A rare case of traumatic arteriovenous fistula between middle meningeal artery and spheno-parietal sinus who presented with only chronic red eye and literature review

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Abstract

Traumatic middle meningeal arteriovenous fistula with sphenoparietal sinus involvement is very rare. It is usually associated with skull fracture and intracranial hemorrhage. Ocular manifestation as sole presentation is extremely rare and only a few cases have been reported. We report a case of traumatic middle meningeal arteriovenous fistula with sphenoparietal sinus involvement 2 months after head trauma, presenting with left eye redness and dilated corkscrew episcleral vessel. CT scan showed venous outflow disturbance of the cavernous sinus with dilated ophthalmic veins. Transarterial endovascular embolisation of the fistula was done successfully; clinical and 6 months MRA resolution was noted. In conclusion, patient with traumatic middle meningeal arteriovenous fistula into the sphenoparietal sinus can present solely with subtle ocular symptoms. Transarterial endovascular embolisation is an effective procedure to close the fistula as seen in this case.

INTRODUCTION

Traumatic middle meningeal arteriovenous (AV) fistula was initially described by Fincher in 1957. Freckmann et al. reviewed cerebral angiography for 446 patients with head trauma and found that 1.8% of the patients have AV fistula of middle meningeal artery. This fistula caused abnormal communication between middle meningeal artery and dural sinuses, leading to arterialization of dural venous drainage system. Sphenoparietal sinus involvement in the middle meningeal artery AV fistula was rare.

As mentioned, sphenoparietal sinus involvement is rare. Patients usually present with intracranial hemorrhage and significant skull damage. Ocular manifestation usually occurs together with other serious neurological symptoms, and disease presentation with ocular manifestation in isolation is extremely rare and only been reported in a few cases.

CASE REPORT

A 74 year-old lady presented with one-month history of left eye redness that persisted despite topical antibiotic prescribed by general practitioner (Figure 1). She has history of minor head trauma one month prior to the eye redness. She slipped and bumped the left side of her head on the concrete wall. She denied loss of consciousness, only experiencing bruising and swelling of the left temporal side of her head that resolved weeks later.

Clinical examination revealed presence of dilated corkscrew episcleral conjunctival vessels at left eye (Figure 1). Visual acuity, extra ocular muscle movement, intraocular pressure, optic nerve function and fundus examination of left eye were normal. Right eye was also normal and other systemic examinations were unremarkable.

CT scan of the brain showed venous outflow disturbance in left cavernous sinus and dilated superior and inferior ophthalmic veins (Figure 2). Cerebral angiography showed AV fistula between left middle meningeal artery and left sphenoparietal sinus. The arterial blood drained from left sphenoparietal sinus into left cavernous sinus. Out flow of cavernous sinus was occluded and the blood was refluxed into superior and inferior ophthalmic veins instead of draining into...
superior and inferior petrosal sinuses (Figure 3).

Transarterial endovascular embolisation of the fistula were done via approach from femoral artery. The procedure was uneventful and successful. The patient’s red eye resolved. MRA brain was done 6 months later and revealed normal superior and inferior ophthalmic vein.

DISCUSSION

This case showed a rare disease spectrum of traumatic middle meningeal arteriovenous fistula with sphenoparietal sinus involvement was demonstrated in this case. Patient was well and only presented with corkscrew episcleral conjunctival vessel that misdiagnosed by the general practitioner as conjunctivitis.

Freckmann et al. classified traumatic middle meningeal arteriovenous fistula into six-type base on their route of drainage.\(^2\) (I). Drainage via middle meningeal veins to pterygoid plexus; (II). Drainage via sphenoparietal sinus or similarly running meningeal vein to sagittal sinus; (III).
Table 1: Case report of traumatic arteriovenous fistula that involved middle meningeal artery and sphenoparietal sinus

<table>
<thead>
<tr>
<th>Author/year</th>
<th>Age and gender</th>
<th>Head trauma/skull fracture</th>
<th>Presentation</th>
<th>Type (based on Freckmann et al.²)</th>
<th>Treatment</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakarinen</td>
<td>25, Male</td>
<td>Minor trauma, no fracture</td>
<td>Headache, continuous pulsating bruit in the ear</td>
<td>Type III</td>
<td>External carotid artery ligation</td>
<td>Recovered</td>
</tr>
<tr>
<td>Freckmann</td>
<td>62, Female</td>
<td>Sphenoid bone fracture</td>
<td>Subdural hematoma and intracerebral bleed</td>
<td>I + II</td>
<td>Surgery</td>
<td>Apallic syndrome</td>
</tr>
<tr>
<td></td>
<td>44, Male</td>
<td>Parietal bone fracture</td>
<td>Small subdural hematoma</td>
<td>II</td>
<td>N/A</td>
<td>Recovered</td>
</tr>
<tr>
<td>Smith</td>
<td>37, Male</td>
<td>Occipitotemporal fracture</td>
<td>Seizures, comatose, subdural and epidural hematoma, raised intracranial pressure and papilloedema</td>
<td>From sphenoparietal sinus into pterygoid plexus</td>
<td>Symptomatic treatment for increased intracranial pressure</td>
<td>Patient passed away</td>
</tr>
<tr>
<td>Unterhofer</td>
<td>53, male</td>
<td>Temporoparietal fracture</td>
<td>Subdural and epidural hematoma, pulsating exophthalmos, chemosis and raised intraocular pressure</td>
<td>III</td>
<td>Transarterial endovascular embolization with coils</td>
<td>Recovered</td>
</tr>
<tr>
<td>Present case</td>
<td>72, female</td>
<td>Minor head trauma, no fracture</td>
<td>Corkscrew dilated vessel at conjunctiva only</td>
<td>III</td>
<td>Transarterial endovascular embolization with glue</td>
<td>Recovered</td>
</tr>
</tbody>
</table>

Drainage via sphenoparietal sinus to cavernous sinus; (IV). Drainage via middle meningeal veins and superior petrosal sinus to cavernous sinus/basilar plexus; (V). Drainage via diploic vein; (VI). Drainage via bridging vein to superior sagittal sinus.

Middle meningeal vein was most commonly involved in traumatic middle meningeal arteriovenous fistula cases whereas sphenoparietal sinus involvement is rare. Only a few cases have been reported and these are listed and compared in Table 1.²,10-12
Concurrent out flow occlusion of left cavernous sinus was seen in this case. It leads to reflux of blood to the superior and inferior ophthalmic vein that contributes to the ocular sign of cork-screw episcleral vessel. Our finding of thrombosis of the cavernous sinus may be caused by the abnormal blood flow from the fistula as a consequence of Virchow’s triad. However, our patient did not present with significant cavernous sinus syndrome.

Spontaneous resolution of traumatic middle meningeal arteriovenous fistula by thrombosis has been well reported. However, this was unpredictable and carries an unacceptable risk of intracranial hemorrhage. Transarterial endovascular embolization of the fistula was done by using glue in this case. It was uneventful and successful. Patient’s ocular symptom was resolved. MRA brain 6 months later showed normal superior and inferior ophthalmic vein.

In conclusion, patient with traumatic middle meningeal arteriovenous fistula into sphenoparietal sinus can rarely present with only ocular symptoms. Transarterial endovascular embolization of middle meningeal arteriovenous fistula is a safe and effective procedure, as demonstrated in this case.

REFERENCES