CSF Rhinorrhea : Clinical Findings Diagnosis & Management

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Abstract

A spinal fluid leak from the intracranial space to the nasal respiratory tract is potentially very serious because of the risk of an ascending infection which could produce fulminant meningitis. A cerebrospinal fluid (CSF) rhinorrhoea occurs when there is a fistula between the dura and the skull base and discharge of CSF from the nose. CSF rhinorrhea commonly occurs as a result of fronto-basal skull fractures, extensive intracranial surgery or destructive lesion. Concomitant peri-orbital hematoma is very significant hence, patients with head injuries and features of periorbital haematoma are at greater risk of unobserved dural tear and delayed CSF leakage.The beta-2 transferrin assay is the confirmatory test of choice because of its high sensitivity and specificity. The presence of skull base fractures with clinical csf leak only computed tomography will suffice. Most of CSF rhinorrhea resolve spontaneously, but if persists for more than 7 days than will lead to bacterial meningitis as a consequence. Treatment regime should be planned keeping in mind the neurological status of the patient along with clinical and radiological findings.

CSF Rhinorrhea

Cerebrospinal fluid is the essential component of central nervous system. It serves as a cushion and lubricant for cerebral hemispheres, cerebellum, and the layers of meninges. Though actual loss of C.S.F (Cerebrospinal fluid) itself is of no particular consequence,va persistance dural fistula represents a hazard for fatal purulent meningitis and death complicates most cases of unrecognised C.S.F rhinorrhoea.Severe head and neck traumaare often connected with fractures of the frontal skullbase or nasoethmoido-orbital complex and cerebrospinalfluid (CSF) leakage. Aspinal fluid leak from the intracranial space to the nasal respiratorytract is potentially very serious because of the riskof an ascending infection which could produce fulminantmeningitis.

Historical Background

Galen in second sentury A.D – First to document the discription of a C.S.F fistula.

Willis in 1676 – First recorded the instance of C.S.F rhinorrhea .

Bidloo and Elder in 17th century – First correlation between C.S.F rhinorrhea and craniomaxillofacial trauma was made.

Classification

CSF rhinorrhea according to Ommaya's classification system can be divided in traumatic and non-traumatic.The traumatic group can be divided in accidental(fronto-basal skull fractures)and iatrogenic as a result of intracranialsurgery. The non-traumatic (spontaneous) group is subdivided into primary where no underlying cause can be found or secondary to intracranial pathology (high or normal pressure).High pressure leaks include tumours, benign intracranial hypertention and hydrocephalus.Normal pressure leaks are due to empty sella syndrome, tumours, congenital defects, infection, arachnoid granulations, meningo-encephalocelesand idiopathic conditions.

Incidence

CSF leak most commonly occurs following trauma (80-90% of cases) and the majority of cases presenting within thefirst three months.Usually the fracture involves some portion of the anterior cranial fossa floor

with the leaks occurringthrough the cribriform plate or ethmoid sinus roof intothe nose. Another frequently seen anterior fossa fracturesite is the posterior wall of the frontal sinus through whichCSF can escape into the nose via the nasofrontal duct. Lesscommon are middle cranial fossa fractures that can causeleakage to the nose via the sphenoid sinus or eustachian tube. Nontraumatic cerebrospinal fluid fistulae tend to occur less frequently (3 to 4 %). They are related to diseasesthat cause increased intracranial pressure or local skulldestruction.

Clinical findings and diagnosis

Clear nasal discharge is the hallmark of CSF rhinorrhea. Most of the cases are unilateral, but even bilateral cases are been noted. CSF rhinorrhoea have significantly greater incidence of
periorbital haematoma. This suggests that patients with head injuries and features of periorbital haematoma are at greater risk of unobserved dural tear and delayed CSF leakage. Frontal and ethmoid fractures in particular are also associated with CSF leakage.Clinically, bending forward of the patient will increase the flow the discharge.Elevated intracranial pressure (ICP) is a common finding in patients with spontaneous CSF nasal leak as it increases the hydrostatic forces exerted at anatomically weakened sites of the skull, and eventually produces a bone defect.

Identification of the site of the leak is very important for surgical repair. Wide range of diagnosing methods employed for detecting CSF leak are B2 transferrin analysis, metrizamide computed tomography (CT) cisternography, intraoperative navigation, intrathecal fluorescein for intraoperative CSF leak detection, fibrin glue or gasket seal with Medpore.Computed Tomography and Magnetic Resonance Imaging are the most reliable methods for distinguishing traumatic and spontaneous CSF rhinorrhea. Simple radiographs like skull X-rays can only demonstrate indirect signs like fractures and pneumoencephalus. Radionuclide cisternography and contrast-enhanced CT cisternography techniques require injections into the intrathecal space, most often via lumbar puncture.Endoscopic sinonasal examinations are performed to detect and visualise the site and size of any leaks.Computerized cisternography and radionuclide cisternography should be used if MR imaging is contraindicated or if a clinically and biologically proven CSF fistulae is not visualized by CT or MR imaging.

Beta-2 transferrin is a carbohydrate-free(desialated) isoform of transferrin, which is almost exclusivelyfound in the CSF, 100% sensitivity and specificity of about 95%. It is a considered as a confirmatory test. Glucotix is used to detect glucose presence in CSF, but is not considered confirmatory due to its lack of specificity and sensitivity.

Three-dimensional constructive interference in steady state (3D-CISS) and contrast enhanced
MR cisternography (CE-MRC) modern method used in detecting the localisation of cerebrospinalfluid (CSF) leak in patients with rhinorrhoea. They are used in complicated cases whereBeta-2 transferrin test have confirmed but radiological techniques does not locate the site.

Management

There are two modalities conservative and surgical. In acute C.S.F leak conservative should be considered, as majority of acute traumatic fistulae will seal spontaneously in 7 to 10 days.Bed rest in a head up position. Patient advised to avoid coughing,sneezing, nose blowing and straining due to physical activities.

Medications like acetozolamide and furosemide reduce the CSF production.

Indwelling of subarachnoid drain is most effective in decreasing intracranial pressures.This modality helps inducing healing by primary intention by allowing dura to approximate.Place the drain for appoximately for 4-10 days draining about 150 ml of C.S.F daily.

Surgical management includes extracranial and intracranial approaches. Extracranial approaches include external ethmoid-sphenoid, transmastoid and transseptos-phenoid approaches. Intracranial approach is Brow-Nad Bitemporal incision. Post-traumatic CSF leaks are uncommon and will usuallyresolve without surgical intervention. Successful managementin refractory cases often involves a combination ofobservation, CSF diversion, and/or extracranial and intracranial procedures. It is currently accepted that endoscopic intranasal managementof CSF rhinorrhea is the preferred method of surgicalrepair, with higher success rates and less morbidity than
intracranial surgical repair in selected cases. Endonasalendoscopic approach can be preferred for the closure of uncomplicated CSF fistula, located at the anterior or posteriorethmoid roof and in the sphenoid sinus, due to its minimal-postoperative morbidity. Uncomplicated CSF fistula, locatedat the posterior wall of frontal sinuses can be repairedextradurally with osteoplastic frontal sinusotomy. Intracranial-approaches should be reserved for more complicated CSF rhinorrhea which results from extensive comminutedfractures of the anterior cranial base and is accompaniedwith intracranial complications. Spontaneous CSF leaks have been managed by the neurosur-geons via a frontal craniotomy withthe success rate between 60 and 80%. It hasbeen associated with significant morbidity such asfrontal lobe retraction and anosmia. Anosmia is the most frequent associated complication.

For successful closure of the defect free vascularized flaps with onlay and underlay techniques can be used. Wormald and McDonough presented the 'bath plug' technique, which consisted of introducing a fat plug with vicryl suture into the intradural space in which the dural defects was less than 15mm.

Use of lumbar drain postoperatively is controversial.

Conclusion

A CSF rhinorrhoea occurs when there is a fistula between the dura and the skull base and discharge of CSF from the nose. A spinal fluid leak from the intracranial space to the nasal respiratory tract is potentially very serious because of the risk of an ascending infection which could produce fulminant meningitis. Prophylactic antibiotics may be effective and should be considered. Treatment decisions should be dictated by the severity of neurological decline during the emergency period and the presence/absence of associated intracranial lesions. The timing for surgery and CSF drainage procedures mustbe decided with great care and with a clear strategy.The precise surgical technique may vary withequal success rate but highlights around clear endoscopic visualization and localization, proper selection of graft material and careful postoperative surveillance.

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