



ORIGINAL ARTICLE

Management of Cerebrospinal Fluid Leaks According to Size. Our Experience[☆]



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Endoscopic sinus surgery;
Meningitis

Abstract

Objective: We present our experience in the reconstruction of cerebrospinal fluid (CSF) leaks according to their size and location.

Materials and methods: Fifty-four patients who underwent advanced skull base surgery (large defects) and 62 patients with CSF leaks of different origin (small and medium-sized defects) were included. Large defects were reconstructed with a nasoseptal pedicled flap positioned on fat and fascia lata and lumbar drainage was used. In small and medium-sized leaks of other origin, intrathecal fluorescein 5% was applied previously to identify the defect. Fascia lata in an underlay position was used for reconstruction, which was then covered with mucoperiosteum from the turbinate. Perioperative antibiotics were administered for 5–7 days. Nasal packing was removed after 24–48 h.

Results: The most frequent aetiology for small and medium-sized defects was spontaneous (48.4%), followed by trauma (24.2%), iatrogenic (5%) and then others. The success rate was of 91% after the first surgery and 98% in large skull base defects and small/medium-sized respectively. After rescue surgery, the rate of closure achieved was 100%. The follow-up was 15.6 ± 12.4 months for large defects and 75.3 ± 51.3 months for small/medium-sized defects without recurrence.

Conclusions: Endoscopic surgery for closure of any type of skull base defect is the gold standard approach. Defect size does not play a significant role in the success rate. Fascia lata and mucoperiosteum allow a reconstruction of small/medium-sized defects. For larger skull base defects, a combination of fat, fascia lata and nasoseptal pedicled flaps provides a successful reconstruction.

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PALABRAS CLAVE

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Meningitis

Manejo de las fístulas nasales de líquido cefalorraquídeo según su tamaño. Nuestra experiencia**Resumen**

Objetivo: Presentamos nuestra experiencia en el cierre de fístulas de líquido cefalorraquídeo según su tamaño y localización.

Material y método: Se incluyeron 54 pacientes con tumores de base de cráneo intervenidos mediante cirugía endoscópica (defectos grandes) y 62 pacientes con fístulas de otra causa (defectos pequeños y medianos). Los defectos grandes fueron reparados con un colgajo nasoseptal previa colocación de grasa y fascia lata y drenaje lumbar. En las fístulas de otra causa se aplicó fluoresceína al 5% intratecalmente para identificar la fístula. Para su reconstrucción utilizamos la fascia lata en posición *underlay* recubierta por un injerto mucoperióstico del cornete. Se retiró el taponamiento a las 24-48 h y se administró ceftriaxona durante 5-7 días.

Resultados: La etiología más frecuente fue la espontánea (48,4%), seguida de la traumática (24,2%), la iatrogénica (5%) y otras. La tasa de éxito en la primera cirugía fue del 91% en los defectos grandes y del 98% en los pequeños. Con la cirugía de rescate la tasa asciende al 100%. El seguimiento a largo plazo fue de $15,6 \pm 12,4$ meses para los defectos grandes y de $75,3 \pm 51,3$ meses para los pequeños, sin evidencia de recurrencias.

Conclusión: La cirugía endoscópica es segura y eficaz en el cierre de los defectos de base de cráneo con o sin fístula activa. El tamaño del defecto juega un papel menor en el resultado. La fascia lata y el mucoperiostio del cornete son suficientes para la reparación de las fístulas pequeñas y medianas, mientras que se prefieren los colgajos nasoseptales para los defectos grandes.

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Introduction

Cerebrospinal fluid (CSF) fistulas (or leaks) into the nostrils consist of a continuous or intermittent leak of CSF into the fossae or nasopharynx caused by a disruption of the arachnoid and the dura mater, usually associated to a bone defect. Connections between the dura mater and the upper airway entail a risk of ascending bacterial meningitis which is calculated to exceed 10% annually.^{1,2}

The most common symptoms are rhinoliquorrhoea (mostly unilateral) and headache, especially if the fistula is associated to a meningocele or ascending meningitis.³ The most common location is at the level of the cribriform plate, followed by the roof of the ethmoid, sphenoid, frontal sinus, *sella turcica* and clivus.⁴

Endoscopic sinonasal surgery is considered as the standard technique in the surgical closure of these fistulas as it decreases the morbidity associated to external approaches. However, the percentage of postoperative fistulas has increased due to the large endoscopic resections of tumours located throughout the skull base. The challenge in reconstructing these major defects is that they are often connected with the ventricular system (third ventricle), causing CSF fistulas with high flows and pressures. Initially, this caused a rate of CSF fistulas over 30%, leading this surgical approach to be questioned. However, recent innovations, particularly the introduction of vascularised flaps⁵ which allow large defects to be adequately sealed, have reduced this rate from 33% to 5.4%.⁶

The objective of this study is to present our experience in the closure of CSF fistulas according to their size and location and, additionally, to create an algorithm for the diagnosis and management of CSF fistulas.

Materials and Methods

The study included patients undergoing endoscopic closure of CSF leaks (n=116) between 1997 and 2013. We conducted a review of medical records, causes, locations, methods of presentation, preoperative studies, surgical techniques, intraoperative findings, postoperative management, complications and closure success. The diagnostic and management protocol for CSF leaks presented in our algorithm (Fig. 1) was followed in all cases.

Patients were divided into two groups:

1. Extended skull base surgery group, including patients undergoing surgery for intracranial pathologies who required extensive endoscopic approaches between 2007 and 2013 (large defects).
2. Non-extended surgery group, including patients suffering rhinoliquorrhoea for other causes between 1998 and 2013 (small to medium defects).

In both groups we used intravenous ceftriaxone for 5–7 days as prophylactic antibiotic therapy due to its penetration into the central nervous system (CNS). Levofloxacin and trimethoprim/sulfamethoxazole are other suitable prophylaxis alternatives for patients who are allergic to cephalosporins.

Group of Extended Skull Base Surgery

We studied 54 patients (66% females; mean age 47.7 ± 15.5 years; range: 22–82 years) with various skull base

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