Determining the Best First-line Modality for Identifying and Localizing Skull Base CSF Leaks

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Background: Patients with skull base cerebrospinal fluid (CSF) leaks present with headaches, fluid in the ear(s), and/or rhinorrhea, which are vague symptoms. Beta-2-transferrin protein assays are the gold standard for identifying CSF leaks, but adequate samples cannot always be collected, and the results give no specific localizing information. Medical imaging, including Computed Tomography (CT), Magnetic Resonance (MR), and Nuclear Medicine (NM) cisternography can be utilized to identify and localize CSF leaks, but are imperfect tests. This study aims to determine the best imaging modality for identifying and localizing skull base CSF leaks by comparing CT, MR, and NM Cisternogram results to beta-2-transferrin assay and intraoperative visualization as criterion standards.

Methods: In this ongoing study, patient cisternogram and pre-cisternogram imaging and results were acquired from the electronic medical record, radiology information system, and picture archiving and communication system. Inclusion criteria include age greater than 18, suspected skull base CSF leak, and CT, MR, and/or NM cisternogram performed. MR cisternogram procedure included intrathecal gadolinium and NM SPECT-CT cisternogram procedure included intrathecal Tc-99m Sulfur Colloid. These data will be analyzed for positive and negative predictive values, sensitivity, specificity, and ROC Curve comparing to beta-2-transferrin assay results and surgical findings.

Results: From 2018-2022, 30 patients with suspected skull base CSF leaks were evaluated. In this limited preliminary data set, MR was more sensitive than CT, CT was more sensitive than NM, there were three false negatives, and there were no false positives. Performing two types of cisternogram increased the chance of identifying leaks. More data is needed to draw stronger conclusions in this ongoing study.

Conclusion/Potential Impact: The initial data suggests that MR cisternogram with intrathecal gadolinium is superior to CT and SPECT-CT cisternogram for detecting skull base CSF leaks. Localizing skull base CSF leaks helps enable surgeons to perform less invasive corrective procedures.