Posttraumatic cerebrospinal fluid cyst of the orbit

Case report

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A 27-year-old man sustained a fracture of the orbital roof and a basofrontal dural tear in a motor-vehicle accident. One week later, he developed an orbitocranial dural fistula manifested by an orbital cyst, pulsatile proptosis, and serous drainage from the eye. Specific diagnosis was established only after computerized tomography metrizamide cisternography demonstrated direct communication of the orbital cyst with the subarachnoid space. The pertinent literature is reviewed.

KEY WORDS • head injury • orbital cyst • cerebrospinal fluid fistula

Dural fistulas commonly result in rhinorrhea and otorrhea. Occasionally, fluid may accumulate beneath the scalp or along the spinal subarachnoid space.20,24 Orbitocranial dural fistulas, however, are rare. We recently treated a patient following head trauma that resulted in fracture of the orbital roof and a basofrontal dural tear. One week later, he developed an orbital cyst with pulsatile proptosis and orbital serous drainage secondary to an orbitocranial dural fistula.

Case Report

This 27-year-old man was involved in a motor-vehicle accident. He sustained multiple injuries including a fractured right femur, avulsion of a portion of the right upper eyelid, and an orbital roof fracture. The patient was easily arousable but disoriented to place. There was a mild left hemiparesis. Computerized tomography (CT) disclosed a fracture of the orbital roof, small bone fragments lying within the right frontal lobe, hemorrhage, and edema. The patient was taken to the operating room to repair the eyelid, reduce the femoral fracture, and remove sequestered intracranial bone fragments. At surgery a large basofrontal dural tear was noted, the extent of which could not be entirely visualized because of a severely edematous frontal lobe. The patient tolerated the procedure well.

Neuro-ophthalmological evaluation 2 days later disclosed visual acuity of 20/100 in both eyes. Pupils were reactive to light, with no afferent defects. The right lid was swollen and ecchymotic. The sutured lid laceration was intact. There was axial proptosis with tight retro-pulsion of the globe of the right eye. Extraocular motions of the left eye were full, but the right eye was frozen in a primary position. In both eyes, the conjunctiva was chemotic and hemorrhagic, the cornea was clear, and the fundus was normal. There were no ocular or cranial bruits. One week later, the patient developed a temperature of 100.6°F. Cerebrospinal fluid (CSF) analysis revealed a leukocyte count of 13,000 (90% polymorphonuclear cells). There was no CSF rhinorrhea or otorrhea. Cultures of the urine, blood, CSF, and wound were negative. Chest x-ray films were normal. Intermittent serous drainage from the right eye was noted.

The patient now exhibited increasing proptosis. Visual acuity was 20/80 on the right and 20/20 on the left. The lid was ecchymotic but much less swollen. His wounds showed no signs of infection. Ocular motility had improved but there was still significant limitation in all directions. The right globe was displaced inferolaterally with pulsatile proptosis. A palpable fluctuant mass was observed in the superonasal quadrant of the orbit. There were no orbital or cranial bruits. Pupillary
Posttraumatic orbital CSF cyst

Fig. 1. Computerized tomography scans with metrizamide. *Left:* Axial view demonstrating a cystic mass in the anteromedial portion of the right orbit. *Right:* Coronal view showing a large defect in the orbital roof with an intraorbital cyst. Communication with the subarachnoid space is demonstrated by the presence of metrizamide within the cyst.

Reactions and corneal sensation were normal. Dilated ophthalmoscopy was unremarkable with no papilledema or choroidal folds.

Repeat orbital CT scans with and without intravenous contrast medium showed an anterior superonasal low-density mass with a rim of enhancement displacing the right globe laterally. An orbital B-scan demonstrated a well-circumscribed mass, which on ultrasonography was internally anechoic with good sound transmission. These findings were indicative of an orbital cyst. Metrizamide cisternography with CT showed that the cyst contained CSF and communicated with the subarachnoid space (Fig. 1).

The patient subsequently had a protracted hospital course, complicated by the development of a cerebral abscess and phlebitis. He was treated conservatively with antibiotics and gradually improved. He was left with mild personality changes and persistent but mild pulsations of the right globe. Ocular motility returned to normal and repeat CT of the orbit showed resolution of the cyst (Fig. 2).

Discussion

This case illustrates some of the known complications of orbitocranial trauma. This type of injury may also be associated with meningitis, carotid cavernous fistula, ocular injury, anosmia, and cranial neuropathies. A dural fistula with orbital cyst formation is rare.

The differential diagnosis for posttraumatic orbital cysts includes retrobulbar and subperiosteal hematoma, orbital abscess, foreign-body cysts, mucocele, and implantation cysts. In this case, a CSF orbital cyst was suspected on the basis of pulsatile proptosis, an extensive dural tear, and a large defect of the orbital roof. In retrospect, serous drainage (presumably CSF) from the orbit was also a clue to the diagnosis.

The combined use of CT scanning, orbital ultrasonography, and metrizamide cisternography established the diagnosis. The CT scans demonstrated a mass with a rim of enhancement in the superonasal orbit, and orbital ultrasonography identified its cystic nature. Specific diagnosis was established only after the metrizamide cisternography-CT scan was obtained which showed communication with the subarachnoid space (Fig. 1). It is assumed that the cyst was an arachnoidal herniation into the orbit; however, we cannot exclude intraorbital loculation of CSF.

Diagnosis of orbitocranial dural fistulas can be difficult. One can confirm that the drainage fluid is CSF by demonstrating that it contains more than 30 mg/ml of glucose. Reducing substances may also be present in tear secretions at a concentration of 6 mg%, 40% of which is glucose. Both CSF and tear glucose concentrations may be proportionately influenced by blood glucose. Comparisons of the glucose concentration in each eye, however, may be useful in distinguishing tear glucose from CSF glucose. Adequate volumes of drainage fluid may be obtained with absorbent cellulose sponges. The fluid can be squeezed from the sponges into a small container. The actual glucose concentration should be determined; glucose oxidative paper tests are not considered a reliable way of testing for glucose. Diagnosis and localization of a dural fistula is more reliably demonstrated with radioisotope-labeled serum albumin (RISA) cisternography. Recently, several groups have successfully used metrizamide cisternography with CT scanning to diagnose and localize CSF rhinorrhea. Our case demonstrates that metrizamide-CT scanning may also diagnose CSF leakage into the orbit.

Leakage of CSF into the orbit has been previously noted. Walsh and Hoyt documented a case in which there was avulsion of the eye associated with "profuse drainage of spinal fluid from the orbit." Ide and Webb reported a case in which pellets entered the medial conjunctiva and middle fossa through the superior orbital fissure. The patient developed lid swelling, chemosis, proptosis, and opthalmoplegia, and a continuous stream of CSF leaked through a tear in the conjunctiva. In a case reported by Bagolini, CSF leakage...
occurred through a superior orbital fracture into the upper eyelid causing progressive lid swelling. Similarly, Copper described a patient who developed a dural fistula that leaked through a penetrating wound of the upper eyelid. Smith and Blount reported another case with fracture of the orbital roof and pulsatile proptosis. Surgical exploration along the superior subperiosteal space released significant amounts of CSF. The authors concluded that the CSF was confined within the posterior orbit; however, this patient had no other signs of CSF leakage or cyst formation. Joshi and Crockard reported a child with delayed CSF rhinorrhea and leakage from the eye that simulated tears. Similar cases of CSF leakage or cyst formation. Joshi and Crockard reported 192 patients with dural fistulas, including five with CSF "orbitoceles."

Orbitocranial dural fistulas should be suspected in patients with orbital roof fractures or penetrating orbitocranial trauma. Leakage occurs through the overlying roof or superior orbital fissure. Based on our case and those previously reported, this diagnosis should be considered if the following signs are present: epiphora or serous drainage from the eye, chemosis, pulsatile proptosis, progressive lid swelling, and orbital cyst formation.

References

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