A rare case of spontaneous carotid sheath abscess presenting as a painful neck mass

Ahmad Tabatabaeishoorijeh, BS,[a,b] Bright Benfor, MD,[a] Simon J. Montelongo, DO,[a] *and* Eric K. Peden, MD,[a] *Houston, Texas*

ABSTRACT

Infections of the carotid arteries and sheath without any underlying etiology are extremely uncommon. In this article, we report the successful open repair of a right carotid sheath abscess in a 71-year-old woman with multiple comorbidities. The repair consisted of excision of the affected carotid segment and reconstruction by interposition of a reversed great saphenous vein graft. Postoperative Doppler ultrasound examination showed patent right carotid artery, and the patient demonstrated no recurrence postoperatively. This case suggests that, although rare, spontaneous carotid sheath remains a possible cause of neck mass, warranting high suspicion index for optimal treatment in a timely manner to avoid further complications. (J Vasc Surg Cases Innov Tech 2024;10:101591.)

Keywords: Carotid artery; Carotid sheath; Abscess; Carotid artery repair; Neck mass; Carotid artery infection

Carotid artery infections (CAIs) are extremely rare, with <100 cases documented in the literature as of 2024, representing only a minute fraction of all vascular infections.[1] Even more infrequent are carotid sheath infections (CSIs), which may arise as a complication of CAI or spontaneously owing to secondary pathologies, with only a handful of cases reported.[2] These conditions, which often present as a neck mass, require the exclusion of other potential etiologies of neck masses, and a high index of suspicion is imperative for prompt diagnosis and intervention.[3] We report a successful open emergent repair of a carotid sheath abscess at the level of the bifurcation of the carotid artery with restoration of flow using a reversed great saphenous vein (GSV) graft interposition. Written informed consent was obtained from the patient for the report of her case and accompanying imaging details.

CASE REPORT

A 71-year-old woman with a past medical history of end-stage renal disease presented to our institution with a 5-day history of right neck pain and swelling. She had recently undergone a tunneled dialysis catheter placement in the left internal jugular vein, which was complicated by methicillin-susceptible *Staphylococcus aureus* and *Enterobacter* bacteremia that was successfully treated with tunneled dialysis catheter removal and intravenous levofloxacin 2 weeks before admission, but denied any previous right-sided cannulation. Upon admission, the patient was afebrile despite a mild leukocytosis with a white blood cell count of 11.6×10^9/L; vital signs were stable, and blood cultures did not show any growth. Physical examination revealed swelling and tenderness to palpation of the right neck associated with poor dentition and hoarse voice. A computed tomography (CT) scan revealed a rim-enhancing lesion encasing a calcified right carotid bifurcation. It measured 1.7 × 1.3 cm and was surrounded by extensive edema (Fig 1). Upon high suspicion of carotid sheath abscess, the patient was brought into the operating room for surgical exploration.

The procedure was performed under general anesthesia. The carotid sheath was exposed through an oblique incision across the anterior border of the sternocleidomastoid muscle. Purulent discharge was encountered upon opening the sheath (Fig 2), and intraoperative cultures were obtained, which subsequently showed no growth. The inflammatory rind was identified and completely dissected off the vessels to obtain control of the bifurcation. The wall of the internal carotid artery was clearly compromised and seemed to be weakened. Upon opening the sheath, the artery was in direct contact with pus, heightening concerns about its involvement and the risk of rupture if left untreated. Thus, the decision was made to replace the affected portion of the carotid artery with a GSV graft that was harvested from the right thigh. Next, proximal and distal clamps were applied, and the infected carotid bifurcation was excised (Fig 2) and reconstructed with the reversed saphenous vein interposed between the common and internal carotid arteries (Fig 3). Both proximal and distal anastomoses were made using running sutures of 6-0 Prolene and, at the end of the procedure, satisfactory Doppler signals were obtained and the wound was closed with a sternocleidomastoid flap over a Jackson-Pratt drain. Surgical pathology confirmed an acute on chronic focal abscess formation with negative stains for fungus and acid-fast bacilli (Fig 4). Despite negative intraoperative and surgical

From the Department of Cardiovascular Surgery, Houston Methodist Hospital[a]; and the School of Engineering Medicine, Texas A&M University.[b]

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Correspondence: Eric K. Peden, MD, Department of Cardiovascular Surgery, Houston Methodist Hospital, 6550 Fannin St, Houston, TX 77030 (e-mail: ekpeden@houstonmethodist.org).

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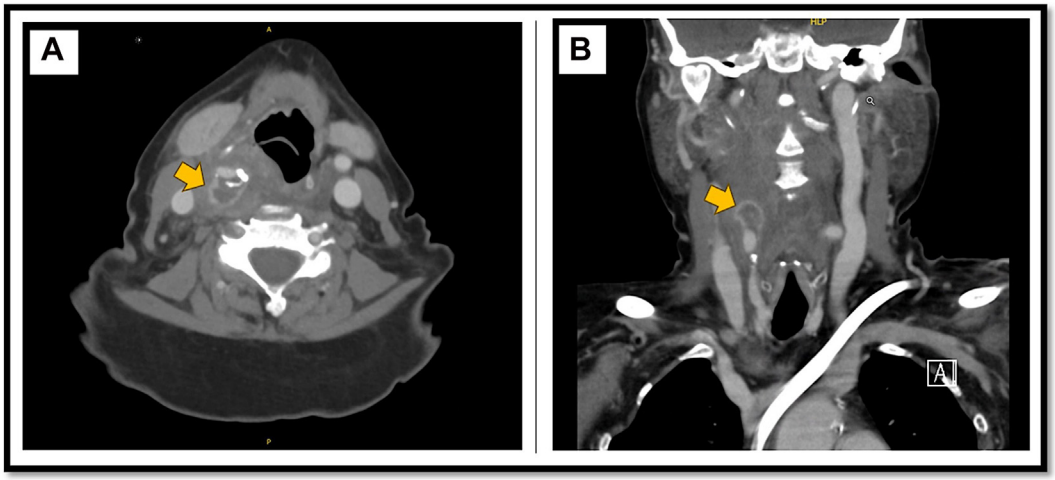

Fig 1. Axial **(A)** and coronal **(B)** views of preoperative computed tomography angiography (*CTA*) showing a hypodense mass with contrast-enhanced rim surrounding a calcified right carotid artery bifurcation, indicating a carotid sheath abscess.

pathology cultures, the patient was placed on broad-spectrum intravenous vancomycin and meropenem postoperatively per infectious disease staff owing to multiple comorbidities and a history of prior bacteremia. However, the patient continued to experience neck pain and discomfort, leukocytosis with whit blood cell counts peaking at 12.6 $\times$ 10^9/L, and a low-grade fever. These symptoms prompted a return to the operating room on postoperative day 10 for reexploration. CT angiography (CTA) performed before reexploration revealed a fluid collection in the anterior carotid space, measuring up to 2.4 $\times$ 1.5 cm in diameter, with no rim enhancement. Exploration revealed the absence of purulence or abscess. The rest of the postoperative course was uneventful, with a CTA revealing a patent carotid artery with no sign of infection (Fig 4). The patient was then discharged home 5 days later with a 2-week course of oral doxycycline. At the 30-day follow up, she was doing well, with stable vital signs and complete wound healing. At both the 6-month and 12-month follow-ups, the laboratory results were unremarkable, the patient reported no neck pain, showed no signs of infection or leukocytosis, and was able to swallow, eat, and drink normally.

DISCUSSION

CAIs are rare and are often associated with bacteremia secondary to head and neck infections, infective endocarditis, or recent surgical and catheter-related operations. These infections involve the arterial wall itself, often leading to severe complications such as mycotic aneurysms or arterial rupture.[1,4-6] CSIs, in contrast, are defined as an infected fascia of the head and neck region and are considered a subtype of deep neck infections, rather than a mere vascular pathology. They are often associated with trauma, microbial infections, malignancies, various cysts, oral cavity infections and poor dentition, and they present as neck masses (Table). Unlike CAIs, CSIs primarily involve the connective tissue structures and potentially adjacent lymph nodes rather than the arterial wall.[2,3] On histopathological comparison, CAIs are typically marked by inflammatory infiltrates within the arterial wall, often accompanied by necrosis and bacterial colonization, whereas CSIs exhibit inflammation of the surrounding fascia, potential abscess formation, and lesser direct involvement of the vascular structures when compared with CAIs. When approaching patients with neck masses, it is important to rule out the most common etiologies in adults, such as infectious lymphadenitis, thyroid nodules, salivary gland disorders, cystic lesions (like branchial cleft cysts or thyroglossal duct cysts), and malignancies, including lymphoma and metastatic carcinomas.[3] The characteristics of the mass upon physical examination, a thorough history, and nonspecific symptoms such as cough and dysphagia, should further direct the differential diagnosis and guide investigations.[3] Our 71-year-old patient presented with poor dentition, which is a known risk factor for CSI. Additionally, she had a recent history of contralateral central venous catheter-related bacteremia that had been treated appropriately; however, the possibility of a hematogenous seeding of infection cannot be ruled out with certainty. Owing to its rarity, a carotid sheath abscess may not be easily thought of as the possible etiology of a neck mass. However, like other reports in the literature, this case highlights the importance of a high index of suspicion for timely intervention to avoid further rupture and systemic or neurological complications. Surgical intervention is required and often involves the drainage of the abscess, debridement of necrotic tissue, excision, and reconstruction of the affected vascular segment to control the infection and

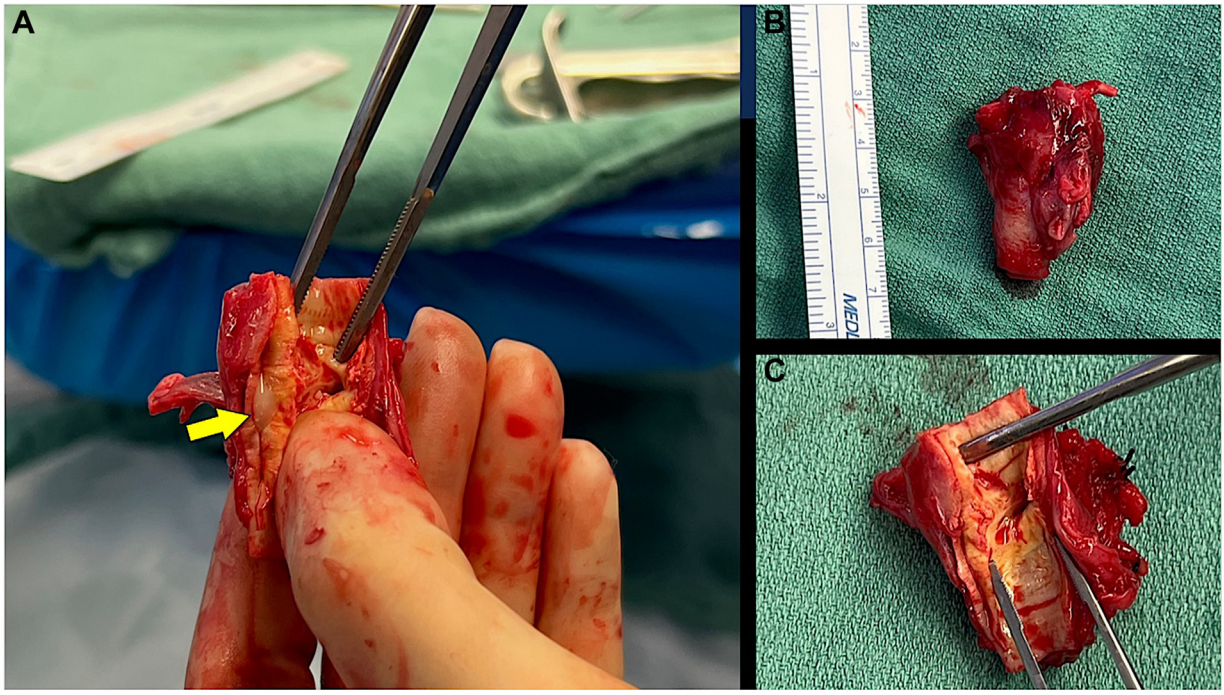

Fig 2. Gross images of the excised carotid bifurcation demonstrating presence of pus in the subintimal layer (*yellow arrow*).

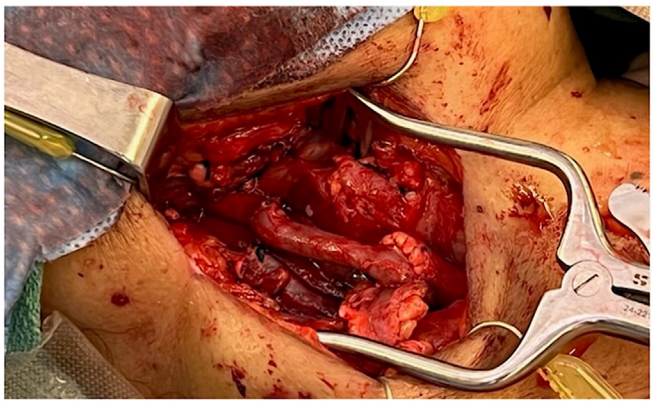

Fig 3. Intraoperative image showing a reconstruction of the carotid bifurcation with a great saphenous vein (*GSV*) graft.

restore bloodflow.[4,17,18] In this case, given the evident involvement of the carotid artery wall, we determined that arterial replacement was necessary, despite the majority of reported cases in the literature not requiring arterial replacement (Table). It should be noted that, although most cases of carotid sheath abscess in the literature have been managed conservatively with debridement and muscle flaps, there remains no standardized management algorithm for these infections owing to the paucity of literature; however, we are biased toward a more radical approach when arterial involvement is suspected because we deem the consequences of a ruptured infect arterial wall to far outweigh the risk of excision and replacement. More studies are warranted to elucidate the optimal treatment strategy for CSIs.

Autologous grafts are preferred over prosthetic grafts as they are more resistant to reinfection.[1,16,17] In this case, we opted for a reversed GSV graft, which was of adequate caliber to accommodate the size of the native artery. In the absence of a suitable GSV, other autologous conduits such as deep veins of the lower extremity or upper arm or, less commonly, upper arm veins may be used.[19-21] Furthermore, given the proximity of the carotid sheath to other neck structures, the approach to carotid sheath abscess should be multidisciplinary, with collaboration between vascular surgeons, otolaryngologists, and plastics surgeons to ensure adequate surgical exposure, arterial reconstruction, and appropriate wound closure with muscle flaps. Postoperative management in this case was complicated by persistent neck pain and low-grade fever, necessitating a second surgical exploration. This case underscores the complexity of postoperative care for carotid sheath abscesses and further highlights the unpredictable nature of the recovery process which extends beyond surgical intervention to include meticulous monitoring for complications and prompt intervention.[22]

CONCLUSIONS

Although rare, this case demonstrates that spontaneous carotid abscess is a possible cause of neck mass,

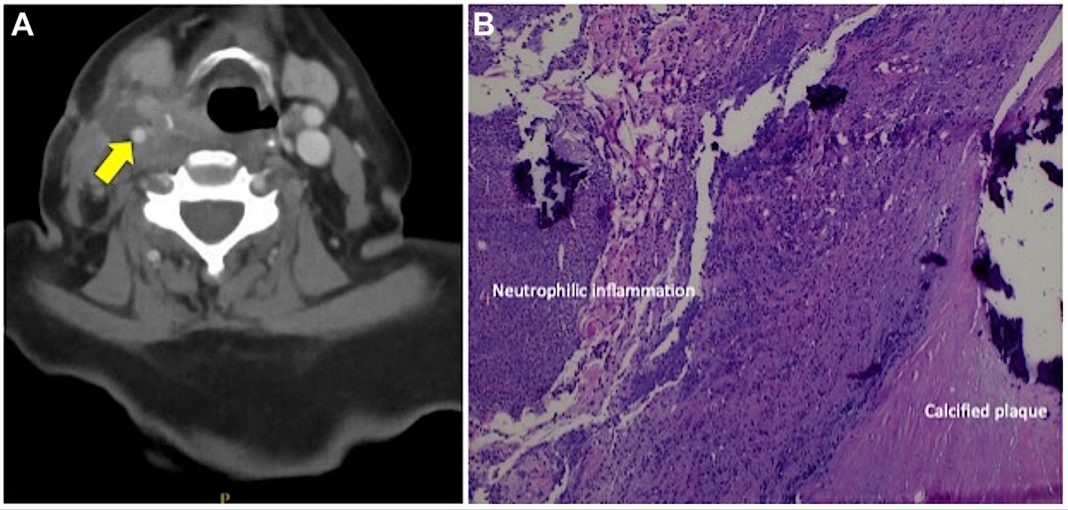

Fig 4. Postoperative computed tomography angiography (*CTA*) showing patent arterial reconstruction with no surrounding mass **(A)**. Pathology was positive for carotid sheath abscess **(B)**.

Table. Reported cases of carotid sheath abscess and infections identified in a PubMed search

Case	Etiology	Presentation	Treatment	Outcome
Badami et al. (1981)[7]	Branchial cyst (secondary)	Swelling, pain, fever	Surgical management (no vascular reconstruction)	N/A
Yamaoka et al. (1990)[8]	Necrotizing fasciitis 2/2 *Streptococcus* and *Bacteroides* (secondary)	Dysphagia, drowsiness, swelling	Surgical management (no vascular reconstruction)	Return to baseline 22 months postoperatively
Kono et al. (2001)[9]	Descending necrotizing mediastinitis (secondary)	Fever, neck swelling, leukocytosis, elevated CRP	Surgical management (no vascular reconstruction)	Return to baseline w/o serious complications
Agada et al. (2006)[10]	Cutaneous tuberculosis (secondary)	Left-sided otitis externa, right-sided Bell's palsy, dysphagia	Medical management	Death (disseminated tuberculosis)
Lin et al. (2007)[11]	Descending necrotizing mediastinitis (secondary)	Fever, SOB, epigastric pain, tachycardic, tachypneic	Surgical management (no vascular reconstruction)	Return to baseline 4 weeks postoperatively
Antonopoulos et al. (2009)[12]	Cavernous hemangioma (secondary)	Mild neck discomfort	Surgical management (no vascular reconstruction)	Return to baseline 7 days postoperatively
McKay-Davies et al. (2011)[13]	Hematoma abscess (secondary)	Fever, neck stiffness, elevated CRP and ESR	Surgical Management (No Vascular Reconstruction)	Return to baseline 7 days postoperatively
Tuncturk et al. (2015)[2]	Tooth decay infection (secondary)	Neck abscess, nausea, headache, dysphagia, leukocytosis	Surgical management (no vascular reconstruction)	Return to baseline 8 days postoperatively
Rahhal et al. (2015)[14]	Uvular SCC and abscess (secondary)	Dyspnea, cough, fever, purulent sputum, tachypneic	Medical management	Death (respiratory insufficiency)
Sanchez et al. (2018)[15]	CA-MRSA pericarditis (secondary)	Neck abscess, fever, tachycardia, tachypnea, leukocytosis	Surgical management (no vascular reconstruction)	Return to baseline 7 days postoperatively
Tabatabaeishoorijeh et al. (present case)[16]	Spontaneous abscess (primary)	Neck abscess, pain, swelling, leukocytosis	Surgical management (with vascular reconstruction)	Return to baseline 30 days postoperatively

warranting a high index of suspicion for timely intervention. Surgical resection and reconstruction ensures complete eradication of the infection while maintaining arterial flow.

DISCLOSURES

None.

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