On-line Case Report

Carotid–cavernous sinus fistula: delayed diagnosis following road traffic accident

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ABSTRACT

We present the case of a patient who sustained a blunt head injury resulting in a delayed diagnosis of a carotid–cavernous sinus fistula. Although rare in occurrence, a high index of suspicion is paramount with a history of head injury and developing signs in the eyes and face. Prompt referral to senior ophthalmic and neurosurgical teams is indicated to prevent the possibility of permanent visual loss with this condition.

Keywords: Carotid–cavernous sinus fistula – Head injury complications

Carotid–cavernous sinus fistulas can result from trauma or arise spontaneously. Post-traumatic causes account for 75% of direct fistulas between the internal carotid artery and the cavernous sinus. These are often associated with a base of skull fracture.^{1,3} We present the case of a patient who sustained a blunt head injury resulting in a delayed diagnosis of a carotid–cavernous sinus fistula. Although rare in occurrence, a high index of suspicion is paramount with a history of head injury and developing signs in the eyes and face. Prompt referral to senior ophthalmic and neurosurgical teams is indicated to prevent the possibility of permanent visual loss with this condition.

Case report

A 64-year-old woman, who was previously fit and well, was admitted to our unit after a road traffic accident, in which she was a pedestrian hit by a car at approximately 35 mph. The ambulance crew at the scene noted an indented windscreen where her head had struck the glass.

On admission, she had a Glasgow Coma Scale score of 11/15, peri-orbital bruising, a laceration over the right side of her forehead and pain in the pubic area. There were no obvious abnormalities on cranial nerve examination.

X-rays revealed bilateral fractures of the pubic rami. In view of the history and decreased coma scale, a head CT was organised. This showed a right frontal fracture and adjacent contusion of the right frontal lobe. There was no evidence of a basal skull fracture on the scan.

Over the following 48 h, her face and eyelids became gradually swollen. Her Glasgow Coma Scale score was stable at 14/15 (reduced only due to inability to open her eyes fully). At this stage, the facial swelling decreased but she complained of impairment in the vision of her left eye. She was reviewed by an ophthalmic SHO at 3 days from injury, in the emergency clinic, who recorded visual impairment of 6/60 in a previously normal left eye. Arrangements were made for her to be seen in the next available consultant clinic but a diagnosis of carotid–cavernous sinus fistula was still

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Figure 1 Patient at day 4 post injury.

Figure 2 Patient 2 months after embolisation.

unsuspected. A fine cut CT scan to investigate the cause of visual impairment further and to rule out the possibility of direct nerve injury may have led to an earlier diagnosis at this stage.

During the morning of the fourth day from injury, her vision worsened and she developed a bilateral proptosis (Fig. 1). She complained of discomfort in her left ear and pain in the left eye. A diagnosis of possible fistula was now suspected and appropriate referral to senior neurosurgical and ophthalmic teams was made.

Examination later the same day revealed a bilateral proptosis and ptosis (worse on the left) but normal fundi. A bruit was noted over both temples and, at this stage, a clinical diagnosis of a carotid-cavernous sinus fistula was made.

She was transferred to the regional neurosurgical unit on the fifth day where she underwent a magnetic resonance angiogram which confirmed the site of the fistula. Embolisation was performed by the neuroradiological team with resultant closure of the fistula. X-rays revealed an orbital floor fracture, which had not been apparent on the original films.

The bilateral proptosis fully settled but she had residual blurring and double vision in the left eye. She recovered fully from her orthopaedic injuries over a period of 8 weeks with normal gait and balance (Fig. 2).

Discussion

The cavernous sinuses lie within the sphenoid bone. They are paired structures that communicate with each other via the circular sinus. The cavernous sinus contains a venous plexus that is part of the dural venous system, receiving blood from the sphenoparietal sinuses and the superior and inferior ophthalmic veins. There are a number of structures that pass through the sinus including the internal carotid artery and oculomotor, trochlear, trigeminal (ophthalmic and maxillary divisions) and abducens cranial nerves.¹

A carotid-cavernous fistula is an abnormal communication between the carotid artery and the venous system within the cavernous sinus.³ Direct fistulas are high-flow shunts that are often associated with blunt or penetrating trauma, which form between the internal

carotid artery and the cavernous sinus. The shearing forces of severe head trauma and fractures can cause the internal carotid artery to be torn from its dural attachments and rupture, thus leading to direct flow into the cavernous sinus. Indirect fistulas are low-flow shunts that are more often spontaneous and are associated with vascular malformations. They form between the meningeal branches of the internal and external carotid artery and the cavernous sinus. Direct fistulas may present within hours whereas indirect fistulas can take months to become symptomatic.²

In this case, the development of clinical signs developed after 48 h and an earlier diagnosis could have been made at 2–3 days, with appropriate ophthalmic and neurosurgical referral and a high index of suspicion. This led to a delayed radiological embolisation at 5 days from injury.

The shunt causes hypertension and, therefore, congestion in the valveless ocular veins.^{1,3} This results in the common symptoms at presentation of whooshing sounds, a swollen painful eye, diplopia and progressive loss of vision. The signs include temporal and orbital bruits, pulsatile exophthalmos, chemosis and visual disturbances.

This is an unusual complication of head injury but the consequences of missed diagnosis include permanent visual damage, neurological deficit, seizures, epistaxis

and potentially fatal intracranial haemorrhage.^{2,3} It is a diagnosis to consider in all cases of painful eye symptoms and visual disturbance both at the time of injury and in the days that follow the initial trauma. Although there was a delayed diagnosis, in this case successful embolisation was performed. It is pertinent to note that a multidisciplinary approach should be employed and early referral for interventional radiological treatment.

It is now routine protocol in our unit to refer head injury patients with visual disturbances to the on-call ophthalmic registrar on the day of admission for formal review.

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