Intrathecal Preoperative Contrast-Enhanced Computed Tomography (CT) and Intraoperative Fluorescein Dye for Cerebrospinal Fluid (CSF) Leaks

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Abstract

Objectives: To describe the utility of intrathecal contrast-enhanced computed tomography and intrathecal fluorescein dye injection for the preoperative localization and intraoperative control of CSF leaks.

Study Design: Retrospective case series

Methods: Preoperative assessment with intrathecal contrast-enhanced CT was used to predict the likely site of CSF leak. These sites were confirmed by the intraoperative identification of fluorescein-containing CSF, and the skull base defect was repaired using established techniques.

Results: In each patient, the site of CSF leakage corresponded to the region of primary concern on each of the contrast-enhanced CT scans. In one patient, fluorescein permitted the visualization of a small encephalocele protruding through the posterosuperior roof of the sphenoid sinus where an abnormality had been correspondingly identified on contrast-enhanced CT scan.

Conclusions: Intrathecal fluorescein dye placement and intrathecal contrast-enhanced CT scans provide complementary information that may be used for the localization and control of CSF leaks.

Techniques

CT Cisternogram
- 6 cc of Omnipaque 180 contrast agent™ is intrathecally administered via lumbar puncture
- High-resolution CT scan performed with patient prone

Intrathecal Fluorescein Technique
- 10 mg dexamethasone and 50 mg diphenhydramine IV
- Lumbar puncture: 10 cc CSF mixed with 0.25 cc 10% fluorescein is reinjected into the intrathecal space
- 0.25 cc of 10% fluorescein is mixed with 3 cc of normal saline and administered IV. This promotes fluorescein's filtration into the CSF through the choroid plexus.

Illustrative Clinical Scenarios

Scenario #1: Two possible sites on high-resolution CT scan

CT Cisternogram Findings
- Contrast filled the olfactory fossa (no extravasation)

Intrathecal Fluorescein Findings
- Right sphenoid encephalocele: no CSF leak
- CSF leak identified at junction of horizontal and lateral walls of olfactory fossa

Scenario #2: Relatively inaccessible skull base defects

CT Cisternogram/Intrathecal Fluorescein
- Contrast/Fluorescein extravasation into the lateral recess of the right sphenoid sinus
- Defect is located lateral to V2
- Successful endonasal endoscopic repair through posterior maxillary sinus wall via pterygopalatine fossa, lateral to V2
- Complete closure of the defect was verified by the cessation of fluorescein extravasation

Conclusions

1. Intrathecal fluorescein dye instillation and intrathecal contrast-enhanced CT scans are valuable diagnostic aids when the site of CSF leakage is unclear on HRCT.

2. Intrathecal contrast-enhanced CT permits assessment of the feasibility of endoscopic repair and the likelihood of complications (e.g., V2 injury) for relatively inaccessible regions such as the lateral recess of the sphenoid sinus.

3. Intrathecal fluorescein instillation is also useful to verify complete closure of the CSF leak at the time of surgery.

References
