

Traumatic Pseudoaneurysm of Cavernous Internal Carotid Artery following Trans-nasal Endoscopic Decompression of the Optic Nerve

Manmohan Singh MCh, AK Mahapatra MCh

Department of Neurosurgery, All India Institute of Medical Sciences, New Delhi – 110 029

Abstract : Traumatic intracranial pseudoaneurysms constitute less than 1% of all intracranial aneurysms. We describe a young patient of head injury, who developed traumatic pseudoaneurysms of cavernous internal carotid artery (ICA) following trans nasal decompression of optic canal for optic nerve compression. Trapping of aneurysm following failed balloon embolization treated the patient successfully.

Keywords : head injury, endoscopic decompression, internal carotid artery, optic nerve injury, traumatic pseudoaneurysm

Introduction

Traumatic intracranial aneurysms are rare and their occurrences can usually be assumed in the presence of significant head injury, unusual location and rather unique radiological findings. Traumatic intracranial aneurysms are highly unstable lesions that may rupture within minutes after formation or remain quiescent for several weeks and may manifest with delayed hemorrhage and neurological deficits¹. Traumatic intracranial aneurysms occur most frequently after blunt or penetrating head injuries²⁻⁵, but they also can be caused by iatrogenic arterial injury during surgical procedures, such as aneurysm clipping⁶, tumor removal⁷, bypass surgery⁸, transsphenoidal surgery⁹ and other neurosurgical procedures¹⁰. We describe a case of traumatic pseudoaneurysm of cavernous internal carotid artery (ICA) in a patient of head injury with optic nerve injury, who underwent trans-nasal decompression of optic canal and developed pseudoaneurysm of cavernous ICA following intraoperative injury to cavernous ICA.

Case Report

A 24-year-old male patient was referred to our institute in the emergency department with epistaxis with nasal packs *in situ*. This young patient had met with an accident two months back and suffered head injury along with right optic nerve injury. He was blind in his right eye. This patient was managed in another hospital for his injuries. He was investigated there and CT head and orbits revealed bony fragments of medial orbital wall near the apex and were

impinging upon the optic nerve (Figure 1). The patient was evaluated by the ENT surgeons and was taken up for emergency surgical decompression of optic nerve. Trans-nasal endoscopic optic canal decompression was carried out. During the surgical decompression, there was sudden acute bleeding, the origin of which could not be seen. Therefore packing of posterior ethmoid sinuses and sphenoid sinus with muscle and fat was carried out. The patient tolerated this procedure and was discharged after one week. His vision did not improve following this surgery. Three weeks later the patient at home developed sudden onset of severe epistaxis from his right nostril, which led to shock. He was immediately rushed to the same hospital and he was resuscitated and nasal packing was done with roll gauze. The patient underwent CT angiogram and was found to have cavernous ICA pseudoaneurysm. He was re-explored and re-packing of sphenoid and ethmoid sinus was done. Patient recovered and was subsequently discharged. Four weeks later, he had repeated bouts of epistaxis from his right nostril and controlled with nasal packing with roll gauze and was referred to our institute. Angiogram revealed lobulated pseudoaneurysm of cavernous segment of internal carotid artery projecting into the sphenoid sinus (Figure 2). There was good cross circulation through the circle of Willis. Right middle cerebral and anterior cerebral arteries were filling from opposite ICA and posterior cerebral artery on cross compression study. Patient was subjected to balloon occlusion of cavernous ICA: one balloon was placed across the neck of aneurysm in the cavernous ICA while the second balloon was kept in the cervical ICA, in case the balloon in the cavernous ICA deflates (Figure 3). Check angiogram showed no filling of aneurysm by injection into the left ICA. Patient tolerated this procedure well. Nasal packs

Address for correspondence : Dr Manmohan Singh, Room No. 719
CN Centre, Dept of Neurosurgery All India Institute of Medical Sciences,
New Delhi – 110 029, Phone – 011-26588700-ext 4914
E-mail : manmohan.1972@yahoo.co.uk

were removed after 24 hours and there was no epistaxis. Next day patient underwent fluoroscopic examination to evaluate the status of balloons. The balloon in the cavernous ICA got partially deflated by the balloon in the cervical ICA was well inflated. There was recurrence of epistaxis on the same day, for which the patient was operated and cervical ICA was ligated just distal to bifurcation. Right pterional craniotomy was done and clipping of intracranial ICA was done proximal to posterior communicating artery, thus trapping the pseudoaneurysm. Patient tolerated this procedure well and was discharged after five days. After six months' follow up, he was doing well with no further episodes of any epistaxis. He however remained blind in his right eye.

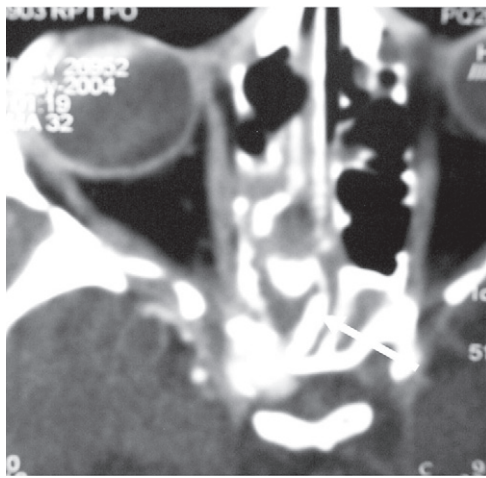


FIGURE 1. Fracture fragments involving right ethmoid bone, sphenoid bone at orbital apex (white arrow)



FIGURE 2. Pseudoaneurysm of cavernous internal carotid artery projecting into sphenoid sinus

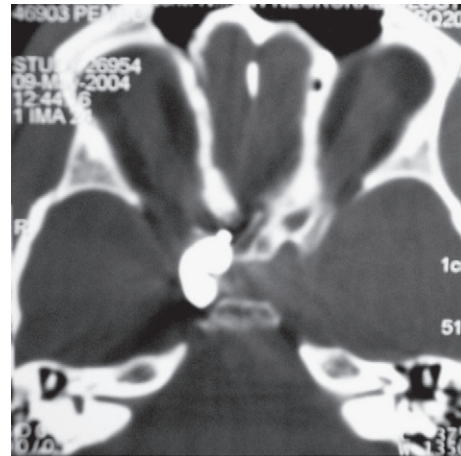


FIGURE 3. Balloon in the cavernous internal carotid artery (white arrow)

DISCUSSION

Traumatic intracranial aneurysms are rare sequelae of head trauma¹¹. The usual time interval between trauma and diagnosis of aneurysm ranges from few hours to as long as 10 years but most present within 2-3 weeks of trauma¹¹. Majority of the traumatic intracranial aneurysms, though rare, occur more frequently in males and are present at unusual arterial sites¹². These aneurysms are seldom multiple and occur in the peripheral cerebral vasculature¹³. Direct injury usually results from penetrating cranial trauma or in driven bony fragments, which leads to vessel wall injury and leads to pseudoaneurysm formation. The natural course of traumatic pseudoaneurysm is difficult to define. Some aneurysms expand gradually and rupture within variable period of time, whereas others spontaneously shrink and disappear^{2,10}. However, even if the lesion shrinks initially, it can expand later.

Iatrogenic trauma to the vessel wall during the surgery is also a well described cause of intracranial pseudoaneurysm. Saito et al¹⁴ described a traumatic aneurysm in the dorsal internal carotid artery, which developed and ruptured two months after the removal of the tuberculum sellae meningioma. Koji et al¹⁵ described a case, where during surgery there was injury to middle cerebral artery while clipping an anterior communicating artery aneurysm, which led to the development of pseudoaneurysm of middle cerebral artery later. The aneurysm was treated with coil embolization. Koji et al¹⁵ also described a case of anterior communicating artery pseudoaneurysm following excision of tuberculum sellae meningioma.

In the present case, the patient might have an

intraoperative injury to cavernous ICA. Another possibility is that the patient had also suffered a significant head injury along with multiple fractures of posterior ethmoids and sphenoid bone which itself could have lead to pseudoaneurysm formation. The injury was sufficient enough to produce pseudoaneurysm of the cavernous IAC and the aneurysm might have manifested during the initial surgery of optic canal decompression carried out in the previous institute.

The aneurysm was well treated with trapping in the present case. Some authors have also reported successful neck clipping of pseudoaneurysms¹⁶, but barring very few pseudoaneurysms, it may not be feasible to obtain proximal and distal control and to find a neck suitable for clipping². Even if neck clipping is successful during surgery, permanent repair is not guaranteed. Trapping or occlusion of the proximal artery with or without extracranial-intracranial bypass has been the procedure of choice for most pseudoaneurysms^{2,7,9}. Uzan et al⁴ analysed 12 cases of intracranial traumatic aneurysms. Nine of the 12 cases were treated with endovascular occlusion of parent artery. Detachable balloons were used in seven cases and GDC's were used in two. Few reports are available on the intraneurysmal embolization of intradural pseudoaneurysms¹⁶. Catheterisation of the pseudoaneurysm is difficult, as the ostium of aneurysm is not at vessel bifurcation(which is subjected to flow along the long axis of the parent artery) but rather on lateral wall of parent artery. The wall of the pseudoaneurysm is very fragile and can rupture during catheterization. Coil embolization of the pseudoaneurysms should be done carefully in selected cases. In the present scenario, a variety of techniques are available to treat traumatic intracranial pseudoaneurysms. The optimal treatment must be individualized for each case. These aneurysms must be diagnosed and treated early, as the mortality rate following bleed is high and ranges between 31% and 54%¹¹.

CONCLUSION

Traumatic cerebral aneurysms may run an unpredictable course and catastrophic rupture is usually a late event. A high index of suspicion should be maintained in head injury patients with unilateral blindness for delayed pseudoaneurysm genesis and rupture. A cerebral arteriogram should be obtained when significant subarachnoid hemorrhage or intraparenchymal hematomas are present, when missiles traverse major arteries, or when the pterional or cranioorbitofacial regions are violated. Treatment should be prompt and rationalized to the individual need and the expertise of the treating team.

REFERENCES

1. Alvarez JA, Bambakidis N, Takaoka Y. Delayed rupture of traumatic intracranial pseudoaneurysm in a child following gunshot wound to the head. *J Craniomaxillofac Trauma* 1999;5:39-44.
2. Amirjamshidi A, Rahmat H, Abbassioun K. Traumatic aneurysm and arteriovenous fistulas of intracranial vessels associated with penetrating head injuries occurring during war : Principals and pitfalls in diagnosis and management. *J Neurosurg* 1996;84:769-80.
3. Nakai H, Kawata Y, Tamura Y et al. A case of traumatic anterior cerebral artery aneurysm following the penetration of the skull base by an iron rod. *No Shinkei Geka* (Japanese) 1999;27:583-9.
4. Uzan M, Cantasdemir M, Seckin MS, et al. Traumatic intracranial carotid tree aneurysms. *Neurosurgery* 1998;43:1314-22.
5. Bhatoe HS, Suryanarayana KV, Gill HS. Recurrent massive epistaxis due to traumatic intracavernous internal carotid artery aneurysm. *J Laryngol Otol* 1995; 109: 650-2.
6. Hayashi A, Oda M, Sekino T, Fujitsu K. Traumatic aneurysm occurring after surgical procedure of large cerebral aneurysm *No Shinkei Geka*(Japanese) 1986;14:881-5.
7. Yamaura A, Makino H, Hachisu H, Takemiya S. Secondary aneurysm due to arterial injury during surgical procedures. *Surg Neurol* 1978;10:327-33.
8. Parent AD, Smith RR. Traumatic aneurysm complicating EC-intracranial bypass : successful surgical clipping. *Surg Neurol* 1981;15:229-31.
9. Ahuja A, Guterman LR, Hopkins LN. Carotid cavernous fistula and false aneurysm of the cavernous carotid artery : complication of transphenoidal surgery. *Neurosurgery* 1992;31:774-9.
10. Dario A, Dorizzi A, Scamoni C, Cerati M, Grimaldi GB. Iatrogenic intracranial aneurysm : case report and review of literature. *J Neurosurg Spinal cord injury* 1997;41:195-202.
11. Benoit BG, Wortzman G. Traumatic cerebral aneurysms-clinical features and natural history. *J Neurol Neurosurg Psychiat* 1973;36:127-38.
12. Dong WK, Hyun JH, Hyeong JY, Yong K. Ruptured pseudoaneurysm after minor head injury, is it traumatic? *J Korean Neurosurg Soc* 2004;35:324-7.
13. Dowd CG, Awasthi D. Management of infectious and traumatic intracranial aneurysms. In : Bajter HH, Loftus CM(eds): Textbook of neurological surgery. Philadelphia, Baltimore, Lippincott Williams & Wilkins, 2002;vol3:pp2473-80.
14. Saito R, Yazaki T, Kawase T, Toya S. Traumatic intracranial aneurysms after removal of tuberculoma sellae meningioma : case report. *No Shinkei Geka* (Japanese)1992;20:973-7.
15. Koji T, Noboru K, Hiroyuki N, Isao D, Takashi O. Coil embolization of intradural pseudoaneurysm caused by arterial injury during surgery : report of two cases. *Am J Neuroradiol* 2002;22:35-39.
16. Lempert TE, Halbach VV, Higashida RT, et al. Endovascular treatment of pseudoaneurysms with electrolytically detachable coils. *Am J Neuroradiol* 1998;19:907-11.