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Case Report

Definitive management of ruptured cavernous internal carotid artery aneurysm

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Introduction

Ruptured cavernous internal carotid artery (ICA) aneurysm with non-traumatic etiology presenting with epistaxis is rare.^{1,2} Multiple treatment modalities such as endovascular balloon/stent-assisted coiling, flow diverter deployment, and parent artery occlusion (PAO) are tried in such cases in the past with variable results. Despite the available management protocols, there is always a debate to choose the best option to reduce the risk of rebleed and cause minimal residual patient disability. We discuss the definitive role of PAO in the management of such difficult aneurysms.

Case report

A 48-year-old female patient presented with a single episode of sudden onset of massive epistaxis (1.5 L of blood) from left nostril. The bleeding stopped spontaneously as abruptly as it started for which she underwent nasal packing and was referred to ENT surgeon of the referral hospital for further management. In our center she was hemodynamically stabilized by administration of IV fluids and two units of packed red blood cells. The patient was on regular medication for allergic rhinitis in the past. There was no history of diabetes, hypertension, local trauma or surgery.

The neurological examination was normal. Nasal endoscopy was essentially normal but a streak of clotted blood was seen from the left sphenoid sinus ostium to the choana. Non-contrast CT scan was suggestive of blood filling the left sphenoid sinus with small collection in the left maxillary sinus and a bony defect of the left superolateral wall of sphenoid sinus. CT angiography demonstrated a focal irregularity at the medial wall of anterior genu of cavernous segment of left ICA (Fig. 1a). MR angiography revealed a small partially thrombosed aneurysm from the cavernous segment of left ICA projecting medially into the sphenoid sinus (Fig. 1b).

Cerebral angiography (digital subtraction angiography) was performed and the size and geometry of the aneurysm was accurately evaluated (Fig. 1c). Left ophthalmic artery was seen arising approximately 4 mm distal to the neck of the aneurysm. A left ICA occlusion test showed adequate

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Fig. 1 – (a) CT angiography coronal section bone window shows bony defect in the left superolateral wall of the sphenoid sinus with small nibbling on the medial wall of left cavernous ICA. (b) TOF MR angiography base image showing left cavernous ICA aneurysm projecting into

cross-flow from the right ICA through anterior communicating aneurysm (ACOM) with an arterial delay of <1 s.

A multidisciplinary team including the otolaryngologist, neurologist, neurosurgeon, and interventional neuroradiologist was involved in evaluating the various treatment options. PAO was considered as the definitive treatment option subject to the patient's response to balloon test occlusion (BTO) and the same was communicated to the patient's relatives. In the scenario of failed BTO, the neurosurgical team was requested to be on standby for ECA-MCA bypass prior to PAO. After obtaining informed written consent, patient was subjected to BTO. Under close neurological observation a $4\text{ mm} \times 20\text{ mm}$ balloon was placed in left cervical ICA at C2–3 level and was inflated for 30 min followed by hypotensive challenge (blood pressure fall of 2/3rd of baseline BP) for 15 min. The patient tolerated BTO well with no neurodeficit. In view of negative BTO, it was decided to proceed for PAO of left ICA. Under general anesthesia 6F guiding catheter (Neuron, Penumbra) was placed in left cervical ICA. Two microcatheters (Echelon 14, Covidien) were navigated into left ICA, one proximal to the neck and the other distal to the neck of aneurysm. First coil was placed distally and left undetached till the end of procedure. Further coiling of the parent artery was performed through the proximal micro catheter using 7 platinum coils (Target 360, Stryker) (Fig. 2a).

Check angiogram revealed complete occlusion of left ICA with non-opacification of the aneurysm. Left common carotid artery run revealed reformation of left ophthalmic artery via left external carotid artery branches. Right ICA angiogram showed good cross flow into left anterior and middle cerebral artery through anterior communicating artery with no significant arterial and venous perfusion delay (Fig. 2b).

Post-procedure, mean arterial pressure of the patient was kept >100 mmHg for 48 h with the help of ionotropic drugs. However, patient still developed mild right upper limb and ipsilateral facial weakness with transcortical motor aphasia on day 1. MRI brain revealed few left side deep and superficial watershed infarcts with corresponding diffusion-perfusion mismatch. Gradually, the patient improved over 1 week with minimal residual neurological deficit. No further episodes of epistaxis occurred. Repeat MRI after 1 week did not show any progression of infarcts. MR perfusion study revealed normal rCBV and rCBF with mild increase in rMTT in left cerebral hemisphere (Fig. 2c). MR angiography revealed exclusion of the left cavernous ICA with adequate flow related enhancement across ACOM into left MCA and ACA. Patient was advised physiotherapy and was discharged on 9th day. Complete recovery of right-sided weakness noted at 1 month.

Discussion

Cavernous ICA aneurysms eroding into sphenoid sinus are relatively rare and always remain a challenge to treat. The nature of such aneurysms is still debatable and various

sphenoid sinus. (c) Cerebral angiogram oblique view reveals small aneurysm arising from anterior genu of left cavernous ICA projecting medially.

Fig. 2 – (a) Post-coiling left ICA angiogram shows complete non-opacification of aneurysmal segment of left cavernous ICA. (b) Post-coiling RICA cross flow angiogram shows slightly delayed arterial flow. (c) T2* perfusion rMTT map after 1 week shows raised rMTT in left MCA territory.

etiologies have been proposed. Some consider it true berry aneurysms but majority of such aneurysms are treated potentially as pseudoaneurysms.³ Role of conservative management of such bare aneurysms in present scenario is rarely considered. Urgent management needs to be decided, as the risk of rebleed is high.

Due to various available options of treatment, it is often difficult to narrow down to a particular mode of management. Such aneurysms in the past have been managed by sphenoid sinus packing with coiling of the aneurysmal sac,⁴ by placing flow diverter across the neck of aneurysm or PAO.⁵ Balloon or

stent-assisted coiling and flow diverter placement across the neck of the aneurysm had also been performed, however, with a potential risk of rebleed once the clots in the sphenoid sinus liquefy and the aneurysm is exposed to air.^{4,6} There are multiple series of cases of such aneurysms and intracranial, in which PAO was considered with optimal results.^{7,8}

Our patient had a history of allergic rhinitis. Despite being immunocompetent, fungal etiology would merit consideration. Option of management by coiling and stenting was tempting as it could have saved the parent artery, but the fact that we cannot be sure of preventing the unacceptable

torrential rebleed, BTO followed by PAO was planned. The plan for coiling with flow diverter placement and sphenoid sinus packing was kept as a second option if consent denied. The case was extensively discussed with the patient and their family members and they consented for PAO. We were also aware of the fact that in few cases after clearing BTO, patient can develop hypoperfusion/ischemic deficits,⁹ but we still decided to go ahead with PAO and take this risk against the risk of fatal rebleed. It is also well established that after PAO there is a delay in cerebral perfusion against the demand of the dominant left cerebral hemisphere.¹⁰ Therefore, after PAO of left ICA, mean arterial pressure of the patient was kept >100 mmHg. Despite that she developed an anticipated mild right-sided weakness and transcortical motor aphasia on day 1 which was recovered completely after 1 month.

Ruptured cavernous aneurysms should be treated aggressively and completely. The same needs to be emphasized to the patient's relatives. Even if patient fails BTO the neurosurgical team can play an important role by performing ECA-MCA bypass following which patient can be subjected to PAO. PAO remains a potential line of definite management of such aneurysms despite keeping the area of brain under risk of ischemia.

Conclusions

Non-traumatic cavernous ICA aneurysms eroding the sinus wall are uncommon. Prompt decision needs to be taken regarding further management after hemodynamic stabilization and attempt to save the parent artery may expose the patient to risk of rebleed and mortality. We consider PAO to be the first line of treatment. Even if patient fails BTO, PAO should be considered subsequent to ECA-MCA bypass surgery. If still such aneurysms have to be coiled then reinforcement with flow diverter placement and sphenoid sinus packing is must, to reduce the risk of fatal rebleed.

Conflicts of interest

The authors have none to declare.

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