

Coil Embolisation of Post Traumatic Giant Supraclinoid Pseudoaneurysm Presenting as Carotid Cavernous Fistula

Abstract

This report documents the occurrence, diagnosis and treatment of a 29 year-old male patient who presented with progressive swelling of the left eye with associated progressive loss of vision, three months after sustaining a closed head injury in a road traffic accident. Magnetic resonance imaging (MRI) showed a large, ill-defined lesion in the left supraclinoid and paraclinoid region with variable contrast enhancement. A four vessel Digital Subtraction Angiography (DSA) showed a large, supraclinoid pseudoaneurysm which had ruptured inferiorly into the roof of cavernous sinus, forming direct carotid cavernous fistula (CCF) which lead to dilatation of the superior ophthalmic vein and subsequent peri-orbital oedema and chemosis of conjunctiva. Complete obliteration of the indirect CCF was achieved by coiling of the aneurysm alone. During follow up, patient reported a significant improvement in vision and follow up DSA after one year shows no recurrence with this technique.

Keywords: Carotid cavernous-fistula, coil embolisation, traumatic cerebral pseudoaneurysm, supraclinoid

Introduction

Carotid cavernous fistula (CCF) occurring secondary to a posttraumatic supraclinoid pseudoaneurysm of the internal carotid artery (ICA) is a rare entity, and a thorough PubMed search has revealed only 6 reported cases.^[1-3] In most cases, CCF occurs secondary to head injuries, rupture of cavernous segment aneurysm or from trauma during transsphenoidal surgery.^[4] Most of the cases were previously treated by either trapping alone, trapping combined with controlled muscle embolization or insertion of a thrombogenic agent into the aneurysm. Although these procedures reported good postoperative outcomes, they were associated with significant morbidity and could not be used in all cases. Endovascular treatment allows placement of coils with or without stents which has shown significant effectiveness in the treatment of extracranial arterial pseudoaneurysms, dissections, and fistulas while preserving the flow through the parent artery. This case report describes a posttraumatic CCF secondary to giant supraclinoid pseudoaneurysm which was treated with coiling of the aneurysm alone as against previous case reports which

advocated coil embolization of both fistula and aneurysm.

Case Report

A 29-year-old male, while driving a car, sustained a closed head injury in a road traffic accident. The patient did not show any symptoms of a severe head injury immediately after the trauma and was treated symptomatically for other minor injuries. Computed tomography of the brain done then was suggestive of skull base fractures of greater wing of sphenoid, and there was no evidence of parenchymal injuries. The patient was discharged following symptomatic improvement. The patient reported to a tertiary care facility again 3 months after the injury with the complaints of progressive swelling of the left eye over the past 15 days with associated progressive loss of vision in the same eye for the past 10 days. Clinical examination revealed that the patient had severe periorbital edema and chemosis of conjunctiva with associated loss of vision (only perception of light) and restricted extraocular movements of the left eye with, as shown in Figure 1.

Magnetic resonance imaging (MRI) performed revealed a large, ill-defined lesion in the left supraclinoid and

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paraclinoid region with variable contrast enhancement. The patient was further investigated with a digital subtraction angiography (DSA), which showed a large 2.8 cm × 0.9 cm supraclinoid aneurysm which had ruptured inferiorly into the cavernous sinus forming a carotid-cavernous fistula (CCF) with an associated dilation of superior ophthalmic veins (SOVs) [Figure 2a and b].

The patient was then planned for coiling of the supraclinoid pseudoaneurysm. Consent for procedure and have their data published was taken. A femoral microcatheter was passed to determine the origin of the aneurysm, which was observed to be proximal to the bifurcation of the ICA. The supraclinoid location of the aneurysm was confirmed as the aneurysm was deemed to be distal to the ophthalmic artery. Mild stenosis of the proximal portion of supraclinoid ICA was also observed. Complete obliteration of the CCF was achieved by coiling of the aneurysm alone [Figure 3].

There were no observed procedural complications. During follow-up, the patient reported an improvement in the vision (6/36) in his left eye. The patient has been followed up for 1 year now. Figure 4 showing DSA performed 1 year postoperatively which is suggestive of completely obliterated aneurysm and fistula and no recurrence.

Discussion

It is a common knowledge that intracranial pseudoaneurysms can develop as a result of head trauma. The occurrence of such cases is very rare and accounts for <1% of the reported intracranial aneurysms.^[1] Cases of head injury which involve the development of an associated CCF secondary to posttraumatic pseudoaneurysm are even rarer.^[2] We believe that the pseudoaneurysm was posttraumatic in origin due to the patient's recent history of trauma, patient's young age, the presence of a concomitant CCF (direct type), irregular outline of the aneurysm, absence of neck, delayed filling and emptying of the sac, and the location of the aneurysm away from the branching point of the ICA. These signs clearly point to a traumatic origin, as observed by many authors.^[2,3,5]

Intracranial pseudoaneurysms can occur in patients with closed head injury either due to shear or rotational injury. The mechanisms causing traumatic aneurysm of the supraclinoid ICA can be direct injury to the ICA by a skull base fracture, overstretching or torsion of the ICA wall by movement of the brain following impact, and tearing by a nearby prominent bony structure or avulsion of a perforator. Traumatic formation of ICA aneurysms that are not immediately adjacent to fractures occurs in segments between points where the artery fixes to the skull



Figure 1: Left eye proptosis and chemosis



Figure 2: (a) Early filling of aneurysm at supraclinoid location. (b) Supraclinoid aneurysm communicating with cavernous sinus through the roof marked with an arrow

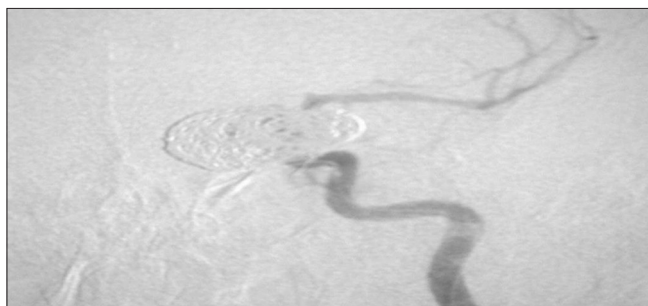


Figure 3: Complete occlusion of carotid-cavernous fistula following coiling of the aneurysm

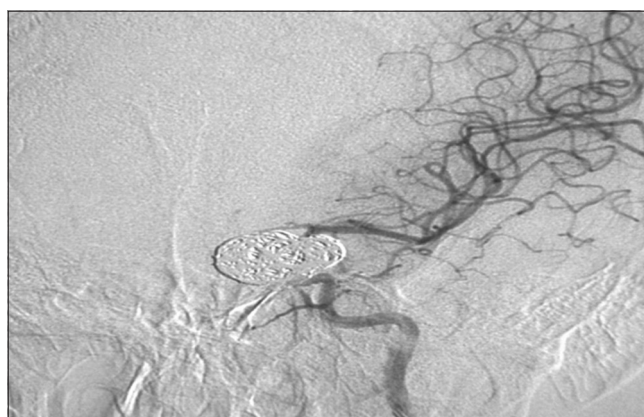


Figure 4: Follow-up digital subtraction angiography 1-year postcoiling of the aneurysm

and other elements. These points are the dura and carotid canal caudally; the ophthalmic artery anteriorly; posterior communicating artery posteriorly; and the origin of anterior and middle cerebral arteries cranially.^[6] In our case, the presence of stenosis just proximal to the bifurcation of ICA suggests dissection in the supraclinoid location leading to the formation of a pseudoaneurysm. It has been reported that the so formed aneurysms rupture within 2–3 weeks of the initial trauma, and they are associated with a high-mortality rate.^[2] In this case, rupture of the aneurysm was not observed even after 3 months of initial trauma.

Posttraumatic intracranial aneurysms are frequently false aneurysms (pseudoaneurysm), i.e., there is disruption across all layers of the arterial wall, and it is a hematoma in the surrounding tissue that prevents blood extravasation. It occurs most commonly in cavernous segment usually secondary to skull base fractures. In our case, it has occurred in the supraclinoid location.

CCF has a characteristic clinical presentation including proptosis, chemosis, ocular movement disorder due to 6th and/or 3rd nerve palsy, leading to double vision, retinal hemorrhages, reduced vision, pulsatile tinnitus, and bruit. These symptoms are related to venous overload of the primary draining veins, namely, the SOV and the inferior petrosal sinus. Congestion in the SOV results in chemosis, proptosis, and retinal hemorrhage and is probably involved in visual loss due to hypoperfusion of the optic nerve and the retina. The presence of a dilated SOV in the MRI and DSA both clearly explained that the symptoms of our patient were due to a CCF. In the present case, the traumatic ICA injury caused supraclinoid ICA dissection and pseudoaneurysm formation which ruptured inferiorly into the roof of cavernous sinus and caused the presentation of CCF with an ophthalmological manifestation. Supraclinoid segment pseudoaneurysms commonly present with subarachnoid hemorrhage and presentation as CCF is unusual and very few reports of these intradural pseudoaneurysms are known.^[7]

The ideal treatment for these types of supraclinoid pseudoaneurysm is to exclude the fistula from circulation, preserving the carotid flow using diverse endovascular techniques. Surgical clipping of pseudoaneurysms carries high risk in view of their fragile nature. Selective exclusion of the fistula and the pseudoaneurysm while preserving the parent artery is the treatment of choice in these cases. This can be achieved by coiling and glue embolization of the pseudoaneurysm and fistula tract which has been described by Cho *et al.* and Karanam *et al.*^[8,9] In our case, the posttraumatic supraclinoid pseudoaneurysm was treated

by coiling alone by transarterial approach, and it resulted in closure of the fistulous tract and improvement of patient symptomatology.

After thorough literature review, we were unable to find any published report where a posttraumatic supraclinoid ICA pseudoaneurysm ruptured inferiorly into the roof of cavernous sinus to give rise to a direct CCF which was successfully treated with coiling of the supraclinoid pseudoaneurysm alone.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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