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How I Do It

The Agger Nasi Punch-Out Procedure (POP): Maximizing Exposure of the Frontal Recess

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INTRODUCTION

For many patients with chronic frontal sinusitis, removal of the uncinate process and limited opening of the anterior ethmoid air cells is adequate to restore proper frontal sinus drainage and ventilation. For those with more advanced disease, however, surgery to enlarge the frontal sinus outflow tract may be required. Typically, the frontal recess is enlarged in the anteroposterior dimension through the clearance of agger nasi cells. The frontal ostium may then be identified and even enlarged if necessary. Surgery of the frontal recess can be technically challenging because of variability in its anatomy as well as its location within the anterosuperior depths of the nasal cavity. The proximity of the frontal recess to the orbit and intracranial cavity demands precision when operating in this region. Therefore, adequate exposure of the recess is critical to the performance of safe and effective frontal sinus surgery. We describe a simple technique to enhance exposure of the frontal recess and thereby facilitate identification and enlargement of the frontal ostium.

MATERIALS AND METHODS

The study population consisted of 50 patients with chronic frontal sinusitis who underwent the agger nasi punch-out procedure (POP) by a single surgeon (R.M.). Inclusion criteria consisted of a history of chronic frontal sinusitis refractory to medical therapy. Patients were divided into two subgroups for the purpose of analysis: those undergoing primary (n = 25) and revision (n = 25) surgery. Each group was consecutively enrolled from January through June, 2000. Charts were reviewed for patient demographics, prior surgical procedures, and computed tomography (CT) stage[1] of sinus disease. All revision patients had undergone previous sinus surgery including ethmoidectomy. If the operative details of their initial procedure (frequently performed by another surgeon) were inadequate to determine that an ethmoidectomy had been performed, patients were excluded from the study. Surgical failure was defined as persistent symptoms of frontal sinusitis refractory to medical therapy necessitating additional frontal sinus surgery. Results were analyzed using Student's *t* test and Fisher's exact test.

Surgical Technique

Surgery begins with complete removal of the uncinate process, including its superior one third to ensure adequate access to the frontal recess. The maxillary ostium and ethmoid bulla are then opened as indicated by the extent of disease involving these sinuses. After identification of the medial orbital wall and skull base, a Hajek forceps or comparable rongeur is used to remove bone and overlying mucosal at the junction of the anterior attachment of the middle turbinate and lateral nasal wall (Fig. 1). The rongeur is oriented in a vertical direction, parallel to the middle turbinate, so as to avoid destabilizing this structure. Typically one or two "bites" with the rongeur are sufficient to remove the anterior face of the agger nasi cells, allowing for direct visualization into the frontal recess. One or more agger nasi cells are typically visible within the recess (Fig. 2). An angled spoon is placed behind the posterior wall of the agger nasi cells and used to curette in a posterior to anterior direction (away from the skull base) to enlarge the frontal sinus drainage pathway (Fig. 3). Fragments of bone and soft tissue are removed with an up-biting Blakesley forceps. With the anterior face as well as the posterior wall and cap of the agger nasi cells removed, the frontal sinus ostium should be directly visible. If not, the ostium can usually be identified by gentle palpation with a blunt tipped probe in the anteromedial portion of the recess (Fig. 4). A second opening leading to a supraorbital ethmoid cell can usually be identified in a more posterolateral location. Although the use of a 30 degree endoscope may be necessary to visualize the frontal ostium, the enhanced exposure obtained by the agger nasi POP often provides adequate exposure to perform the entire surgery with a 0 degree endoscope.

Depending on the severity of disease, the diameter of the frontal ostium may need to be further enlarged. This enlargement is performed by the removal of bone along the anterior rim of the ostium with a curette, rongeur, or drill. Typically, such enlarge-

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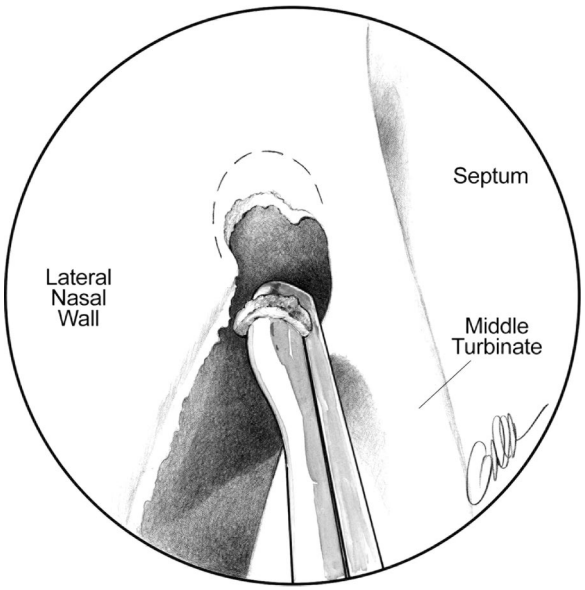

Fig. 1. Endoscopic view of right nasal cavity. Hajek forceps or similar rongeur is used to remove bone superior to middle turbinate attachment (dashed line).

ment is reserved for patients undergoing revision surgery. Care must be taken to avoid injury to the posterior mucosa of the frontal recess to minimize the risk of circumferential scar formation with restenosis.

RESULTS

The primary and revision surgical groups had a comparable mean age (47.4 vs. 42.0 yr, respectively, $P = .13$) and male-to-female ratio (1.1 and 1.3, respectively). Patients in the revision group underwent an average of 1.6 (range, 1–4) sinus surgeries before the POP. Mean sinus CT stage[1] was significantly lower for the primary group when compared with the revision group (3.04 vs. 3.52, respectively, $P = .002$).

There were no surgical complications. Surgical failure occurred in 7 of 50 patients, for an overall success rate of 86%. The success rate of the agger nasi POP was significantly higher for primary cases than revision cases (96% vs. 76% respectively, $P = .049$). The lone failure in the primary group developed synechiae in the frontal recess and underwent a successful revision agger nasi POP 18 months after the initial surgery. Four of the six failures in the revision group were attributed to recurrent nasal polyps; the remaining two developed synechiae in the frontal recess. Four of the failures were treated with en-

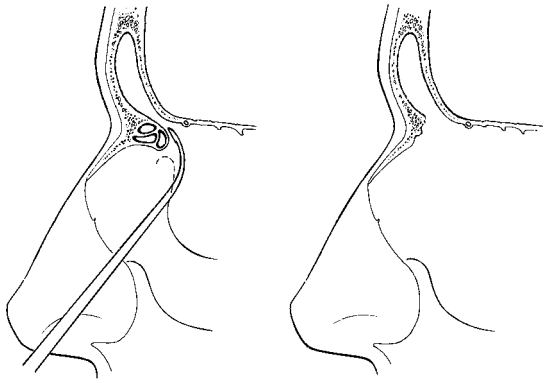

Fig. 3. Sagittal view demonstrates placement of angled spoon curette behind exposed agger nasi cells (A). These cells are removed by sweeping curette in posterior to anterior direction (away from skull base). Note larger diameter of frontal sinus drainage pathway after removal of agger nasi cells (B).

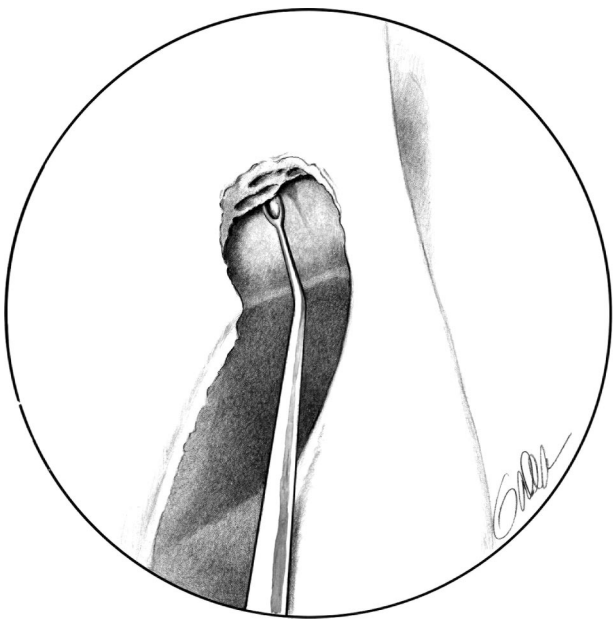

Fig. 2. Once frontal recess has been exposed, multiple agger nasi cells are visible. Angled spoon curette is placed posterior to agger nasi cells in preparation for their removal.

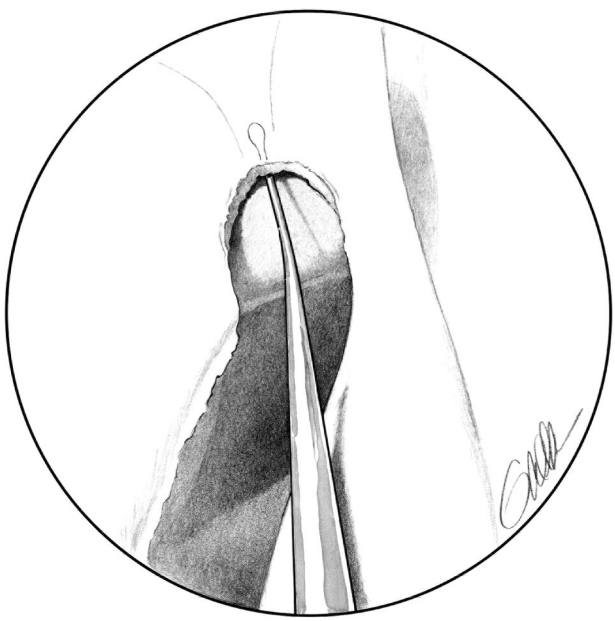

Fig. 4. At completion of agger nasi punch-out procedure, a ball-tipped probe may be inserted into frontal sinus, confirming patency of frontal ostium.

doscopic frontal sinus drillout (Draf type III or modified Lothrop) procedures,[2] one of whom progressed to frontal sinus obliteration. The remaining two failures were salvaged with revision agger nasi POP. Mean time to failure was 2.5 years. Mean follow-up for all patients was 5.3 (range, 5.1–5.5) years.

DISCUSSION

For many otolaryngologists, treatment of disease within the frontal sinus remains the most challenging aspect of endoscopic sinus surgery. Exposure of the frontal recess is difficult because of its location in the most anterior and superior depths of the nasal cavity as well as its complex underlying anatomy. Moreover, the anterior wall of the agger nasi cells, which is left intact during conventional approaches, obstructs the direct view to the frontal ostium and limits exposure of the frontal recess. By removal of the anterior face of the agger nasi cells, the agger nasi POP provides the surgeon with improved exposure for identification and enlargement of the frontal sinus ostium. Visualization within the recess is often so good that the surgeon can operate on the frontal sinus with a 0 degree endoscope, avoiding the added challenges of working around corners with a 30 degree endoscope. The 86% success rate of the agger nasi POP in this series is consistent with published success rates for endoscopic frontal sinus surgery of 79% to 98%.[3–5]

The apparent success of this technique attests to the fact that removal of the agger nasi cells is sufficient to open obstructed frontal sinus drainage pathways in many patients with frontal sinusitis. Although removal of these cells is not actually enlarging the frontal ostium, it is enlarging what may be the narrowest point of egress from the frontal sinus in many patients, particularly those with well-pneumatized agger nasi cells where mucus must flow over and around these cells to reach the nasal cavity. It is for this reason that the agger nasi POP appears to be particularly well suited for patients with large, prominent agger nasi cells. Such individuals tend to have a broad-based attachment of the middle turbinate to the lateral nasal wall, allowing for easy placement of the bone rongeur and opening into the agger nasi cells.

A potential complication of POP is destabilization of the middle turbinate with subsequent lateralization, which may lead to re-obstruction of the frontal sinus. In consideration of the small amount of bone removed during the POP, this destabilization seems unlikely, and it was not observed in this series. Schaefer and Close[6] and Wormald[7] have described a similar technique to enhance exposure of the frontal recess. Neither noted an increased incidence of middle turbinate lateralization.

The formation of obstructing postoperative adhesions within the frontal recess, however, was the cause of surgical failure in three patients in our study. Such adhesions are one of the most common causes of recurrent obstruction after endoscopic sinus surgery[8,9] and were thought to be the result of surgical manipulation within the recess. The "axillary flap" technique described by Wormald[7] is designed to minimize the incidence of postoperative adhesions. In this technique, a posteriorly based mucosal flap is maintained to cover exposed bone adjacent to the middle turbinate.

The higher surgical success rate observed in this study for patients undergoing primary POP as compared with a revision procedure is consistent with the reported increased failure rate for revision sinus.[3] Growth of recurrent nasal polyps, as well as synechiae, were found to be the causes of recurrent obstruction. The significantly higher sinus CT stage for the revision group may also have been a contributing factor to a higher surgical failure rate in these patients. More advanced surgical procedures, including frontal sinus drillout and obliteration, led to eventual resolution of symptoms in these patients with more aggressive disease.

Although none of the patients in this study reported postoperative epiphora, an additional theoretic risk of the agger nasi POP is damage to the orbital contents, including the lacrimal sac, which lies in close proximity to the frontal recess.[10] Injury to the sac can be avoided by maintaining the jaws of the bone rongeur parallel to the medial orbital wall while opening the face of the recess.

CONCLUSIONS

The agger nasi POP is a safe technique that may enhance intraoperative exposure of the frontal recess. This technique appears to be effective in both primary and revision surgery for patients with frontal sinusitis.

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