

Short Title:

Stenting for ICA injury in transsphenoidal surgery

A short report

**Title:**

Emergency placement of a self-expandable covered-stent for carotid artery injury during transsphenoidal surgery. Short report.

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## **Abstract**

A patient sustained internal carotid artery (ICA) injury during transsphenoidal surgery. Bleeding from the resultant pseudoaneurysm was not fully controlled by surgical packing. Emergency endovascular deployment over the injured ICA segment of a self-expandable covered-stent ('Symbiot' stent), initially designed for use in coronary saphenous vein-graft, was successful in securing haemostasis.

## **Key words**

internal carotid artery

pseudoaneurysm.

stent

transsphenoidal surgery

endovascular therapy

## **Emergency placement of a self-expandable covered-stent for carotid artery injury during transsphenoidal surgery. Short report.**

### **Introduction**

Internal carotid artery (ICA) injury is an uncommon but potentially fatal complication of transsphenoidal surgery.<sup>1</sup> We report one case in which bleeding from an injured ICA during transsphenoidal removal of a pituitary adenoma could not be fully controlled by surgical packing, and definitive haemostasis was achieved by endovascular deployment of a covered-stent originally designed for use in coronary saphenous vein grafts.

### **Case report**

A 51-year-old woman had an incidental non-functioning pituitary macroadenoma, which exhibited bilateral ICA encasement. (Figure 1) During transsphenoidal tumour removal, the right ICA was accidentally injured. Surgical packing was performed using cotton pledgets within the pituitary fossa. Haemostasis was partially controlled after twenty minutes of pressure exerted via surgical instruments although there was still continuous slow oozing of blood. The sphenoidal sinus was packed with cotton pledgets and the nasal cavities were packed with Mericel (Xomed Surgical Products, Jacksonville, FL). The patient was able to maintain stable haemodynamics with fluid resuscitation. The operation was terminated and the patient was immediately transferred to the angiographic suite under general anaesthesia. Angiography revealed a pseudoaneurysm at the cavernous portion of the right ICA. (Figure 2a) Endovascular stenting was performed immediately. A 4.0 x 20.0 mm Symbiot stent

(Boston Scientific/Scimed, Maple Grove, MN) was placed under road-map guidance across the injured ICA segment. No balloon assistance was required. Repeated angiography confirmed patency of the ICA and obliteration of the pseudoaneurysm. (Figure 2b) The patient received aspirin, clopidogrel and systemic heparinization to prevent stent thrombosis afterwards. The heparin was stopped the next day, the sella was re-explored and packing materials from the previous operation were removed. There was no further arterial bleeding but further attempt to remove the residual tumours was abandoned due to troublesome bleeding secondary to the effect of the anti-platelet agents. The patient made a good recovery and later received external irradiation. Follow-up magnetic resonance angiography at three months showed that the ICA was patent and without recurrent pseudoaneurysm.

## **Discussion**

Endovascular embolization of ICA pseudoaneurysm following transsphenoidal surgery using detachable coil has been described.<sup>2</sup> However, the lack of a true wall in these pseudoaneurysms and the absence of normal healthy tissue within the sella may result in extrusion of the coil and enlargement of the pseudoaneurysm.<sup>3</sup> Endovascular stenting is a viable alternative. Because the carotid siphon is tortuous, conventional Wallstents may not conform well and may cause kinking.<sup>4</sup> Treatment of ICA injuries following transsphenoidal surgery has been described using the JoStent coronary stent-graft (Jomed International, Helsingborg, Sweden)<sup>5</sup> In one report of using balloon-assisted deployment of the JoStent, arterial spasm was encountered, possibly due to incompatibility between the

stent and the shape of the ICA.<sup>6</sup> Moreover, the pressure induced during balloon inflation may potentially weaken the arterial wall, causing pseudoaneurysm enlargement.

The covered-stent used in the present case is self-expandable and does not require balloon-assisted deployment. It is relatively small and flexible for intracranial use. The stent is covered on both the luminal and abluminal sides with highly porous polytetrafluoroethylene which may decrease distal embolization during stent deployment by trapping debris, as well as serving as a physical barrier to prevent neointimal proliferation and restenosis.<sup>7</sup> This stent also causes relatively few artifacts on follow-up MRI. Stent thrombosis and infection are potential complications. Unlike the situation after coil embolization, surgical re-exploration is theoretically feasible and safer after stenting. In practice, however, multiple anti-platelet agents are required after stenting to prevent stent thrombosis, and in the present case, surgical re-exploration of the tumour was met with very troublesome bleeding. Indeed, the need for anti-platelet agents after stenting may increase the risk of post-operative haemorrhages and must be taken into consideration especially after major neurosurgical procedure.

## **Conclusion**

The present case demonstrated the use of an endovascular covered-stent in the urgent treatment of hemorrhage from cavernous ICA injury following transsphenoidal surgery. The covered-stent described has the advantages of being flexible and could be readily

navigated across the carotid siphon. It is self-expandable and does not carry the risk of arterial injury associated with balloon deployment.

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## **Figure Legend**

Figure 1: Coronal contrasted MR image of the pituitary adenoma demonstrating bilateral ICA encasement.

Figure 2a: Digital subtraction angiography (DSA) showing the pseudoaneurysm (*arrow*) at the cavernous portion of the right ICA.

Figure 2b: DSA after stent deployment showing obliteration of the pseudoaneurysm.

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## **Authors' contribution**

1. Gilberto Ka Kit Leung – main writer of article
2. Kai Ming Auyeung – opinion on Symbiot stent
3. Wai Man Lui – opinion on endovascular technology
4. Yiu Wah Fan.- opinion on the principles of management