Closed Microfracture Technique for Surgical Correction of Inferior Turbinate Hypertrophy in Rhinoplasty: Safety and Technical Considerations

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Summary: An abundance of surgical procedures are in use for the management of inferior turbinate hypertrophy in rhinoplasty patients. An ideal treatment approach is elusive, given the variability of patient presentation regarding obstructive nasal airway, significant complications associated with techniques that cause mucosal trauma, and the high recurrence rates associated with more conservative techniques. In an effort to improve patient safety, the authors describe a conservative technique—the closed microfracture—that provides an effective functional airway improvement and minimal to no complications. The authors propose a treatment approach for enlarged inferior turbinates based on turbinate subtype. (*Plast. Reconstr. Surg.* 136: 607e, 2015.)

Turbinate hypertrophy is a common cause of nasal airway obstruction encountered in rhinoplasty patients.[1] The inferior turbinate contributes to the posterior border of the internal nasal valve, and turbinate hypertrophy is commonly implicated in nasal airflow obstruction.[2] All causes of nasal airway obstruction—including turbinate hypertrophy—must be recognized and addressed at the time of rhinoplasty surgery to prevent postoperative nasal airway obstruction.[3–7] Mucosal turbinate hypertrophy is typically bilateral, is secondary to environmental or autogenic causes, and is usually responsive to medical management. Conversely, bony turbinate hypertrophy is typically unilateral, and develops as a physiologic compensatory response to changes in nasal airway flow—classically from a deviated septum.[8] All patients with bony hypertrophy are candidates for surgical correction, as are patients with mucosal hypertrophy that do not respond adequately to medical therapy.

HISTORY AND EVOLUTION OF TURBINATE REDUCTION AND OUTFRACTURE

The best surgical intervention strategy for enlarged inferior turbinates is controversial. An abundance of surgical procedures exist—each with its own limitations: outfracture, steroid injection, cryosurgery, chemical cautery, laser cautery, electrocautery, submucous resection, and partial or complete resection.[8–12] The inferior turbinate outfracture technique was first described by Goode[13] but was abandoned, as the turbinate position was found to "rebound" within months of surgery, thereby causing recurrent airway obstruction. The nature of the greenstick fracture causes recurrence in more than 50 percent of cases within months of surgery.[14–16] Extensive surgical resection techniques, such as partial and full turbinectomies, were found to significantly relieve airway obstruction. However, complications were significant; devastating outcomes included bony overresection and incurable rhinorrhea or "empty nose syndrome."[11] Submucous resection became a more conservative alternative; however, the technique

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was unable to avoid complications associated with mucosal trauma, such as synechiae, crusting, and bleeding.[8,17] Hematoma rates between 2 and 14 percent have been reported in the literature, but this is likely reduced by avoiding significant posterior resection.[18] Cryosurgery, electrocautery, and chemical cautery techniques are prone to ciliary dysfunction, crusting, synechiae, and relapse.[12,14]

All surgical techniques that traumatize the mucosa can lead to a multitude of complications.[14,19] Risk of such complications and concern for patient safety have caused the clinical pendulum to swing back in favor of more conservative approaches.[10,20,21] An ideal surgical approach should provide a lasting improvement to nasal airflow dynamics and minimize trauma to the mucosa with the goal of preserving turbinate function and minimizing complications. The closed microfracture method as described below is a promising technique that can be used successfully in the majority of patients when proper patient selection is performed. The closed microfracture technique was designed to have a low complication rate and to prevent recurrence.

OPERATIVE TECHNIQUE FOR CLOSED MICROFRACTURE

The closed microfracture technique is similar to the outfracture technique in that neither technique involves bony resection or mucosal trauma. The crucial difference between the two techniques is that the closed microfracture technique results in a comminuted fracture inside an intact mucosal sac (Fig. 1). Therefore, as opposed to the outfracture technique in which the bone is solely fractured at the neck of the inferior turbinate with a tendency to recur, comminution prevents the turbinate from returning to an obstructive position. Intraoperatively, after removal of the oxymetazoline-soaked pledgets from the nasal cavity, a long heavy Vienna nasal speculum is used to microfracture the inferior turbinates through a closed approach. The turbinate is outfractured in a juddering motion proceeding from posterior to anterior while pushing the Vienna speculum laterally on the turbinate (Fig. 2). (**See Video, Supplemental Digital Content 1**, which displays a closed microfracture of the hypertrophied inferior turbinate during rhinoplasty, ***http://links.lww.com/PRS/B426***.) This results in a comminuted fracture pattern and avoids a greenstick-type fracture that could migrate back. The inferior turbinate assumes a more inferolateral position in the nasal cavity, allowing improved airflow through the medial meatus. Doyle splints are typically used for 1 week postoperatively to splint the septum and turbinates apart.

RESULTS

In the senior author's practice (R.J.R.), we evaluated 500 consecutive rhinoplasty patients undergoing closed microfracture technique between 1999 and 2014. In our retrospective case series, we found a 0 percent incidence of turbinate hypertrophy recurrence, synechiae, malunion, or nonunion requiring surgical intervention, based on nasal speculum examination and absence of nasal obstruction symptoms over a 6-month follow-up. Postoperatively, we

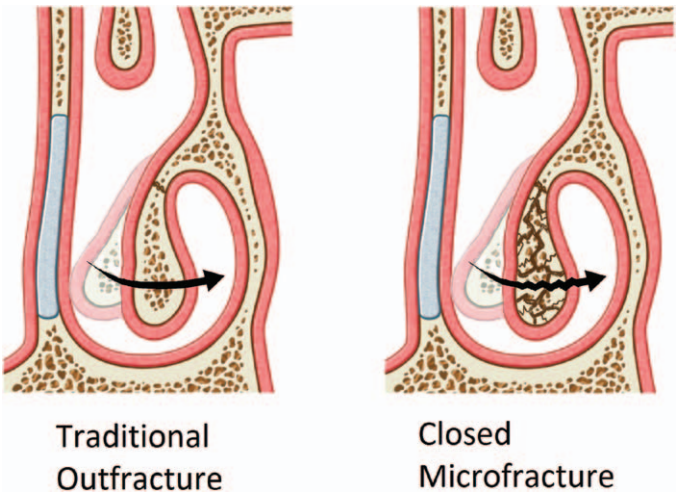

Fig. 1. Comparing techniques (traditional outfracture versus closed microfracture) for the treatment of inferior turbinate hypertrophy in rhinoplasty patients.

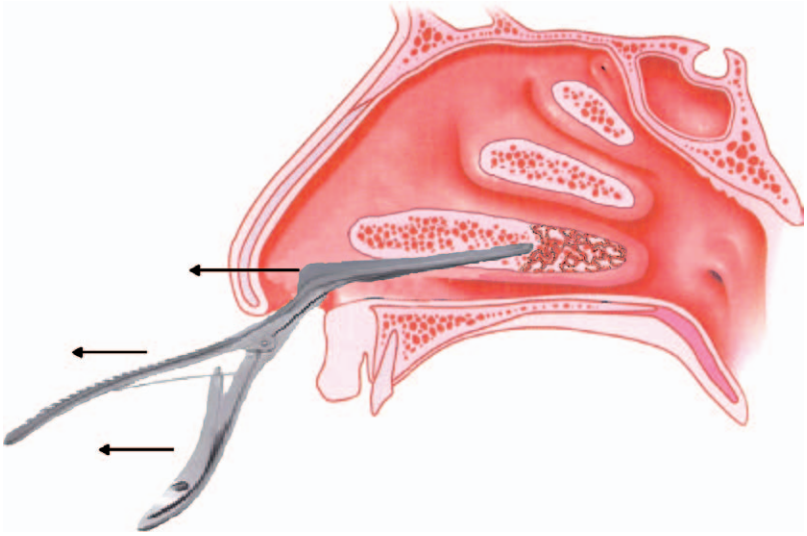

Fig. 2. Closed microfracture using a Vienna speculum.

Video. Supplemental Digital Content 1 displays a closed microfracture of the hypertrophied inferior turbinate during rhinoplasty, ***http://links.lww.com/PRS/B426***.

found a 0 percent incidence of postoperative hematoma, crusting, desiccation, or wound healing issues, as the technique does not involve a mucosal incision. All 500 patients in our case series had mild to moderate turbinate hypertrophy. Severely enlarged turbinate hypertrophy from either (1) bony hypertrophy or (2) mucosal hypertrophy that had failed medical management was found to occur in less than 3 percent of our entire rhinoplasty patient population. In this rare group, a more invasive technique was warranted—for which submucous resection was our preferred technique.

APPROACH TO TURBINATE HYPERTROPHY

All patients presenting for rhinoplasty are evaluated clinically for medical and surgical causes of nasal airway obstruction as described by Rohrich et al.[8] Surgical causes of nasal airway obstruction are evaluated on physical examination and most commonly include turbinate hypertrophy, septal deviation, incompetent external nasal valve, and collapsed internal nasal valve. More rare surgical causes include nasal tumor, nasal polyposis, septal spur, foreign body, small inferior meatus, and concha bullosa.[22]

To guide surgical approach, inferior turbinate enlargement can be clinically classified by subtypes based on hypertrophied tissue type and turbinate size (Fig. 3 and Table 1).[23] Patients with mucosal hypertrophy are further evaluated using a topical vasoconstrictive agent, and a medical management plan is initiated. Surgical candidates for hypertrophied turbinate reduction have either (1) redundant hyperplastic mucosa or vasomotor-induced mucosal changes that do not respond to

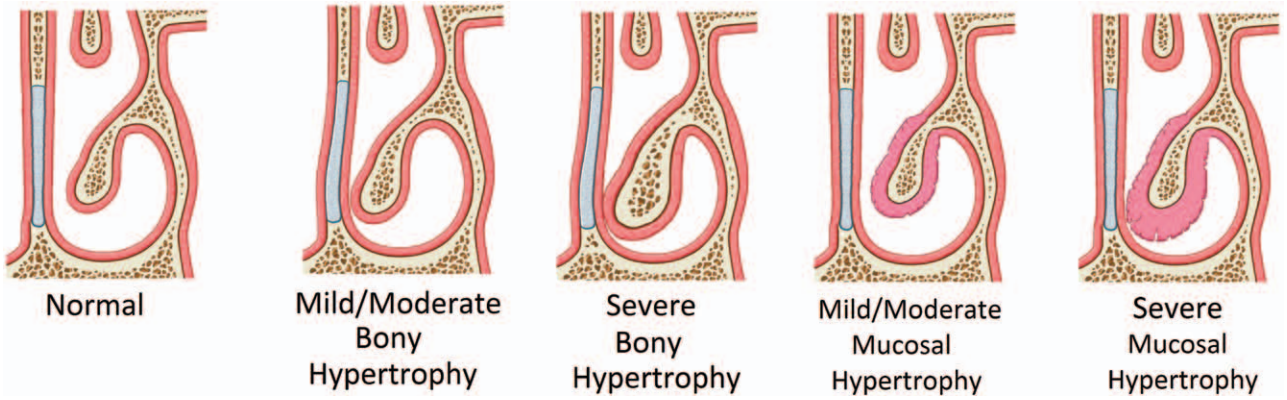

Fig. 3. Inferior turbinate hypertrophy subtypes.

Table 1. Distinguishing between Bony and Mucosal Hypertrophy of the Inferior Turbinate

	Bony Hypertrophy	Mucosal Hypertrophy
Cause	Anatomical	Medical, environmental, autonomic
Physical examination	Rigid bone palpable	Spongy mucosa palpable, bluish hue
Radiography/CT scan*	Bony enlargement	No bony enlargement
Location	Usually unilateral	Unilateral or bilateral
Septal deviation	Almost always present	Not usually a risk factor
Topical vasoconstrictors	No effect	May shrink
Surgical management	Will respond	May develop refractory symptoms
Medical management	No effect	Will likely respond

CT, computed tomographic.
*Not routinely ordered.

medical management, or (2) an anatomical cause, most commonly a deviated septum (Fig. 4). Even if septal deviation and hypertrophied turbinates are asymptomatic preoperatively, the anatomical deformity is still corrected with surgery, and the turbinate is addressed prophylactically to avoid symptomatic obstruction following septal straightening.[24] Closed microfracture can be performed in all surgical candidates with mild to moderate turbinate hypertrophy regardless of hypertrophied tissue type. In rare cases with severe turbinate hypertrophy, a more invasive technique should be considered. Our preferred technique in these cases is submucous resection; however, this technique is necessary in only 3 percent of our patient population.[6,8]

CONCLUSIONS

The closed microfracture technique provides a safe, noninvasive, and effective solution for inferior turbinate enlargement in rhinoplasty patients, and offers a long-lasting result and minimal to no complications. Although our team has safely relied on the closed microfracture technique for 97 percent of our rhinoplasty patients requiring surgical correction of turbinate enlargement, one turbinate procedure alone is not adequate to treat all subtypes of turbinate enlargement. Our patients have

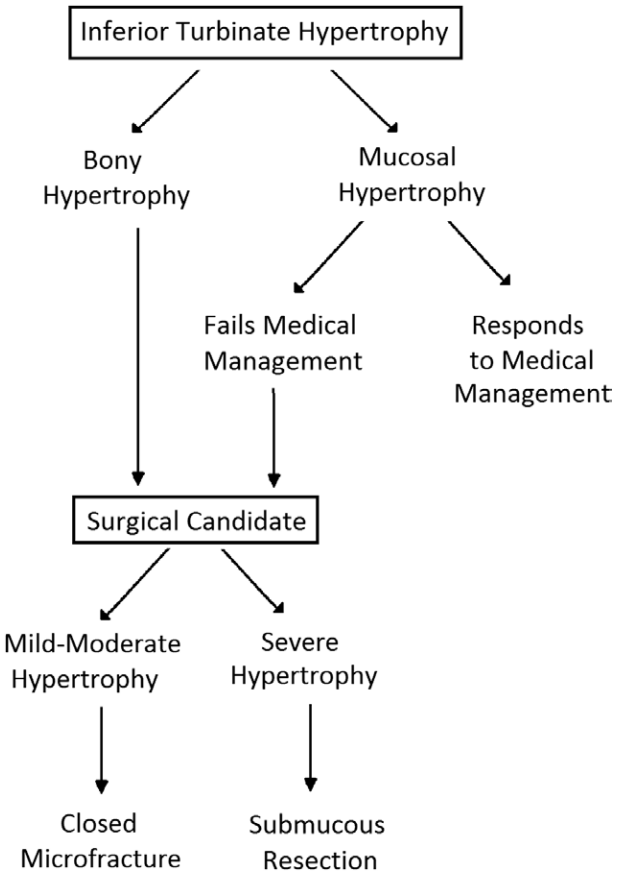

Fig. 4. Clinical approach for inferior turbinate hypertrophy.

benefited from a more tailored approach based on preoperative evaluation—reducing the indication for more invasive turbinate reduction techniques. The closed microfracture technique is superior to the traditional outfracture technique given its low tendency to recur. The traditional outfracture technique leads to recurrent nasal obstruction in the majority of cases.[14–16] The closed microfracture technique produces bony comminution of the turbinate (as opposed to greenstick fracture), allowing the turbinate to remain and heal in the preferred inferolateral position in the nasal cavity (as opposed to rebounding). We encourage evidence-based studies comparing functional outcomes and complication rates among commonly used treatment modalities for managing turbinate hypertrophy in rhinoplasty patients.[16]

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