Case Report

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A Direct Carotid-Cavernous Fistula due to Penetrating Trauma by a Knitting Needle to the Temporal Region

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Abstract

Traumatic carotid-cavernous fistulas (CCF) usually occur after closed head injuries. In addition, CCFs can also be caused by penetrating injuries with stab or gunshot injuries. We present the case of traumatic CCF that was caused with a knitting needle directly penetrating through the temporal region. A 46-year-old man consulted with a progressive left swollen eye. His head computed tomography (CT) revealed a left temporal lobe contusion and fracture of the left temporal bone. Digital subtraction angiography (DSA) showed a direct high-flow fistula (Type-A lesion). After the balloon occlusion test, which was well tolerated by the patient, the internal carotid artery was occluded by the interventional radiologist. A review of the literature demonstrated that all of the traumatic CCFs occurred due to penetrating stab injuries through the orbita. To our knowledge, such a case has not been previously reported.

Key words: *Carotid-cavernous fistula, knitting needle, penetrating trauma, temporal*

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Introduction

A Carotid-cavernous fistula (CCF) is an abnormal communication between the carotid artery and the surrounding cavernous sinus. A CCF can be classified according to its etiology (traumatic or idiopathic), its anatomy (directly from the internal carotid artery (ICA) or from dural branches of the ICA or external carotid artery), the velocity of the shunting flow (high flow or low flow), or the draining pathway (anterior or posterior) [1]. Traumatic CCFs usually occur after closed head injuries. In addition, CCFs can also be caused by penetrating injuries with stab or gunshot injuries [2]. A review of the literature demonstrated that all of the traumatic CCFs occurred due to penetrating injuries through the orbita. We report the case of a CCF that was caused with a knitting needle

directly penetrating through the temporal region.

Case presentation

A 46-year-old man was transferred from a peripheral hospital to our center for further evaluation, because of a progressive left swollen eye. He had a stabbing abdominal multitrauma one week before admission. He had undergone laparotomy in the surgical department of the initial hospital because of gastric perforation.

Figure 1: Photograph of the patient. A sutured knitting needle wound was on the left temporozygomatic region (arrow). The patient had a Dandy's triad on the left eye.

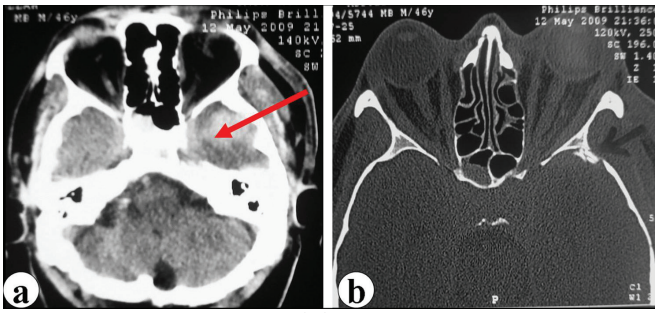

Figure 2: CT scan showing (A) a cerebral contusion in the left temporal lobe (asterisk) and (B) a fracture of the left temporal bone (arrow).

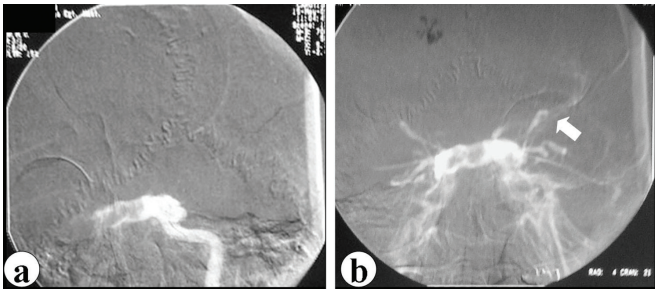

Figure 3: (A) Carotid angiogram showing a direct CCF from cavernous segment of left ICA to cavernous sinus and (B) prominently steal phenomenon (arrow).

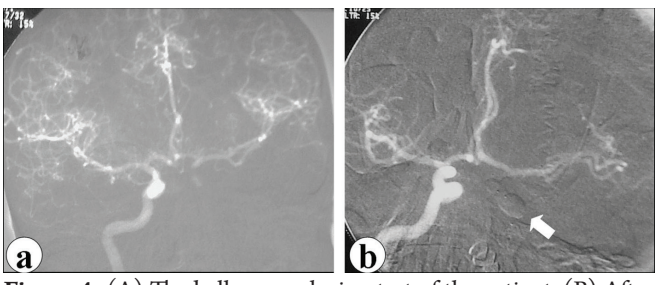

Figure 4: (A) The balloon occlusion test of the patient. (B) After occluded the ICA (arrow).

When he was admitted to our hospital, 3rd, 4th and 6th cranial nerves paralysis, exophthalmia, chemosis, and conjunctival edema were found and there was also an orbital bruit and murmur of the left eye. His Glasgow Coma Scale score was 15. There was also a sutured wound in the left temporozygomatic region, although he had no complaints (Figure 1). His head computed tomography (CT) revealed a left temporal lobe contusion and fracture of the left temporal bone (Figure 2A-B). Subsequently, Digital subtraction angiography (DSA) was performed. A bilateral ICA injection showed a direct high-flow fistula (Type-A lesion) from the cavernous segment of the left ICA to the cavernous sinus and prominently steal, and retrograde feeding of both ophthalmic veins dominantly affect the left one (Figure 3A-B).

After the balloon occlusion test, which was well tolerated by the patient, the ICA was occluded by the interventional radiologist (Figure 4A-B). After the procedure, the murmur had disappeared. The patient's chemosis and proptosis improved within a few days. 3rd, 4th and 6th cranial nerves paralysis had resolved completely by 6 months.

Discussion

A traumatic CCF is almost always direct, caused by a laceration of the ICA, or rupture of its intracavernous dural branches. Based on pathogenesis, hemodynamics, and angiographic anatomy, Barrow et al. [3] classified CCFs into four types (Types A-B-C-D). According to this classification, Type-A lesions are high-flow, and a spontaneous resolution of these lesions is rare; they are also associated with a high morbidity rate.

Du Trevou and Van Dellen [4] reported 330 patients with stab wounds to the head in 1992. Ten percent of these patients had also suffered stab wounds to different areas in addition to the head. The majority of these were to the abdomen, chest, and neck. In 250 of these patients (76%), the weapon had already been removed by the assailant, and there was radiological evidence of penetration of the dura; 124 patients (50%) had a cerebral hematoma, 77 patients (31%) had a cerebral contusion, 22 (9%) a subdural hematoma, 13 (5%) a cerebral infarct, and a single patient had an extradural hematoma. Surprisingly in that study, there was not one case of carotid-cavernous fistulas [4].

Through a review of the literature, CCFs secondary to penetrating injuries revealed that all of the traumatic CCFs occurred due to penetrating injuries through the orbita [5-8]. We report the case of a CCF due to penetrating trauma directly through the temporal region.

Patients with a CCF usually present with the following three signs: pulsatile exophthalmos, chemosis, and a cephalic bruit called Dandy's triad [9,10]. Complete disruption of the wall of the ICA allows highly pressurized arterial blood to be directly transmitted to the cavernous sinus and ophthalmic veins, leading to venous hypertension. The principal manifestations of venous hypertension are proptosis, chemosis, conjunctival injection, and visual loss. However, cranial nerve paralysis, bleeding from the mouth, nose, or ears, intracranial hemorrhage, increased intracranial pressure, and steal phenomena may also be seen [9,10]. Fortunately, our patient had a Dandy's triad; therefore, CCF was diagnosed easily.

These patients usually presented to the ophthalmologist or neurologist with eye signs or cranial nerve dysfunction. A delay in diagnosis or misdiagnosis is always possible, particularly if the patients without classical presentation are not critically evaluated. The diagnosis is usually based on clinical manifestations and imaging findings. Although CT and magnetic resonance image (MRI) studies help for CCF diagnosis, DSA is essential for confirming the diagnosis and also in the management of a CCF [11].

The aim of the treatment is the occlusion of the direct fistulous site to prevent the hyperpressure in the cerebral venous system, while preserving the ICA [12]. In 1978, Debrun et al. reported the successful treatment of 12 of 17 direct CCFs with detachable balloons [13]. The current treatment of choice for a CCF is an endovascular approach, and all cases of direct CCF call for interventional treatment. Recently, new techniques, such as balloon-assisted coiling and using stents to preserve the patency of the parent artery, have been reported [11].

In the present case, stabbing of the left temporal region had not been given enough priority because of his emergency condition. Our case demonstrated that if multitrauma patients have stab wounds of the scalp, the patients should be carefully examined and profoundly evaluated with thin slice head CT.

Conflict of interest statement

The authors do not declare any conflict of interest or financial support in this study.

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