Nasopetal Flap Repair After Endoscopic Transsellar Versus Expanded Endonasal Approaches: Is there an Increased Risk of Postoperative Cerebrospinal Fluid Leak?

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Abstract

Background: Expanded endoscopic endonasal approaches (EEAs) has allowed resection of cranial-base lesions beyond the sella but is thought to have increased risk of postoperative CSF leakage because of the larger skull base defect. We evaluated our experience with vascularized pedicled nasoseptal flap (PNSF) reconstruction and compared the CSF leak rates between tumor extirpation using endoscopic transtemporal or transsphenoidal approaches.

Methods: A retrospective review of patients who underwent PNSF reconstruction for intraoperative high-flow CSF leaks after EEA to compare incidence of postoperative CSF leaks.

Results: 37 transsellar defects (Group I) were repaired with a PNSF and 32 expanded EEA defects (19 transplanum-transstuberculum, 10 transcribriform, 3 transsphenoidal) (Group II) were repaired with a PNSF. No postoperative CSF leaks occurred in Group I. One (3.1%) delayed CSF leak was encountered in Group II leading to 3.1% leak rate in that group (p > 0.05).

Conclusion: There is no significant increased risk of postoperative CSF leak between transsellar and expanded EEA defects when a PNSF is utilized.

Introduction

The recent advances in endoscopic skull base surgery have brought novel andasserative techniques to remove skull base tumors through the nose. Advances in instrumentation, anatomic knowledge and surgical technique have contributed to the development of endoscopic expanded endonasal approaches (EEAs) to a variety of cranial base pathologies that reside beyond the confines of the sella turcica. However, the increased exposure allowed by these approaches also translates into larger skull base and dural defects that are more difficult to repair. One of the fundamental principles of these repairs involves separating the intraarachnoid compartment from the subarachnoid space and has been achieved with multiple different techniques and more recently with the vascularized pedicled nasoseptal flap (PNSF). Many factors have been postulated as potential reasons for increased postoperative CSF leakage after endoscopic skull base surgery. These factors include skull base tumor resection, the size of skull base bony defect and subsequent soft tissue opening and the green outline shows the dural opening. Stepwise repair of skull base dural defect: (A) cranialization of an endonasal corridor which has been significantly reduced with the advent of the vascularized PNSF. Given the reported success of this technique, we have adopted the PNSF as our preferred method for closure of skull base and dural defects with high-flow intraoperative CSF leak used in conjunction with a multilayer closure. However, despite its high success rates, the PNSF is not effective in all cases. In a study by Zanation et al2, the following were associated with increased postoperative CSF leakage: 1) an increased size of skull base bony defect; 2) an anterior cranial fossa defect; 3) a tumor with a large intracranial component; 4) a tumor involving the parasellar region; 5) a tumor involving the parasellar region; and 6) a tumor involving the parasellar region.

Results

Thirty-seven transsellar skull base defects (Group I) and 32 expanded skull base defects (19 transplanum-transstuberculum, 10 transcribriform, 3 transsphenoidal) (Group II) were repaired with a PNSF. The average size of the skull base defects in Group I was 3.4 cm² (range, 2.0 – 9.2 cm²) and in Group II was 6.5 cm² (range, 2.2 – 13.8 cm²). The skull base defect sizes were significantly larger in Group II (p < 0.05) compared to Group I. Analysis comparing the transsellar defects to the different EEA defects is found in Table 1.

Table I - Defect Sizes by Approach

<table>
<thead>
<tr>
<th>Approach</th>
<th>Average Size of Defect (cm²)</th>
<th>Range (cm²)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transsellar (Group I)</td>
<td>3.4</td>
<td>2.0 – 9.2</td>
<td></td>
</tr>
<tr>
<td>Expanded Approaches (Group II)</td>
<td>6.1</td>
<td>2.2 – 10.4</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Transplanum-transstuberculum</td>
<td>6.1</td>
<td>2.2 – 10.4</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Transcribriform</td>
<td>7.8</td>
<td>2.7 – 13.8</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>Transsphenoidal</td>
<td>7.8</td>
<td>2.2 – 13.8</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

Discussion

Recent advances in endoscopic skull base surgery have facilitated transnasal resection of larger intracranial tumors through the creation of expanded corridors in the cranial base. However, while allowing improved access for tumor extirpation, these approaches also create much larger skull base and dural defects with intraoperative high-flow CSF leaks. These larger defects have been associated with potential increased risks for postoperative CSF leakage.2, 3 It has been significantly reduced with the advent of the vascularized PNSF.24 Given the reported success of this technique, we have adopted the PNSF as our preferred method for closure of skull base and dural defects with high-flow intraoperative CSF leak used in conjunction with a multilayer closure. However, despite its high success rates, the PNSF is not effective in all cases. In a study by Zanation et al2, the following were associated with increased postoperative CSF leakage: 1) an increased size of skull base bony defect; 2) an anterior cranial fossa defect; 3) a tumor with a large intracranial component; 4) a tumor involving the parasellar region; and 5) a tumor involving the parasellar region.

Conclusions

Although prior studies have found a trend toward an increased risk of postoperative CSF leakage with expanded endonasal skull base approaches due to larger skull base and dural defects, our data did not confirm this trend. The potential risk of postoperative CSF leaks associated with larger defects created through expanded approaches can be minimized by multilayer closures with a PNSF and meticulous surgical technique. Future larger prospective multi-center studies are warranted to further validate these results.

References