Catastrophic Internal Carotid Artery Injury in Endoscopic Transsphenoidal Surgery: a Case Report

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Abstract

Internal carotid artery (ICA) injury during endoscopic transsphenoidal surgery (ETSS) is a rare but critical complication. A 69-year-old man underwent ETSS for a nonfunctioning pituitary macroadenoma. He had intraoperatively severe bleeding that occurred from a suspected rupture of the right paraclinoid ICA, resulting in 3500 ml of blood loss and hypotension. After controlled bleeding, he was transferred to the angiographic suite, where cerebral angiography confirmed the injury. Definitive management involved ICA balloon sacrifice to stop the bleeding. Postoperatively, the patient was sedated in the intensive care unit for three days to ensure vascular stability. Sedation was managed with propofol. The patient was extubated on the third day with no significant neurological deficits except for right visual field loss. This case shows the critical role of a coordinated multidisciplinary approach in managing ICA injury during ETSS, demonstrating how prompt action can minimize complications.

Keywords: anesthetic management, endoscopic transsphenoidal surgery, internal carotid artery injury

Introduction

Endoscopic transsphenoidal surgery (ETSS) is commonly used to treat pituitary tumors and other skull base conditions.[1] ICA injury during ETSS, though rare, is a catastrophic event that can occur unpredictably. The incidence of ICA injury during TSS ranged from 0.34-2.6%.[2] It can cause significant problems, such as stroke or death, with a reported mortality rate of around 10%.[3]

A 69-year-old Thai man with an incidental nonfunctioning pituitary macroadenoma underwent elective ETSS. He has the underlying disease of hypertension and a history of amaurosis fugax. This patient was under general anesthesia with standard monitoring, including an arterial line for real-time blood pressure and blood sampling. We had a large bore intravenous line in place and had booked the ICU postop with one unit of group match blood component as usual.

During the removal of the sphenoid septum, brisk arterial bleeding occurred, leading to a sudden blood loss of 3500 milliliters

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and episodes of hypotension. The bleeding was suspected to result from a rupture of the right paraclinoid ICA. Hemorrhage control was achieved using crushed muscle from the right upper thigh. When the unexpected occurred, we had to request more blood due to arterial bleeding and establish additional intravenous lines. Blood components and fluids were rapidly administered. Initially, one unit of packed red blood cells (PRC) was ordered preoperatively. Following massive intraoperative blood loss, an emergency request was made for four additional units of PRC and four units of fresh frozen plasma (FFP). Upon arrival, four units of PRC were rapidly warmed and transfused. Concurrently, the patient received 2,800 mL of crystalloid and 1,500 mL of colloid fluids. Five PRC and four FFP units were administered, with the remaining FFP transfused in the interventional radiology unit. Throughout the intraoperative period, the patient's systolic and diastolic blood pressures remained within the range of 100-110 mmHg and 50-60 mmHg, respectively, with a mean arterial pressure (MAP) of approximately 70-80 mmHg. Heart rate was stable at 70-75 beats/min, and other vital signs remained within normal limits. Ephedrine (total 9 mg IV) was intermittently administered to maintain MAP above 65 mmHg.

The interventionist was alerted, and meanwhile, the anesthesiology team prepared for patient transfer. Once stabilized, the patient was moved to the angiographic suite. A cerebral angiogram was performed under general anesthesia, with blood pressure controlled to ensure adequate cerebral perfusion pressure. After a discussion between the interventionist and neurosurgeon, ICA balloon sacrifice was deemed necessary to secure the bleeding at the right proximal ICA. Complete occlusion of the proximal right ICA and the meningo-ophthalmic anastomosis was achieved.

The patient remained intubated and sedated in the intensive care unit (ICU) as planned, with immobilization maintained for three days to protect the repaired ICA. Sedation was stopped, and the patient was successfully extubated on postoperative day three, as originally planned. Neurological assessments were limited to minimizing movement, with pupil reactions being the only available evaluation method. Propofol infusion and bispectral index (BIS) monitoring were chosen for sedation management.

On the first night, more than 100 mcg/kg/min of propofol was administered, keeping the BIS between 30-50. On post-operative day (POD) 1, the propofol requirement was reduced to approximately 80 mcg/kg/min. The pupils, measuring 2 mm, showed slight reactions to light in both eyes. Vital signs and laboratory results were within normal ranges. On POD 2, sedation with propofol was continued, and the patient's vital signs remained stable. Tracheal extubation was performed on POD 3, and the patient exhibited no other neurological deficits except for a loss of vision in the right visual field, which was the new deficit.

Discussion

ICA injury during ESS, though rare, is a catastrophic event that can occur unpredictably. The incidence of ICA injury during TSS ranged

from 0.34-2.6%.[2] The arterial bleeding was massive, and the operation field was minimal, making it extremely difficult to identify the bleeding lesion. There is still no consensus on the best management for ICA injuries.[4] Upon the occurrence of the arterial bleeding, the surgeon decided to control the bleeding lesion by crushing muscle from the right upper thigh. This decision effectively controlled the bleeding. Our multidisciplinary team's experience and our instruments' readiness were crucial in this situation.

During the event, the blood pressure quickly fell due to the unidentified arterial bleeding. With the patient in a state of massive hypovolemic shock, our primary goal was to maintain stable hemodynamics to ensure adequate organ perfusion, including cerebral perfusion pressure. Once the bleeding was secured, we were able to maintain normal blood pressure to ensure adequate CPP throughout the intraoperative and interventional neuroradiology period.[4-6]

At ICU, the patient was planned to lay still on the bed to prevent rebleeding for three days. The only way to check a neurological exam is by checking pupil reactivity. So, an anesthesiologist was consulted for sedation and paralysis if we needed to. On the first night, the propofol requirement is significant. We discussed the risk of propofol infusion syndrome with the surgeon due to the potential for over-infusion, and muscle relaxants were considered only, if necessary, since neuromuscular blocking drugs do not impact the pupillary light reflex. For the rest of the recovery period, he proceeded as planned.

ICA injury during transsphenoidal surgery can have serious consequences. Managing ICA injuries during surgery is very difficult due to the small surgical area and the arterial bleeding require quick decisions and multidisciplinary with interventional radiology and intensive care. Some patients may suffer fatal brainstem failure and multiple cerebral infarcts despite active postoperative management, while others may experience only transient or no neurological deficits.[2] These variations show the unpredictable and potentially severe nature of ICA injuries, emphasizing the importance of rapid intervention and a multidisciplinary approach to optimize patient outcomes.

Conclusion

During this critical event, the prompt actions of an experienced team were crucial in reducing morbidity and mortality, leading to a successful outcome.

References

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