Cerebrospinal Fluid Fistula in Case of CSF Rhinorrhoea

By N.U. Bahri, MD [2]

A 42-year-old male with complaints of headache and clear watery discharge from right nostril which increased on leaning forward for 15 days.

History: A 42-year-old male with complaints of headache and clear watery discharge from right nostril which increased on leaning forward for 15 days.

Figure 1(a): Coronal bone window CT images shows suspicious bony defect (arrow) in lateral lamella of cribriform plate on right side.
Figure 1(b): Coronal bone window CT images shows suspicious bony defect (arrow) in lateral lamella of cribriform plate on right side.
Figure 2: Axial bone window CT image showing opacified right ethmoid sinuses.
Figure 3(a): Coronal Heavily T2 W 3D sequence image showing CSF intensity column (arrow) tracking from right olfactory fossa into anterior ethmoidal sinus. This sequence confirms the suspicious site of fistula.
Anterior rhinoscopy was unremarkable. Nasal endoscopy was normal. Beta 2 transferrin test was positive. Clinically it was a case of CSF rhinorrhoea and computerized tomography was advised to confirm the diagnosis and to locate the site of leak. In addition to this MR cisternography was performed.

Diagnosis: CSF rhinorrhoea as a result of CSF leak through bony defect.

Findings: There is evidence of a suspicious bony defect of approximate size 2 mm in lateral wall of right olfactory fossa, i.e. lateral lamella of cribriform plate, with presence of fluid density material in anterior ethmoid sinuses. Bilateral olfactory fossae are Kero’s type III, measuring approximately 7.5 mm in depth. Enhancing polypoidal mucosal thickening was noted involving both maxillary sinuses, right frontal sinus causing blockage of right osteomeatal unit and frontal recess. Additional findings were hypoplastic right middle turbinate, hypertrophied inferior turbinate with deviation of nasal septum towards right side.

Further we performed MR cisternography to confirm leakage of CSF through the suspicious bony defect seen on CT scan. The MR imaging technique included 3 mm thin-section T1-weighted coronal sequences, fast spin-echo T2-weighted coronal, axial, and sagittal sequences and heavily T2-weighted coronal sequence in the supine position.

Findings: On MRI fluid of CSF intensity is seen tracking from right olfactory fossa through bony defect which was seen on CT into anterior ethmoidal cells on right side resulting in anterior ethmoid sinusitis.
Discussion: CSF rhinorrhoea results from leakage of CSF through osteodural defect at below mentioned potential sites:

- Sites of CSF leak through which there is either rhinorrhoea or otorrhoea:
  - Cribriform plate, frontal sinuses, orbital roof areas, Sella turcica, Petrous area, Fovea ethmoidalis, Planum sphenoidale, Lamina cribrosa of internal auditory canal and Posterior wall of internal auditory canal.

Etiology: Traumatic: postoperative (iatrogenic), other trauma (accidental)
Nontraumatic: “High pressure”: Tumors, hydrocephalus, Benign intracranial hypertension, “Normal pressure” (spontaneous): Congenital anomalies or bony atrophy, Tumor or osteomyelitis erosions (3).

To locate the site of leak or fistula is imaging diagnostic challenge. Role of imaging lies in accurate localization of CSF leak so that the chances of negative or repeat explorations get reduced. Proper surgical plugging of a bony defect is important, as the defect can be a source of recurrent pyogenic meningitis.

In a patient like this with strong clinical suspicion of CSF rhinorrhoea with CT scan showing possibility of defect, MR Cisternography is confirmatory noninvasive modality with high accuracy in locating the site and extent of CSF leak than CT Cisternography. MR Cisternography detects a CSF fistula by the inherent bright signal of CSF on T2-weighted images. On the T2-weighted fast spin-echo sequence and heavily T2WI-weighted coronal sequence, the bright signal from the CSF column is seen against the black background of air in the paranasal sinuses (1). In addition MR demonstrates CSF leakage in multiple planes without the disadvantage of ionizing radiation.

The leaked CSF that gets collected in the paranasal sinuses has a characteristic signal so it easily gets differentiated from inflammatory paranasal secretions.

The leaked extracranial CSF is typically more hypointense than the proteinaceous inflammatory secretions on T1-weighted images, which have a brighter signal (1).

CT cisternography which is invasive should be performed only when MR fails to locate the site. CT cisternography should be performed as a last option, preferably by injecting non-ionic water soluble contrast agent into lumbar subarachnoid space and placing a nasal pledget, as the leakage could be too slow to be detected on a routine study (2). CT cisternography is invasive and uncomfortable for the patient, and there is risk of complications such as headache and infection and it is contraindicated in patients with active meningitis or raised intracranial pressure.

Lastly, MR cisternography is also useful for following up patients who have had surgery for CSF fistula or recurrent CSF rhinorrhoea.

References:

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Disclosures:

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