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Case Report

When open surgery fails: endovascular treatment of a surgically inaccessible high cervical internal carotid artery aneurysm – a case report

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ABSTRACT

Extracranial internal carotid artery (ICA) aneurysms are rare vascular lesions associated with a risk of thromboembolism, rupture, and cranial nerve compression. Open surgical reconstruction has traditionally been considered the standard treatment; however, lesions located high in the cervical segment may pose significant technical challenges due to limited exposure and difficulty in obtaining distal control. This report describes the case of a 36-year-old man presenting with several weeks of left-sided neck pain and headache. Computed tomography angiography demonstrated a saccular aneurysm of the proximal left ICA measuring approximately 31×17×18 mm. Open surgical repair was attempted but intraoperative findings revealed a high cervical aneurysm with a fragile arterial wall and inability to safely obtain distal control, leading to abandonment of reconstruction. Definitive treatment was subsequently achieved using a staged endovascular approach with deployment of a covered stent graft. Completion angiography confirmed complete exclusion of the aneurysm with preserved antegrade flow and no evidence of endoleak. The postoperative course was uneventful and the patient remained neurologically intact. This case highlights the importance of intraoperative decision-making and supports endovascular reconstruction as an effective alternative in anatomically challenging extracranial carotid aneurysms.

Keywords: Internal carotid artery aneurysm, Extracranial carotid aneurysm, Endovascular repair, Covered stent, Vascular surgery, Case report

INTRODUCTION

Extracranial aneurysms of the ICA are uncommon lesions encountered in vascular practice, but their clinical relevance is disproportionate to their incidence. Although they account for a very small fraction of all arterial aneurysms, they carry a meaningful risk of thromboembolic complications, including transient ischemic attacks and stroke. In addition, depending on their size and location, they may cause local symptoms due to compression of adjacent structures.

The underlying etiology is variable. In everyday clinical settings, atherosclerosis remains one of the more common causes, although post-traumatic and iatrogenic pseudoaneurysms are also frequently reported. Less commonly, connective tissue disorders or fibromuscular dysplasia may be involved. Regardless of cause, once identified, most of these lesions warrant active management rather than observation.

For decades, open surgical repair has been considered the preferred treatment strategy. It allows direct visualization of the lesion and offers durable reconstruction. That said, not all aneurysms are equally accessible. Lesions located high in the cervical segment of the ICA can be particularly demanding. Exposure is limited, distal control is often difficult to achieve, and the proximity to cranial nerves increases the risk of perioperative

morbidity.[1] However, optimal management of high cervical ICA aneurysms remains controversial due to anatomical constraints and the limited surgical accessibility.

With the development of endovascular techniques, treatment strategies have gradually evolved. Covered stents, in particular, provide a way to exclude the aneurysm from circulation without the need for extensive dissection.[2]

In the present report, we describe a case in which open repair was initially attempted but ultimately abandoned due to intraoperative findings. Definitive treatment was achieved using an endovascular approach. This case report has been prepared in accordance with the SCARE 2018 guidelines.

CASE REPORT

Patient information

A 36-year-old male was referred for further evaluation of persistent pain on the left side of the neck, which had been present for several weeks. In the days preceding admission, he also began to experience intermittent headaches. Importantly, he did not report any neurological symptoms such as visual disturbances, weakness, or episodes suggestive of transient ischemia.

His medical history included arterial hypertension, obesity, hypothyroidism, and depression. He had undergone left knee arthroscopy in the past. There was no history of cervical trauma or prior vascular procedures. Family history was unremarkable.

Clinical findings

On examination, the patient was in good general condition. He was hemodynamically stable and fully oriented. Cardiopulmonary assessment did not reveal any abnormalities. Neurological examination was within normal limits. There was no palpable mass in the neck, and no bruit was detected.

Diagnostic assessment

Computed tomography angiography identified a saccular aneurysm of the proximal segment of the left ICA, measuring approximately 31×17×18 mm. The lesion demonstrated features consistent with partial mural thrombosis and peripheral calcifications, while distal flow remained preserved. Representative axial images illustrate the inferior and superior portions of the aneurysm (Figure 1).

Multiplanar reconstructions confirm the high cervical location with cranial extension toward the skull base and its relationship to surrounding structures (Figure 2). Three-dimensional volume-rendered imaging further highlights the spatial relationship to the mandible, skull base, and adjacent vertebrae, emphasizing the anticipated difficulty of surgical exposure (Figure 3).

Laboratory investigations were largely unremarkable, apart from mild inflammatory marker elevation and lipid abnormalities. Renal function and coagulation parameters were within normal limits.

Given the size of the aneurysm and the potential risk of embolic complications, interventional treatment was considered appropriate.

Therapeutic intervention

Open surgical exploration

An open repair was initially planned. The procedure was performed under local anesthesia using a standard longitudinal approach along the sternocleidomastoid muscle. After careful dissection, the common, external, and internal carotid arteries were exposed.

Systemic heparinization was administered. A brief test of carotid clamping was carried out and did not result in any neurological changes, suggesting adequate collateral circulation.

At this stage, however, it became clear that the operative conditions were unfavorable. The aneurysm extended higher than expected, and the distal ICA appeared to run within the aneurysmal sac itself. The vessel wall was extremely delicate and prone to bleeding even with minimal manipulation.

Attempts to obtain secure distal control were unsuccessful due to the anatomical constraints, consistent with the high cervical configuration demonstrated on preoperative imaging (Figure 2-3).

In view of these findings, proceeding with reconstruction was considered unsafe. The decision was therefore made to terminate the procedure. Hemostasis was achieved and the wound was closed. The patient recovered without complications.

Endovascular treatment

Following reassessment, an endovascular approach was selected as the definitive treatment strategy.

The procedure was performed under local anesthesia via right femoral access. After placement of a 6F sheath and systemic anticoagulation, selective catheterization of the left carotid system was achieved.

Pre-deployment digital subtraction angiography confirmed the saccular aneurysm and delineated its neck and relationship to the parent vessel in anteroposterior and lateral projections (Figure 4).

A guidewire was advanced across the lesion, and a covered stent graft (Viabahn 5×50 mm) was deployed to fully cover the aneurysmal segment.

Final angiography demonstrated complete exclusion of the aneurysm, with preserved antegrade flow through the ICA and no evidence of leakage or distal embolization, confirmed in orthogonal projections (Figure 5).

The patient was started on dual antiplatelet therapy (aspirin and clopidogrel) following the procedure.

Follow-up

The postoperative course was uncomplicated. The patient remained neurologically intact and did not report further symptoms.

Follow-up imaging confirmed proper stent function, with maintained patency and no evidence of endoleak or restenosis. The patient remained asymptomatic during follow-up.

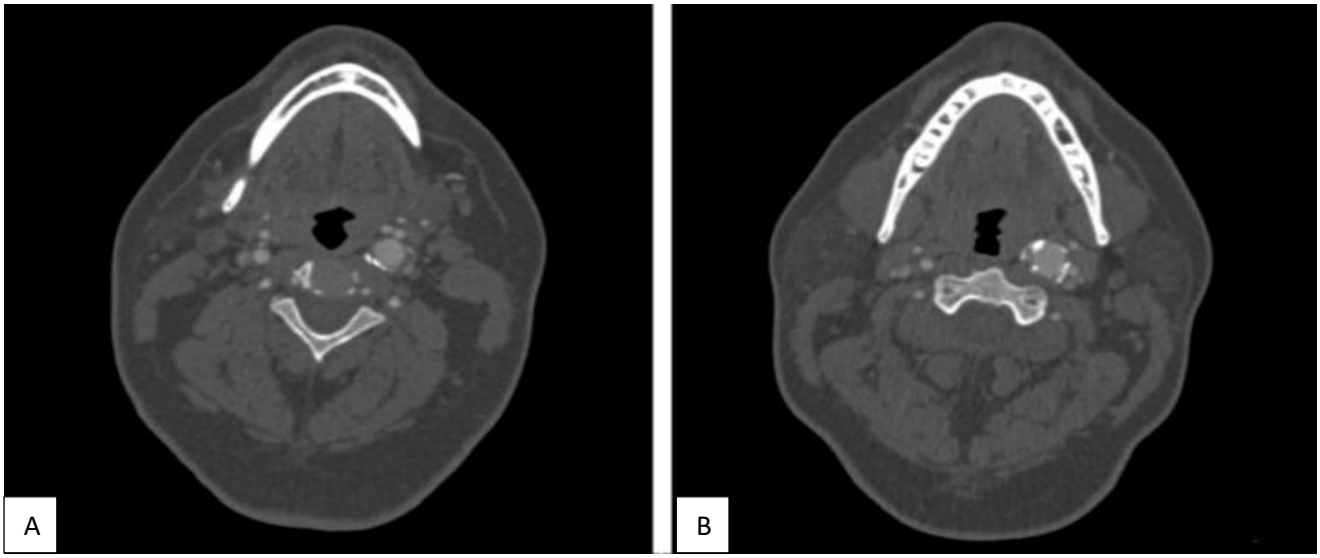

Figure 1 (A and B): Axial CT angiography of left internal carotid artery aneurysm.
*Axial contrast-enhanced images demonstrate a saccular aneurysm arising from the upper cervical segment of the left ICA, with clear visualization of its inferior and superior extent.

Figure 2 (A and B): Multiplanar CT angiography of left internal carotid artery aneurysm.
*Multiplanar reconstructions illustrate a high cervical LICA aneurysm with cranial extension toward the skull base and its spatial relationship to the carotid bifurcation and adjacent cervical structures.

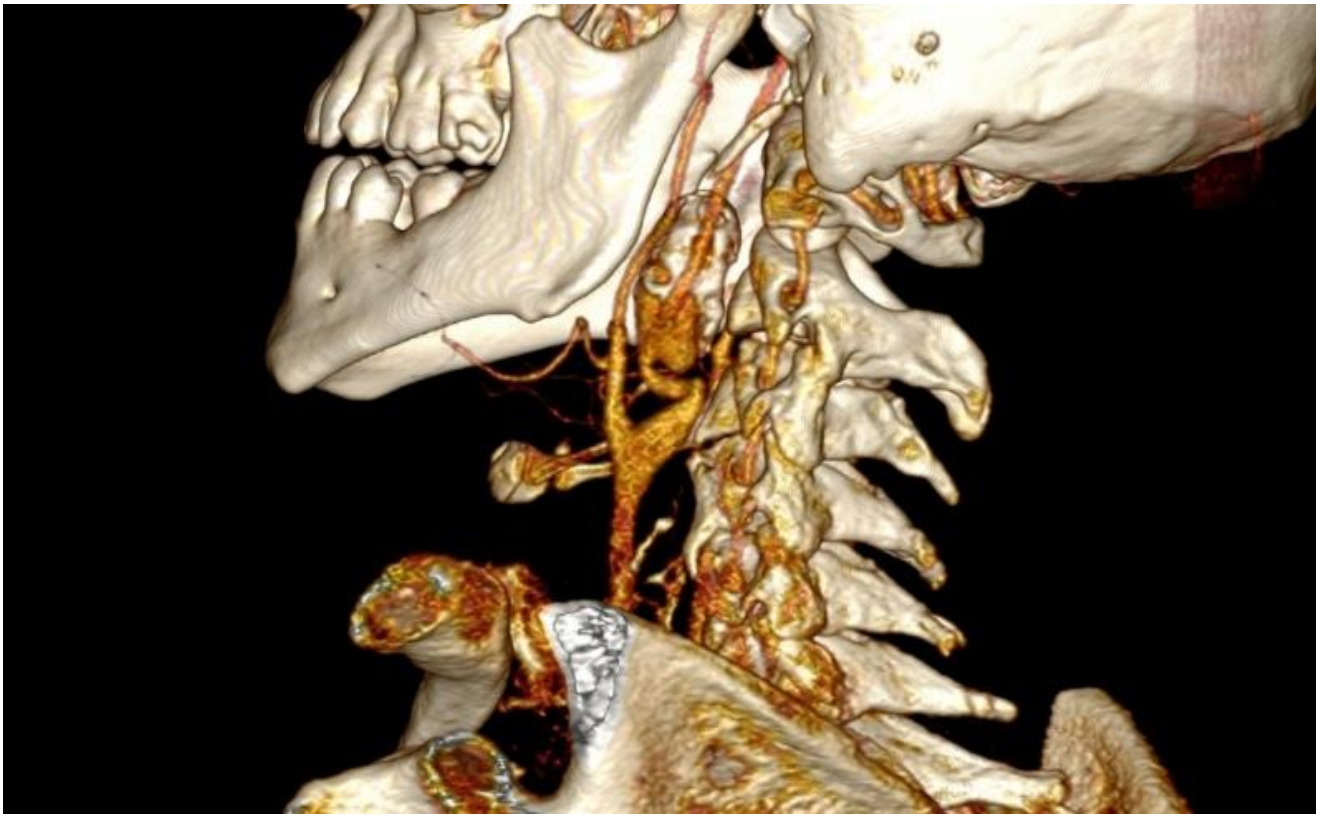

Figure 3 (A and B): Three-dimensional CT angiography reconstruction of left internal carotid artery aneurysm.
*Volume-rendered reconstruction demonstrates the aneurysm at the upper cervical level, highlighting its anatomical relationship to the mandible, skull base, and cervical vertebrae, relevant for surgical exposure.

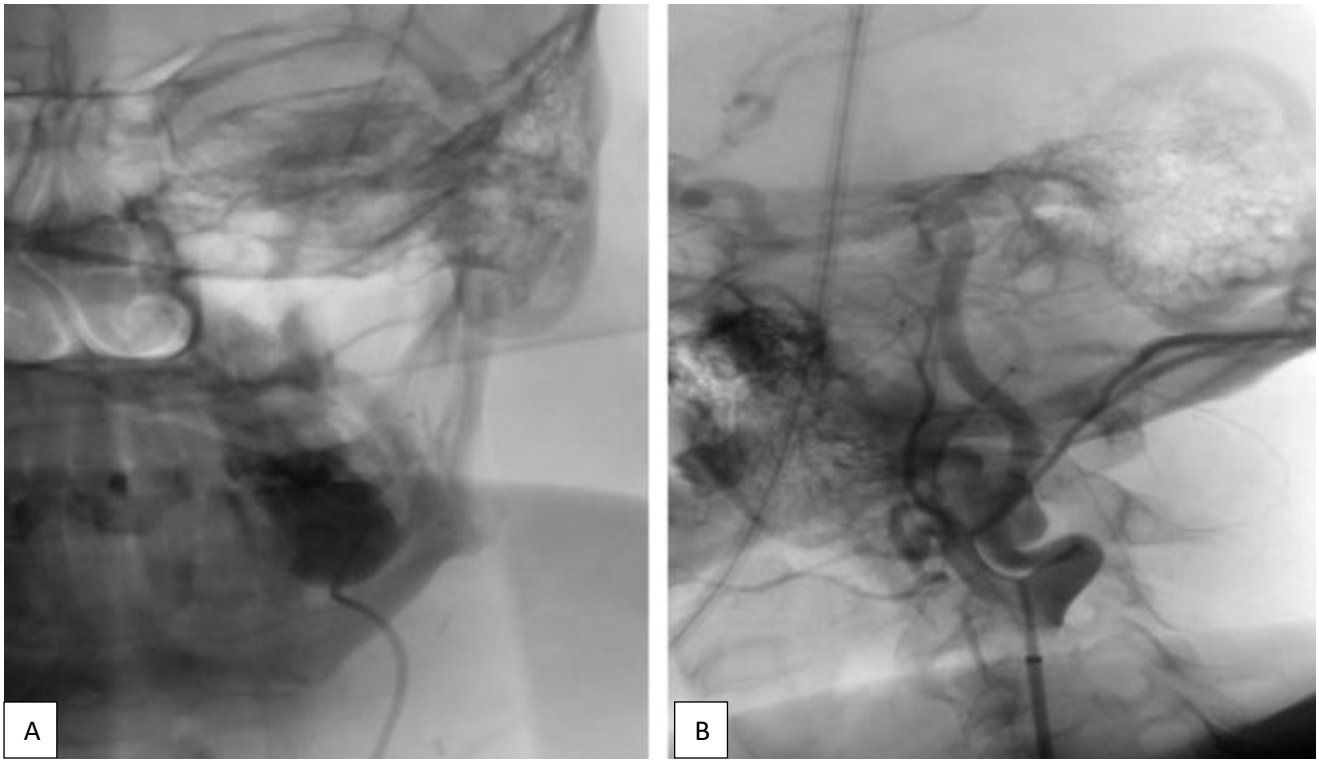

Figure 4 (A and B): Digital subtraction angiography of left internal carotid artery aneurysm before intervention.
*Pre-interventional angiography demonstrates a contrast-opacified saccular aneurysm of the LICA, with clear delineation of its morphology and relationship to the parent vessel.

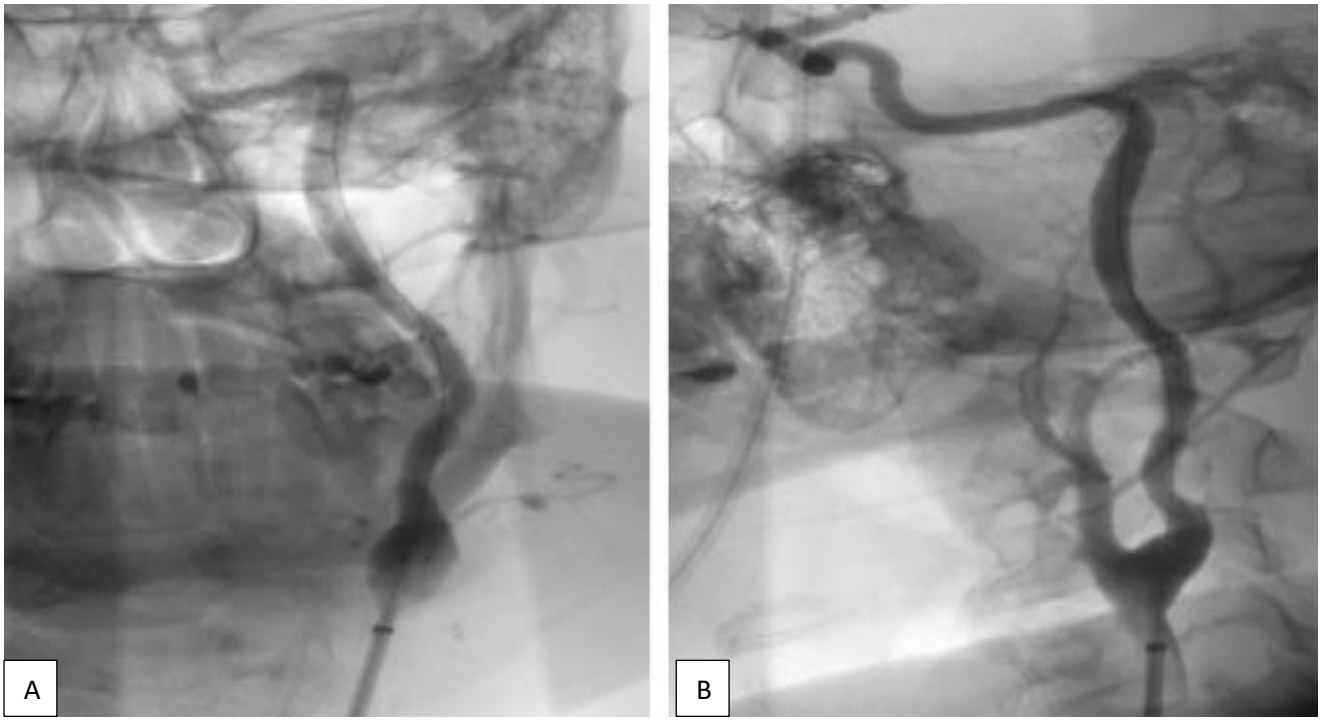

Figure 5 (A and B): Digital subtraction angiography after endovascular treatment of left internal carotid artery aneurysm.

*Post-interventional angiography confirms complete exclusion of the aneurysm sac with preserved antegrade flow and maintained patency of the left internal carotid artery.

DISCUSSION

Extracranial ICA aneurysms, although rare, represent clinically significant lesions due to their potential for embolic complications and neurological sequelae. Current evidence supports active management in most cases, even in asymptomatic patients.

Open surgical repair remains a well-established treatment modality, offering durable results when anatomical conditions are favorable. However, lesions located at the high cervical level pose a distinct challenge. Limited exposure, proximity to cranial nerves, and difficulty in achieving distal control significantly increase procedural risk.[1] The present case exemplifies these limitations, where intraoperative findings precluded safe continuation of open reconstruction.

Endovascular therapy has emerged as a valuable alternative, particularly in anatomically complex cases. Covered stent grafts enable exclusion of the aneurysm while preserving arterial continuity, without the need for extensive dissection.

Systematic reviews and clinical studies have demonstrated high technical success rates and favorable outcomes associated with this approach.[2,3] While open repair remains the gold standard in accessible lesions, endovascular approaches offer a less invasive option with comparable short-term outcomes, especially in anatomically challenging cases.

In the present case, the transition from an open to an endovascular strategy was guided by intraoperative judgment. This staged approach allowed for safe and effective management of a lesion that was not amenable to conventional surgery. The favorable clinical and radiological outcomes observed are consistent with contemporary reports in the literature.[4]

Careful patient selection and anatomical assessment remain essential when determining the optimal treatment modality.

This case underscores the importance of individualized treatment planning and adaptability in vascular surgery. In selected patients, endovascular intervention should be considered not only as an alternative but as a primary strategy when anatomical constraints limit surgical feasibility.

CONCLUSION

Management of high cervical extracranial ICA aneurysms can be challenging. When open surgical repair is not feasible, endovascular treatment offers a safe and effective alternative. Careful preoperative assessment and intraoperative decision-making are essential in optimizing patient outcomes.

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