Mastoid bone as a new graft material in rhinoplasty

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ABSTRACT

Background: The management of certain nasal deformities, especially after prior rhinoplasty, may require grafting material. In this study we describe the use of mastoid bone as a viable and low morbidity autologous graft.

Methods: Mastoid bone was used for nasal augmentation, smoothing dorsal nasal irregularities, or augmentation of radix. Candidates for mastoid bone graft were patients undergoing primary rhinoplasty suffering from low radix or saddle nose deformity and candidates for secondary rhinoplasty suffering from prior overresection of the osteocartilaginous structures.

Results: Fifty-six patients met the study criteria. Eighteen patients underwent secondary rhinoplasty and suffered from prior overresection of osteocartilaginous structures and 38 patients underwent primary rhinoplasty. Of these, 18 patients had a low radix and 20 patients had a saddle nose deformity. Follow-up was 6–49 months (mean, 23 months). All cases resulted in an augmented straightened nasal dorsum, increased tip projection, and adjusted radix. There were no cases of graft infection. In two cases the graft was displaced requiring revision. The amount of graft absorption even after 2 years follow-up was acceptable. There were no donor site complications.

Conclusions: The mastoid bone graft provides adequate autologous bone in most cases of primary or revision rhinoplasty. The donor site carries low morbidity and a well camouflaged scar. It is easily accessible especially for the otolaryngologist who is accustomed to operating on the mastoid bone.

Key words: Augmentation, graft, mastoid bone, radix, rhinoplasty, saddle nose, secondary rhinoplasty

Candidates for primary rhinoplasty surgery often complain of saddle nose deformity or a pseudohump. Although one of the most common problems leading to pseudohump is tip underprojection, a common missed point is low radix. In addition, overresection or destruction of the osteocartilaginous structures because of previous surgery is a common problem in secondary rhinoplasty. Management of such deformities especially in secondary rhinoplasty is challenging because of the lack of useable tissues, thus necessitating the use of a graft.

Many autogenous and alloplastic graft materials have been used for reconstruction of the nasal structures and augmentation of the profile. However, most surgeons prefer the use of autologous grafts from sources including calvaria, iliac crest, rib, septal cartilage, conchal cartilage, nasal hump, and bony inferior turbinate. Septal and ear cartilage are preferred for reconstruction of the cartilaginous part of the nose. However, these grafts have some limitations including difficulty in working with the inherent curvature of the cartilaginous radix graft and the unavailability of adequate septal cartilage for reconstruction of the saddle nose in secondary rhinoplasty. Rib graft is associated with donor site morbidity and scarring, which may not be acceptable for some patients, especially young women. Bony grafts from the calvaria, hip, and rib have some advantages including good fixation, low rate of displacement, and integration into adjacent tissue. However, these grafts also carry certain donor site morbidity.

In this article we present our experience with the mastoid bone as an alternate grafting material for rhinoplasty. Mastoid bone is not associated with serious donor site morbidity while providing adequate material to augment the dorsum or radix in most situations. It is easy to harvest, especially for the otolaryngologist who is comfortable operating on the mastoid. To the best of our knowledge, the mastoid bone graft has not been previously described in otolaryngology literature.

METHODS AND MATERIALS

Study Group

In this case series, rhinoplasty candidates who suffered from saddle nose deformity (secondary or primary) or low radix who underwent mastoid bone graft augmentation during the period from 2004 to 2008 were included. The exclusion criteria were a history of previous mastoid operation or ear pathology (e.g., otitis media). All patients were followed postoperatively with physical exam and photodocumentation. Informed consent was obtained from each patient and the study protocol was reviewed and approved by Tehran University of Medical Sciences Research Ethics Review Board.

Technique

For harvest of the mastoid bone, a postauricular skin incision was made as usual during mastoidectomy. By subperiosteal dissection the mastoid bone was exposed from the temporal line to the mastoid tip. The graft was designed using cutting drills; bone in a desired size and shape was harvested by gentle osteotomy (Fig. 1, a–b). After making peripheral cuts, the deep attachment was broken by blunt force with a freer elevator. This graft can provide nearly 30–40 mm of autologous bone (Fig. 1, c–d). It is preferred to harvest mastoid cortex with adjacent peristeum; we believe this will help reduce graft resorption. The final molding of the graft was performed using diamond burs to provide the desired shape as a “dorsal graft” or “radix graft.” A precise pocket was carefully created in the recipient site to stabilize the graft in the early postoperative period and prevent its dislocation. When used as a radix graft, the bone was placed in a pocket in the subperiosteal plane deep to the procerus muscle; in this situation, the relative thickness of the skin soft tissue envelope will camouflage the graft, even in the thin-skinned patient. When used for the dorsum, we prefer fixing the graft with sutures (Fig. 2).

RESULTS

Fifty-six patients (mean age, 25 ± 6 years; women/men, 45:11) were enrolled in this case series. The patients included 18 with cases of overresected osteocartilaginous noses and 38 primary rhinoplasties (18 low radix and 20 saddle nose). Representative cases are illustrated in Figs. 3–6. The mean size of harvested grafts in length was 37 mm
(range, 20–50 mm), in width was 11 mm (range, 7–14 mm), and in depth was 4 mm (range, 3–7 mm).

Mean follow-up was 32 months (range, 6–52 months). All cases resulted in an augmented, straightened nasal dorsum and adjusted radix. The final results were satisfying throughout the follow-up period with no evidence of graft infection. The graft was displaced in only two cases; these were managed with operative correction (Fig. 7). There was an acceptable range of resorption. We had no cases of complete resorption, with none of the grafts undergoing >30% resorption. Mean reduction in the corrected dorsal nasal height was 10% (range, 2–29%). In one patient who required revision septal surgery, inspection of the graft showed good integration. All grafts maintained their shape with no evidence of distortion. There were no donor site complications.

**DISCUSSION**

True saddle nose deformity may arise because of trauma, inflammatory disorders, or iatrogenic causes. One of the main causes of saddle nose deformity continues to be from overresection of septal cartilage during septoplasty. Although with newer techniques such as endoscopic septoplasty, the incidence of this complication should diminish, saddle nose deformity continues to be a significant complication in this patient population. Low radix and dorsum makes the nose look short and wide. Use of grafts or implants increases dorsal height and gives an appearance of a narrower nose with a strong natural profile without any need for osteotomy. If the compromised area is only in the middle vault, a small dorsal onlay graft will solve the problem. A severe saddle nose deformity will require greater quantities of grafting material. Septal and auricular cartilages are still considered the material of choice but many times do not supply the quantities needed to correct these deformities.

Various materials are used for dorsal or radix onlay grafts. The
ideal graft material would be completely compatible with the host; easily shaped; and resistant to graft infection, resorption, migration, and extrusion. Several synthetic materials exist including polyamide mesh, polymeric silicone, waterproof breathable fabric, calcium phosphate cement paste, polytuf, and porous high-density polyethylene. However, these materials are associated with increased risk.

Figure 4. Results of mastoid bone graft. (a and b) Graft used to heighten low radix (panel a, preoperative image; panel b, postoperative image); (c and d) hump removal and correcting low radix (panel c, preoperative image; panel d, postoperative image).

Figure 5. Results of mastoid bone graft in secondary rhinoplasty. (a) Preoperative image anterior view; (b) preoperative image lateral view; (c) postoperative image anterior view; (d) postoperative image lateral view; (e and f) 3 years follow-up anterior and lateral view.

Figure 6. Results of mastoid bone graft in twisted nose. (a) Preoperative image anterior view; (b) preoperative image lateral; (c) posterior image anterior view; (d) postoperative image lateral view.
of graft infection, extrusion, and possible rejection. Despite noticeable advancement in making synthetic biocompatible materials, use of autogenous materials is preferred by most surgeons. Lower rates of graft infection, extrusion, and resorption are some of the advantages of autografts compared with alloplasts and biosynthetic materials.

Although septal and conchal cartilage is the preferred graft in most instances, bone provides much more abundant tissue to work with. Bone grafts from different sources including iliac crest, calvaria, and rib have been used over the years. These bone graft options do have some disadvantages such as cosmetic and functional donor site morbidity; life-threatening complications such as pneumothorax, and intracranial hemorrhage are also always a concern.

Here, we describe a new source for harvesting bone graft to use in augmentation rhinoplasty. The mastoid bone provides excellent bone stock for grafting and can be easily shaped. For example, this graft can be used between the bone graft and underlying tissue to help with dislocation, the graft should be made to fit exactly in its bed. Cartilage reconstructing a portion. To decrease the rate of graft morbidities, the graft should be made to fit exactly in its bed. Cartilage can be used between the bone graft and underlying tissue to help with graft fixation.

CONCLUSION

Mastoid bone is an excellent choice when autologous bone graft is needed for dorsal nasal or radix augmentation. Harvest of this graft is simple with almost no donor site morbidity. Further investigation into the long-term outcome and benefits of this graft are warranted.

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REFERENCES
