HHS Public Access

Author manuscript

SunText Rev Pediatr Care. Author manuscript; available in PMC 2022 March 07.

Published in final edited form as:

SunText Rev Pediatr Care. 2022 ; 3(1): .

Cerebral Spinal Fluid Ophthalmorrhea: A Rare Case Report

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Abstract

Background: Cerebrospinal fluid (CSF) leak from the nose (rhinorrhea) or the ear (otorrhea) are common with traumatic brain injuries. CSF leak from the orbital roof (ophthalmorrhea) is something rare and warrants further discussion.

Case: We present a unique case of CSF leak from the orbital roof proceeded by three days history of trauma to the orbit.

Discussion: Using the clinical case, we discuss unique aspects of the clinical picture, radiological findings of interest, and the surgical procedure for repair.

Keywords

Cerebral spinal fluid leak; Orbit; Ophthalmorrhea; Repair

Introduction

The overall incidence of cerebrospinal fluid (CSF) leak in traumatic brain injury (TBI) patients varies between 0.25 to 0.5% [1]. Most of these leaks manifest as either rhinorrhea or otorrhea. Majority stop spontaneously in the 3rd - 5th day post injury and rarely continue until the 7th day [2]. Occasionally, CSF leak can continue and requires surgical repair to prevent long-term risk of meningitis. CSF leak from the orbit is exceptionally rare and warrants careful workup if suspected [3]. Here within, we present this unique case of CSF leak via the orbit (ophthalmorrhea) in a 17-year-old boy and utilize the case to discuss the symptoms and signs to clue the clinician to the diagnosis. We also highlight the radiological features and management, which in this case included explorative craniotomy with extraction of a foreign body that was the cause of the leak. We also discuss importance of follow up to ensure stability of the repair.

Case Report

A 17-year-old boy presented to the emergency department with a history of trauma to the left eye. The patient was shoved by his friend into the sharp edge of a pen at school. On

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examination, the patient was conscious, oriented to time, place & person, and had normal vital signs. Glasgow coma scale assessment was as follows: right eye opened spontaneous, left eye was closed with significant periorbital edema, normal verbal response, and followed commands without difficulty giving overall score of 15. Local examination revealed small perforation wound of less than 0.5 cm in the left upper eyelid. An ophthalmologist was consulted and saw the patient and his advice was to be treat conservatively with eye ointment. Skull x-ray was done after initial evaluation and showed a foreign body settled in the left temporal area (Figure 1).

At this point neurosurgery was consulted and patient was admitted to the unit. The patient was complaining of severe headache in the left frontal region, which was not responding to analgesia. He developed nausea and vomiting. On day 3 post-injury, a clear watery discharge was noted. The leakage became profuse, so urgent exploration was planned with a left sub temporal craniotomy. Standard approach was utilized with 4 burr holes and 1 over the keyhole at the zygomatic fossa. The dura was opened in a rectangular flap with the base on the medial side. Brain retraction at the edge of the inferior temporal lobe was utilized. At this point the translucent metallic head of a pen was noted at the bottom of the temporal fossa (Figure 2). A puncture hole through the orbit was noted as well as dural violation. The foreign body was removed, area irrigated, and dura closed in watertight fashion. A trial of valsava showed no residual CSF leak. The bone flap was replaced, and closure done in standard fashion. The patient was admitted to the intensive care unit for 48 hours and continued antibiotics and antiepileptics. He was then transferred to the floor. The patient discharged on post-op day 7 with prophylactic antibiotics for 1 week and suture removal at day 14.

Discussion

The arachnoid forms a sheath for the optic nerve as it extends into the orbital cavity through the optic canal. Ultimately this will fuse with the sclera and provides a closure without CSF egress. Notably the subarachnoid space extends around the optic nerve for most of its course [4]. CSF fluid leak via the orbital roof is exceptionally rare due to the protected nature of the orbit. In this case report, we show that direct penetration of the orbital wall can cause high flow CSF leak requiring emergent surgical repair. The foreign body had penetrated the orbital wall and dura and ultimately settled in the temporal fossa. Despite ophthalmology evaluation, skull x-ray was the initial clue for the presence of a foreign body. ~ 30 craniocerebral injuries caused by nail-guns have been reported in the literature but this case is unique due to a school pen penetrating the orbit, which is a lower velocity impact [5].

Nail gun injuries often had less damage and better prognosis compared with gunshot injuries, although CSF leak was high [6]. If left untreated, the risk of infection and vascular injury are possible lethal complications. In this case, preoperative examination and imaging was valuable. Once high flow CSF leak was noted, early surgical repair was very effective in removing the foreign body, controlling the CSF leak, and providing excellent outcome for the patient. The anatomical location of the penetration site is important in determining the ideal surgical plan. For this case, although the injury was through the orbit, the foreign body had settled in the temporal fossa warranting a wider surgical approach for management.

Therefore consideration of trajectory of injury and damage to other nearby structures is imperative to choose the safest surgical corridor [7]. A craniotomy debridement technique was recommended for penetrating craniocerebral injuries as early as 1940 following World War II. However, with high rates of bacterial contamination associated with penetrating injuries, the outcomes of the initial surgeries were poor. As the availability of widespread antibiotics has evolved, the safety of craniotomy for removal of foreign body and closure of dural defect has improved dramatically [8]. Penetrating injuries of the orbit and nasal sinuses due to foreign bodies are rare. This report of a patient with a ballpoint pen penetration injury through the left orbit is unique in the literature. Nails normally stay in the penetration trajectory. Due to the shape and disconnection of the ball point pen, the foreign body actually migrated to the temporal fossa likely worsening the CSF defect [9].

Conclusion

Isolate orbital wall injuries are rare but the principles from this case can be applied to nail gun injuries, bullet injuries, and glass fragment injuries during motor vehicle collisions [10]. Early imaging is critical to assess for presence of foreign body. If one is noted, suspicion for CSF leak should be high and monitored closely. Patient should be placed on broad spectrum antibiotics. In our case, CSF leak was high flow and required emergent surgical repair. The early intervention was successful in removing the foreign body, repairing the CSF leak, and allowing excellent recovery with continued broad-spectrum antibiotics. Standard is typically cefepime and vancomycin for 2 weeks. We also continued AEDs for 1 week (levetiracetam) due to the retraction on the temporal lobe required to remove the foreign body. Penetration trajectory is critical in determining operative approach.

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Figure 1:
plain lateral skull X-ray showing the metallic head of the pen in the temporal fossa region.

Figure 2.
A: shows intact pen with its 2 parts **B:** picture of the same pen with demonstration of metallic portion that was extracted from temporal fossa.