck mass.

The patient was sent for an ultrasound examination (Fig 1) and computed tomography angiography (Figs 2 and 3), which confirmed the presence of a recurrent left common carotid pseudoaneurysm that measured 1.2 × 1.4 cm. The patient was admitted to the hospital and started on broad-spectrum antibiotics after blood culture specimens were obtained because of suspicion for possible infection. During the next 24 hours, cardiopulmonary deterioration due to a type II non-ST-segment elevation myocardial infarction developed, and the patient required intubation for pulmonary edema. Blood cultures initially positive for gram-negative coccobacilli were subsequently identified as *P. multocida*. According to history obtained from the family, the patient owned cats that often licked her wounds.

After the patient was medically optimized, she was brought to the operating room. The initial dissection of the pseudoaneurysm revealed friable and grossly infected carotid tissue with an unincorporated bovine pericardium graft without any portions of disruption. After placement of a 12F Argyle shunt, the grossly infected tissue was débrided (Fig 4) and sent for culture. A saphenous vein autograft was used for carotid angioplasty (Fig 5). A 7-mm French JP was placed over the vein patch, the sternocleidomastoid muscle was approximated over the vessel, and the skin and subcutaneous tissues were closed.

Postoperatively, the patient progressed, and the drain was removed on postoperative day 3. Intraoperative tissue cultures grew *P. multocida*, and the patient was started on a 6-week antibiotic course of intravenous ertapenem. During the remainder

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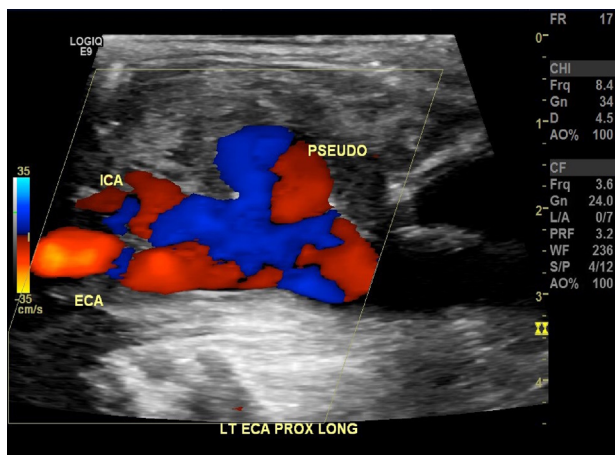


Fig 1. Doppler ultrasound image demonstrating left carotid pseudoaneurysm. ECA, External carotid artery; ICA, internal carotid artery.

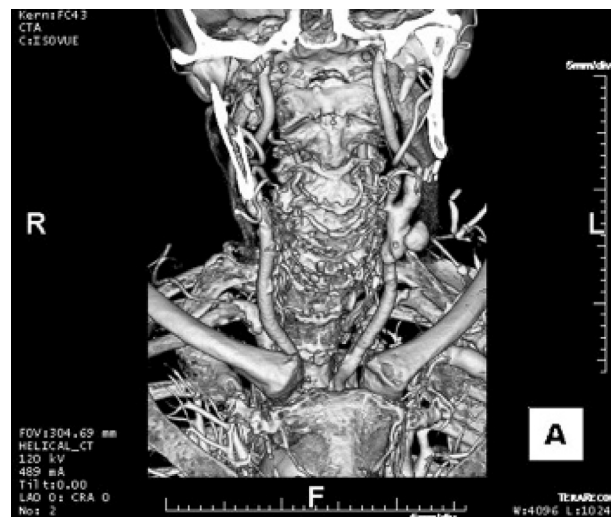


Fig 3. Computed tomography angiography reconstruction showing left common carotid pseudoaneurysm.



Fig 2. Computed tomography angiography of left common carotid showing a 1.2- × 1.4-cm pseudoaneurysm.

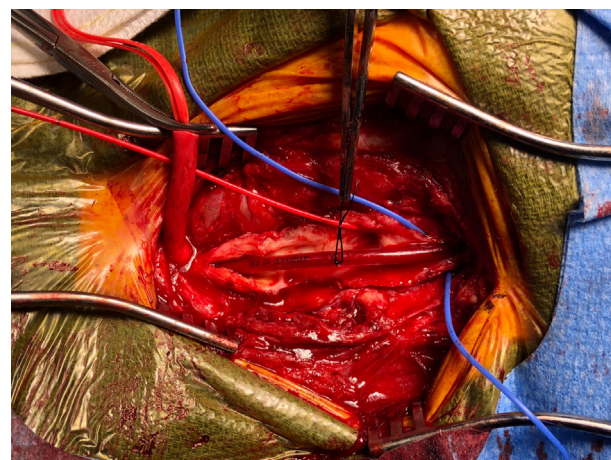


Fig 4. Left carotid artery dissection with 12F Argyle shunt placement.

of her hospital course, she continued to improve and was eventually discharged to a skilled nursing facility. She has subsequently followed up in clinic at 6 months with normal findings on imaging and has suffered no further sequelae, with complete resolution of her hoarseness.

DISCUSSION

Pseudoaneurysm formation after carotid endarterectomy is a rare but serious complication with an incidence of up to 1.76%.³⁻⁶ This complication has been reported to occur anywhere between 2 days and 20 years postoperatively.⁷ Buscaglia et al⁸ first reported this complication in a patient who underwent bilateral carotid endarterectomies 6 years before presentation. The authors attributed the complication to disruption and absorption of the silk suture used for the Dacron patch. In a subsequent literature review, Branch and Davis³ concluded that infection was the major cause of pseudoaneurysm formation and recommended

repair with saphenous vein patch using monofilament sutures in addition to antibiotics. Further studies substantiated this claim, identifying *Staphylococcus epidermidis* or *Staphylococcus aureus* as the most common infectious organism.⁹⁻¹¹

P. multocida is a gram-negative anaerobic coccobacillus that is found in the enteric tracts of many household pets, including cats, dogs, and rabbits. *P. multocida* infection typically presents as localized cellulitis or signs of infection within hours of inoculation after bites or scratches.¹² Although our patient never had any apparent acute scratches, her family reported that her wounds were often licked by her cats, which most likely led to bacteremia and seeding of her bovine graft that was placed in the initial procedure.

Vascular graft infection with *P. multocida* as the bacterial pathogen has seldom been reported. Kalish and Sands¹³ reported the case of a patient who had a



Fig 5. Left carotid status after saphenous vein patching.

polytetrafluoroethylene aortofemoral graft that developed a pseudoaneurysm secondary to infection with *P. multocida*. The infection was attributed to the patient's dog that was licking the patient's open toe wound. Similarly, Sannella et al¹⁴ reported a case of infection of a Dacron aortofemoral graft that presented as a draining incisional wound in a patient who was frequently bitten by a dog; the authors noted that the strain of *P. multocida* from the wound culture matched that of the patient's dog. Kessler et al¹⁵ described an aortofemoral graft that developed a pseudoaneurysm 2 weeks after the patient sustained two bites on an extremity. Silberfein et al¹⁶ reported a case of a patient whose aortic endograft became infected after a rabbit bite to the patient's calf. Jayakrishnan et al¹⁷ also reported a case of an infected aortic endograft thought to be seeded from a previous cat bite to the patient. Interestingly, the authors treated the patient nonoperatively with percutaneous drainage and graft preservation. Fourreau et al¹⁸ reported the case of a patient whose femoral crossover graft became infected and presented with a progressively expanding pulsatile mass. Similar to our case, the patient was a cat owner who had no symptomatic or visible scratches. Schneider et al¹⁹ described a patient with an expanded polytetrafluoroethylene hemodialysis access graft whose cat had bitten her a week previously. In many of these cases, patients often initially denied infectious symptoms of fever and chills as well as any history of penetrating dog or cat bites and presented days to weeks later after contact with their pets. As in our case, the vascular graft was most likely hematogenously seeded with *P. multocida*.

Unlike the previously described cases, our patient had a bovine pericardium patch angioplasty after a carotid endarterectomy. Although infection rates vary by material used for patching, bovine pericardium is thought to have lower infection rates compared with other synthetic grafts. In addition, bovine patches confer lower risk of

rebleeding and improved incorporation compared with synthetic materials.²⁰⁻²²

This case demonstrates the importance of clinical suspicion in diagnosis of vascular infections. This patient likely had *P. multocida* infection during her first reoperation that was misdiagnosed as a technical complication, delaying her eventual definitive management. Whereas *P. multocida* is rarely implicated, having a household pet should alert a clinician to consider this organism as a potential infectious agent regardless of bite or scratch history.

CONCLUSIONS

This case demonstrates the need for recognition and consideration of a broad differential of pathogens in evaluating and treating vascular infections. Although rare, *Pasteurella* should be considered a possible pathogen in patients with infection who have household pets, regardless of bite or scratch history.

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