

# Acute endovascular repair of iatrogenic right internal carotid arterial laceration

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## Abstract

Carotid arterial bleeding is a feared and possible life-threatening complication of transsphenoidal surgery. We present a case of a meningioma that during resection had a serious complication with laceration of the internal carotid artery (ICA). These patients rarely undergo endovascular treatment, with indications mainly due to the development of pseudoaneurysms or penetrating trauma. However, endovascular treatment with covered stents of carotid arterial bleedings is a feasible alternative due to technical advances and smaller sized stentgrafts that expand treatment options.

**Keywords:** Meningioma, transsphenoidal surgery, arterial bleeding, stentgraft

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## Introduction

Transsphenoidal surgery is a common and safe procedure with a mortality rate <1%. However, a significant number of complications do occur (1). The risk of arterial injury cannot be completely eliminated, especially given the complexity in some cases. The most serious complication is laceration of the internal carotid artery (ICA), which includes severe peri- or postoperative bleeding, pseudoaneurysm, and possibly arterio-cavernous fistula (2). Immediate diagnosis and treatment is essential to prevent a fatal complication.

Surgical repair of these complications are difficult, but may include ligation of the ICA or reconstruction with bypass grafting. Also, surgical repair is associated with a high incidence of major complications such as death and stroke (3). Endovascular techniques have emerged as an important potential alternative and may allow for a less invasive repair; among these are the use of detachable balloons (4), flow diverter stenting (5), and different coiling techniques (6,7). However, there are few reports about the acutely employed endovascular stent repair of internal carotid artery injury. In this report we present the successful endovascular repair of a right-side internal carotid injury due to a perioperative laceration by using a covered stent.

## Case report

A previously healthy 58-year-old man was admitted to an ear, nose, and throat (ENT) specialist due to a right-side serous otitis media and hearing loss. Initially he was treated medically but with no significant improvement of his condition. He was referred for a magnetic resonance imaging (MRI) examination, which showed a right-side contrast-enhancing meningeal skull base expansion with tumor growth into the prepontine cistern, sphenoidal sinus, and along the right ICA (Fig. 1).

A transsphenoidal biopsy from the tumor concluded with a meningo-epithelial meningioma (WHO grade I), and he was scheduled for two-step surgery, starting with the tumor component medial of the ICA. He was admitted to the neurosurgery department in good physical condition, and with a normal neurological and hormonal status. Surgery was performed through a transnasal transsphenoidal approach from the right side. The tumor was fibrotic and during resection a profuse arterial hemorrhage occurred. Hemostasis was achieved temporarily by surgical packing and the patient was admitted to angiography.

Through a right-side femoral access, a 6 French (F) sheath (Boston Scientific, Sunnyvale, CA, USA) was placed and a 5 F right coronary catheter (Boston Scientific, Sunnyvale, CA, USA) was used for selective angiography. The angiogram

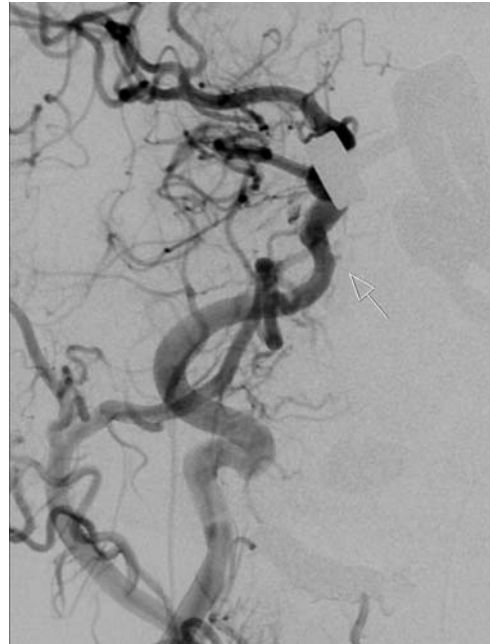


**Fig. 1** Preoperative MRI showed a tumor on the right base of the skull with growth into the prepontine cistern and sphenoidal sinus bilaterally. The tumor was also encasing the right ICA

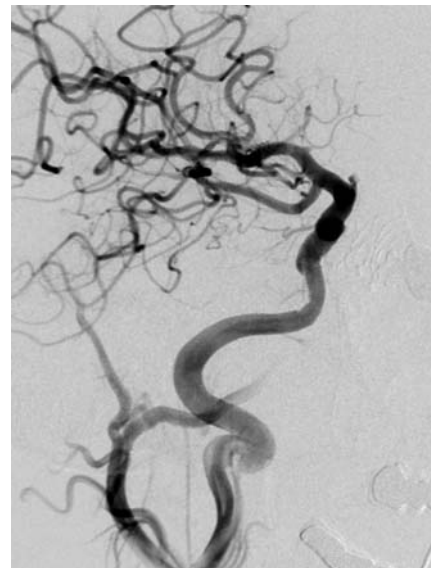
showed some extravasation of the contrast medium, shaped as a small irregular pseudoaneurysm at the distal part of the C3 segment of the right ICA (Fig. 2). The extravasation was limited due to the temporary hemostasis. The angiogram also revealed a small proximal segment of the anterior cerebral artery (A1) and a large posterior communicating artery (PCOM) on the right side. Due to tortuous anatomy, a 0.014-inch floppy guidewire was replaced by a 0.0035-inch hydrophilic wire (Boston Scientific, Sunnyvale, CA, USA). With some manipulation a stentgraft (4.5/16 mm Jostent Graftmaster; Abbott Laboratories, Abbott Park, IL, USA) was placed and deployed with balloon dilatation, and the bleeding was immediately occluded (Fig. 3). There were no thromboembolic complications and the puncture site was closed successfully. Because of the perioperative bleeding, administration of intra-arterial Heparin (5000 IE) was delayed until the stentgraft was in place. The patient recovered uneventfully and a computed tomography (CT) scan the following day showed an open stentgraft and no bleeding was seen (Fig. 4a). The CT also confirmed the small A1 (Fig. 4b) and the large PCOM on the right side, as well as a hypoplastic proximal segment of the right posterior cerebral artery (P1). He continued on Plavix 75 mg daily for a period of 6 months; during this period no events related to the covered stent occurred.

## Discussion

Although high survival rates are reported for WHO grade I meningiomas, complications and long-term disability occur



**Fig. 2** After complications during surgery an acute angiogram showed some contrast medium extravasation from the distal part of the C3 segment of the right ICA (arrow). Hemostasis was already achieved temporarily by surgical packing



**Fig. 3** A control angiogram showed the stentgraft in place and the leakage totally occluded

frequently decreasing the quality of life (8). Meningiomas located on the base of the skull are classified as “high-risk location” in the CLASS classification (9). The most common management is surgical excision, and to achieve an as extensive resection as possible while minimizing neurological morbidity. Internal carotid injuries are rare, especially lacerations related to intracranial operations. Endovascular treatment options are considered mainly in cases of pseudoaneurysms or penetrating traumas.

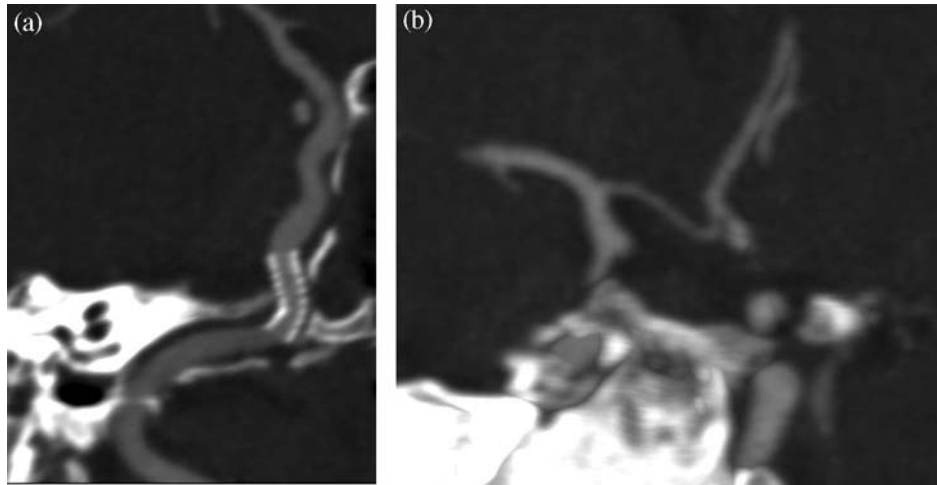


Fig. 4 (a) A follow-up CT the next day showed the stentgraft in place and no further bleeding was seen. (b) The follow-up CT also confirmed the small right A1

Carotid arterial bleeding is a feared and possible life-threatening complication of surgery on the base of the skull. Traditional endovascular treatment has been arterial occlusion distally and proximally to the injury, eventually combined with bypass surgery. Lately, stentgrafts have become a more usable option. In general self-expandable stentgrafts are regarded as more flexible, but these are less available in small sizes. Complications are rare, but include dissection, distal embolus, perforation, or occlusion. In our patient the intracerebral arterial anomaly and a possible complicating occlusion of the ICA could have led to infarction of parts or the entire right cerebral hemisphere, however, due to the life-threatening situation it was not an option to cancel the attempt of endovascular treatment.

Endovascular treatment with covered stents has for some time successfully been used to treat subclavian and axillary arterial injuries (10), also of the common carotid artery (11). However, due to technical advances and smaller sized self-expandable stentgrafts that expand treatment options, endovascular treatment with covered stents even of internal carotid arterial bleedings is a feasible alternative. The appeal for endovascular treatment in our case is the surgical inaccessibility of the cavernous segment of the carotid artery and limited options for surgical repair, as well as carotid artery preservation. This type of therapy should be particularly appealing when multiple traumatic injuries or medical co-morbid conditions exist.

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