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Case Report

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Deep Neck Infection Complicated by Internal Carotid Pseudoaneurysm: A Diagnostic and Therapeutic Challenge

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Abstract

Parapharyngeal infections may result in a pseudoaneurysm of the internal carotid artery, a rare but potentially fatal condition. Early recognition and multidisciplinary management are crucial to avoid catastrophic outcomes. We present a case of a twenty-two-year-old man with a parapharyngeal abscess complicated by an internal carotid artery pseudoaneurysm. The patient presented with painful left neck swelling, fever, dysphagia, and hoarseness. Examination revealed oropharyngeal asymmetry, ipsilateral vocal cord paralysis, and shoulder weakness findings consistent with jugular foramen syndrome. Imaging demonstrated a parapharyngeal abscess with a surrounding hematoma encasing the distal internal carotid artery, which appeared aneurysmal and was confirmed as pseudoaneurysm. Despite appropriate antibiotic therapy, the patient's neck pain progressively worsened, and repeat imaging demonstrated enlargement of the lesion. Urgent endovascular coil embolization was successfully performed. The patient was discharged on the second postoperative day and remained neurologically stable at six-month follow-up, with radiological improvement. Carotid pseudoaneurysm secondary to deep neck infection is exceedingly rare. Infection may spread from the parapharyngeal space to the carotid sheath, causing progressive arterial wall erosion. Early identification is crucial, as rupture carries high mortality without intervention. Recent evidence supports endovascular management as a safe and effective alternative to open surgery, particularly for lesions involving the skull base or petrous segment, where surgical exposure is hazardous. This case underscores that deep neck infections presenting with cranial neuropathies or opioid-refractory pain warrant prompt vascular imaging, and that endovascular occlusion represents a safe and effective treatment when collateral circulation is sufficient.

Keywords: Parapharyngeal abscess, carotid artery, aneurysm, jugular foramen syndrome, embolization, case report

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Introduction

Deep neck infection (DNI) remains a potentially life-threatening condition. The parapharyngeal space is particularly critical, as infection may extend to the carotid sheath, risking airway obstruction and vascular erosion. Although mycotic aneurysms account for less than 1% of all aneurysms, they carry a mortality rate of approximately 20% (1). Erosion of the carotid artery due to infection is exceedingly rare, with pseudoaneurysm formation reported only in isolated cases.

Cross-sectional imaging is crucial. Computed tomography (CT) is often first-line, while magnetic resonance imaging (MRI) better delineates soft tissue and vascular involvement. When vascular injury is suspected, angiography remains the diagnostic gold standard (2). With advances in interventional radiology, endovascular therapy has become a viable option when surgical management carries prohibitive risk. Here, we describe a rare case

of internal carotid artery (ICA) pseudoaneurysm secondary to a parapharyngeal abscess, successfully treated with endovascular coil embolization.

Case Presentation

A 22-year-old male presented to the emergency department with left-sided neck swelling, severe pain, fever, hoarseness, and dysphagia. He had no significant comorbidities aside from remote tonsillectomy and a five pack-year smoking history. At an outside facility, he had received clindamycin intramuscularly for five days, then oral amoxicillin-clavulanate for two weeks, without improvement. The patient was referred to our otolaryngology department from the emergency department with a three-week history of persistent symptoms that had failed to improve despite antibiotic therapy. Physical examination revealed left-sided neck swelling, and the patient was subsequently admitted for further diagnostic evaluation and treatment.

At presentation, he exhibited left vocal cord paralysis, ptosis, and miosis, consistent with Horner's syndrome. The presence of oropharyngeal asymmetry accompanied by unilateral vocal cord paralysis and limitation of shoulder movements on the same side indicates involvement of cranial nerves IX, X, and XI, consistent with jugular foramen syndrome. These two neurological findings reflected involvement of distinct anatomical pathways. Horner's syndrome represents dysfunction of the cervical sympathetic chain coursing along the ICA, whereas jugular foramen syndrome results from impairment of the lower cranial nerves (IX, X, and XI) as they traverse the jugular foramen at the skull base. Laboratory studies showed leukocytosis and elevated C-reactive protein. On initial contrast-enhanced CT obtained at admission, an 80×50×50 mm parapharyngeal abscess was demonstrated, along with a 12-mm aneurysmal dilation of the distal cervical ICA (Figure 1a). MRI confirmed the collection and raised suspicion of pseudoaneurysm (Figure 1b). Surgical drainage of the parapharyngeal abscess was deliberately avoided because of the close anatomical relationship between the abscess cavity and the ICA pseudoaneurysm, which posed a high risk of catastrophic hemorrhage in the event of inadvertent vascular injury.

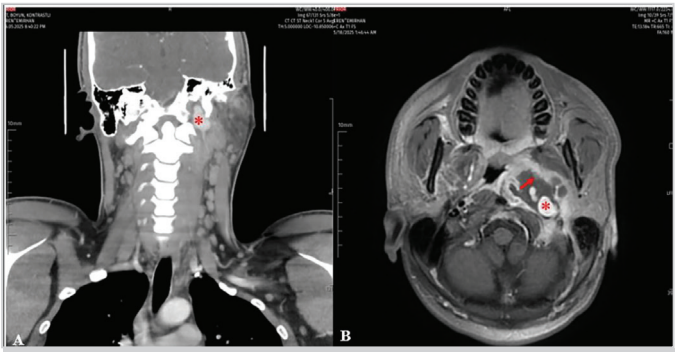

Figure 1. Pre-embolization images. A. Coronal contrast-enhanced CT showing a left parapharyngeal abscess and adjacent internal carotid artery pseudoaneurysm (asterisk), B. Axial contrast-enhanced T1-weighted MRI showing the pseudoaneurysm (asterisk) surrounded by hematoma (arrow)
CT: Computed tomography, MRI: Magnetic resonance imaging

Extensive evaluation excluded infective endocarditis, vasculitis, syphilis, and tuberculosis. Blood and abscess cultures were not obtained due to prior prolonged antibiotic therapy, and invasive diagnostic procedures were avoided because an ICA pseudoaneurysm was identified on initial imaging. Following consultation with the infectious diseases team, empirical intravenous therapy with ampicillin-sulbactam was initiated and continued throughout hospitalization. By hospital day 10, the patient developed disproportionate worsening neck pain despite opioid therapy. Accordingly, repeat CT angiography showed aneurysm enlargement by 1.5 cm. Angiography revealed narrowing of the cervical ICA with aneurysmal filling extending to the petrous segment, without distal opacification. In light of aneurysm progression and given the high risk of rupture together with evidence of sufficient collateral circulation, a multidisciplinary council decided to proceed with endovascular coil embolization of the ICA (Figure 2a, b). The procedure was uneventful. The patient was discharged on postoperative day two with oral ampicillin-sulbactam therapy prescribed for an additional two weeks and remained neurologically intact during six-months of follow-up. MRI at one month confirmed radiological improvement (Figure 3). Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Discussion

Early recognition and treatment of DNIs are essential to reduce morbidity and mortality. The most frequent complication is airway obstruction, reported in 14.2% of cases (3). Rare complications include unilateral vocal cord paralysis and infectious carotid pseudoaneurysm secondary

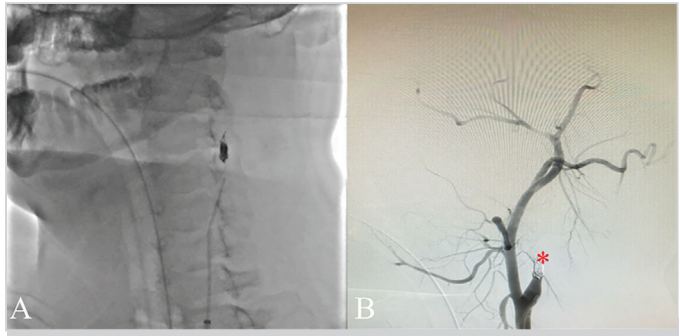

Figure 2. Endovascular findings. A. Selective left carotid angiography showing coil placement within the distal internal carotid artery, B. Post-embolization angiogram demonstrating absence of flow distal to the occluded segment (asterisk)

to parapharyngeal abscess (4). The incidence of vocal cord paralysis in DNI is approximately 1.5%, attributed to the involvement of the pharyngeal branch of the vagus nerve (3).

The term mycotic aneurysm, introduced by William Osler, refers to any infection-related aneurysm (1). Carotid involvement is particularly rare. In the pre-antibiotic era, syphilis, tuberculosis, and endocarditis were the predominant causes, whereas today hematogenous seeding and direct invasion from adjacent infection are recognized mechanisms (1,5). In our case, pseudoaneurysm formation may have resulted from direct extension of the parapharyngeal abscess. Fernández et al. (6) provided a comprehensive anatomical and pathophysiological explanation of how parapharyngeal infections may extend into the carotid sheath through progressive adventitial invasion, ultimately compromising the arterial wall. They further identified Horner's syndrome, severe dysphagia, and disproportionate pain as early clinical indicators of carotid space involvement findings that closely parallel the neurological presentation observed in our patient. Reported predisposing factors include immunosuppression, malignancy, corticosteroid therapy, and diabetes, of which none were present in our patient, adding to the case's uniqueness (6). Pirvu et al. (7), reported that most extracranial mycotic aneurysms occur in older or immunocompromised patients, with *Staphylococcus aureus*, *Salmonella*, and *Streptococcus* species as the leading pathogens. Our patient's lack of systemic comorbidity further underscores the exceptional nature of infection-induced pseudoaneurysm in an otherwise healthy host. This distinction becomes more evident when the presented case is viewed in the context of age and immune status reported in literature. Reported adult cases predominantly involve older individuals, often in the sixth to eighth decades of life, with significant systemic comorbidities such as uncontrolled diabetes mellitus, hypertension, or recent surgical or traumatic vascular injury (1,2,4,6). In the pediatric population, infection-related carotid pseudoaneurysms have also been described (8). In contrast, this case suggests that severe vascular complications of DNIs can also be encountered in young, immunocompetent patients, despite the absence of traditional risk factors.

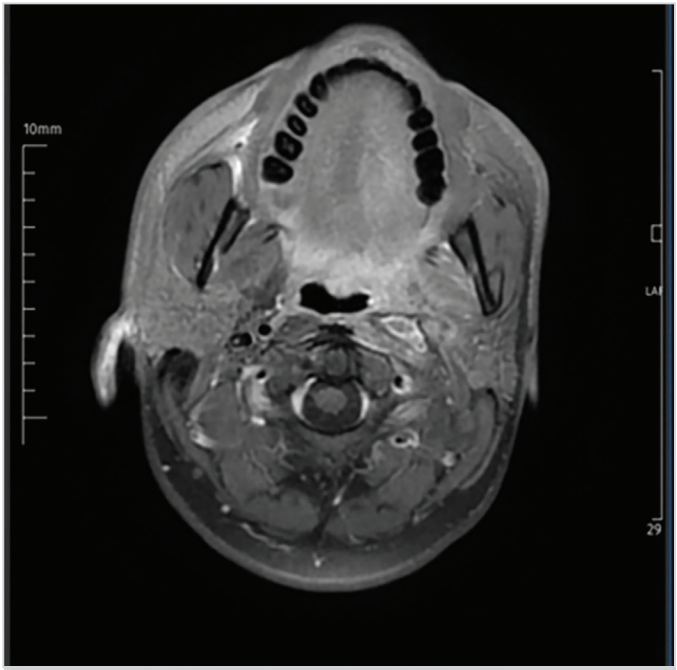

Figure 3. Post-embolization image. Axial contrast-enhanced T1-weighted fat-suppressed MRI showing marked resolution of the internal carotid artery pseudoaneurysm in the left parapharyngeal space
MRI: Magnetic resonance imaging

Management is complicated by a potential risk of embolization and rupture, which results in high morbidity and mortality. To our knowledge, there are no available guidelines recommending the best treatment option. Conservative therapy is discouraged due to the high risk of fatal complications (7). The definitive treatment of carotid mycotic aneurysms is surgical resection of the aneurysm with reestablishment of arterial flow, aiming to eliminate the infected aneurysm, prevent ischemic complications, and evacuate any associated hematoma (9). However, surgical ligation of the ICA carries a 30-60% risk of ischemic infarction, as reported by Nader et al. (2) and Fernández et al. (6), particularly in older or high-risk patients. Although grafts and anastomosis have been described, endovascular therapy is increasingly favored in anatomically complex or high-risk lesions. Stent grafts, flow diverters, and coil embolization have been reported as safe and effective alternatives (10). Antibiotic therapy remains the cornerstone of management; Knouse et al. (1) and Pirvu et al. (7) recommend a minimum of 6 weeks of targeted intravenous antibiotics, extendable to 6 months in persistent infections or immunocompromised hosts.

In our patient, the aneurysm extended to the petrous ICA, where surgical resection was technically challenging and hazardous. A multidisciplinary council composed of specialists from interventional radiology, infectious diseases, otolaryngology, and neurosurgery concluded that endovascular coil embolization was the safest strategy, supported by evidence of adequate collateral circulation. The procedure was successful, and the patient remained free of complications at six-month follow-up. Clinically, disproportionate pain resistant to opioids and multiple cranial neuropathies were the most striking findings. Worsening pain and new anisocoria prompted repeat imaging, which revealed aneurysm enlargement and necessitated urgent intervention. Mismanagement of such lesions as conventional DNIs, with surgical drainage attempted before vascular evaluation, may result in catastrophic hemorrhage secondary to pseudoaneurysm rupture. In our case, a staged management strategy was adopted, prioritizing

vascular stabilization before any attempt to address the abscess. Because surgical manipulation in close proximity to the pseudoaneurysm carried a high risk of catastrophic hemorrhage, immediate drainage was avoided; instead, the patient was managed with close radiological and clinical follow-up and appropriate antimicrobial therapy, while the vascular lesion was secured by endovascular intervention. We believe that this cautious and multidisciplinary approach may be appropriate in similar high-risk clinical scenarios. Following this staged approach, vascular risk was first controlled, and in the absence of clinical deterioration during close follow-up, additional surgical drainage was not deemed necessary. Therefore, clinicians should maintain a high index of suspicion when atypical neurological symptoms, opioid-refractory pain, or unexplained hematoma are present.

A key limitation in this case is the absence of microbiological confirmation, as reliable culture results could not be obtained due to prior empirical antibiotic therapy. While clinical and radiological findings were suggestive of an infectious process, including radiological evidence of a parapharyngeal abscess, elevated inflammatory markers, and clinical improvement following antimicrobial therapy, a direct causal relationship between the infection and pseudoaneurysm formation cannot be definitively established. Furthermore, extensive evaluation excluded other potential causes, including infective endocarditis, syphilis, tuberculosis, and rheumatological conditions such as vasculitis. Therefore, infection is considered the most likely underlying mechanism; however, causality cannot be definitively established, and close clinical follow-up is warranted, with attention to findings suggestive of alternative etiologies.

Conclusion

This case emphasizes the need for a multidisciplinary approach in managing rare cervical aneurysms, where unusual findings such as disproportionate pain or cranial neuropathies should raise suspicion. Early recognition should prompt vascular imaging to rule out aneurysmal disease. Mismanagement of such lesions as conventional DNIs, with surgical drainage attempted before vascular evaluation, may result in catastrophic hemorrhage secondary to pseudoaneurysm rupture. In high-risk anatomical sites, endovascular coil embolization can be a safe and effective alternative to surgery, enabling rapid recovery. The unclear etiology, despite thorough evaluation, highlights the importance of continued surveillance and further studies on these uncommon but serious conditions.

Ethics

Informed Consent: Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Footnotes

Authorship Contributions

Surgical and Medical Practices: S.A.U., Concept: B.V.C., S.Ö., Design: B.V.C., Data Collection and/or Processing: T.G.K., S.A.U., Analysis or Interpretation: B.V.C., S.Ö., Literature Search: T.G.K., Writing: B.V.C., T.G.K.

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Main Points

- Deep neck infections can rarely lead to life-threatening vascular complications such as internal carotid artery pseudoaneurysm, and early recognition is essential to prevent catastrophic hemorrhage.
- The presence of cranial neuropathies or progressive, treatment-refractory neck pain in parapharyngeal infections should prompt immediate vascular imaging to exclude carotid involvement.
- Multidisciplinary collaboration is essential throughout both the diagnostic and the therapeutic processes in managing rare vascular complications of deep neck infections.
- Endovascular management represents a safe and effective treatment option for carotid pseudoaneurysms when adequate collateral circulation is present, especially in anatomically challenging regions.

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