Review of literature of saddle nose deformity reconstruction and presentation of vomer onlay graft

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Abstract
Objective: Saddle nose deformity is a well-described condition that most commonly results from trauma or prior surgery. For larger saddle nose deformity defects, bone grafts are a reconstructive option that provide adequate structure for repair. One new technique for repair of these deformities is a vomerian bone onlay graft. We aim to provide a review of literature on autogenous repair of saddle nose deformities, as well as introduce a new technique in which the vomer bone is used as an onlay bone graft.

Methods: Literature review and case series. Five cases in which vomer onlay grafts were used for repair of saddle nose deformity were reviewed between January 2013 and December 2015. Aesthetic outcomes and postoperative complications were evaluated at subsequent follow-up visits in clinic.

Results: In all cases where vomer bone was harvested, the vomer onlay graft provided adequate structure to traverse the saddle nose deformity. No postoperative complications were observed in an 18 month follow-up period.

Conclusion: Vomerian bone onlay grafts are a reconstructive option for saddle nose deformity and nasal dorsum defects. While septal cartilage is commonly used, and ethmoidal bone has been previously described as an option for composite graft reconstruction, vomer bone onlay grafting has not been well described in the literature. This method may be of use when previous nasal surgery has been performed and standard septal cartilage is not possible to harvest. The aesthetic outcomes following nasal dorsum reconstruction using onlay grafts are favorable, but long-term outcomes of these grafts require further study.

Level of Evidence: IV.

Keywords
rhinoplasty, saddle nose deformity, vomer onlay graft

Received: 11 February 2020 | Revised: 27 July 2020 | Accepted: 28 August 2020

DOI: 10.1002/lio2.475

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INTRODUCTION

The saddle nose deformity is the loss of structural integrity of the lower two-thirds of the nose, resulting in functional and aesthetic impairment.\(^1\) The major feature of this deformity is a combination of loss of septal support and disruption of the septum, upper lateral cartilages, the nasal bone-septal cartilage complex, and the contraction of the skin soft tissue envelope, leading to a deficiency of the middle nasal vault, which weakens nasal valve function.\(^1\) Repair of saddle nose and similar deformities therefore represents one of the most challenging problems in nasal surgery, requiring long term structural support while avoiding sacrifice of aesthetics.

Over the past 60 years, diverse options have evolved for surgical reconstruction. For minor dorsal deformities with limited septal structural damage, cartilage or fascial overlays have been considered.\(^2,3\) However, bone grafts extending from the native nasal bones to the cartilaginous dorsum have been increasingly utilized to provide increased structural support and allow for direct bone-to-bone healing.\(^4,5\) We aim to provide a review of literature on autogenous surgical repair of saddle nose deformities, as well as introduce a new technique: the use of the vomerian bone dorsal onlay graft, contoured in a similar manner to a cranial bone graft.

MATERIALS AND METHODS

2.1 Search strategy and article selection

PubMed was searched from inception through April 1, 2019. Keywords included “saddle nose deformity” cross-referenced with “reconstruction” (Figure 1). The following criteria were used to guide inclusion of studies: (a) patients carried a diagnosis of saddle nose deformity, (b) patients underwent autogenous surgical repair of the deformity with description of the technique for repair, and (c) studies reporting original data. Studies not written in English or lacking abstract or full text were excluded.

2.2 Patient selection for case series

This study was reviewed by the local Institutional Review Board and approved under protocol 18-117H. Patients were selected intra-operatively as candidates for vomer onlay grafts based on previous surgical history of septoplasty, exposure and examination of the saddle nose deformity, and pre-operative facial analysis. Five cases were conducted between January 2013 and December 2015. Aesthetic outcomes and post-operative complications were evaluated at subsequent follow-up visits in clinic.

2.3 Surgical technique

A hemi-transfixion incision is used to elevate mucoperichondrial flaps and gain access to the septal cartilage. If a septoplasty is being performed, the vomer should be completely spared up to the perpendicular plate of the ethmoid until it is ready to be harvested. In cases where a septoplasty is not being performed, the vomer can be approached through the same incision after dislocating the quadrangular cartilage from the vomer. Caution should be used to avoid harvesting bone at the face of the sphenoid. To be a suitable graft, vomer bone must be approximately 3 to 4 mm in thickness. Grafting the bone once harvested requires delicacy if the bone is particularly thin, but as a bone graft, it is generally durable and can be harvested with portions of the quadrangular cartilage for increased graft size. The bone is generally separated from the perpendicular plate of the ethmoid with heavy scissors and an osteotome is used to elevate it from the nasal floor. Most defects require starting grafts of at least 2 cm × 4.5 cm but this should be confirmed with specific measurements from the patient.

The vomerian bone is contoured using heavy scissors and an otologic drill with a diamond burr set to achieve a smooth contour mimicking the natural convex nasal dorsal shape (Figure 2). An inverted-V midcolumellar incision is used to elevate to elevate the skin and soft tissue over the nasal cartilage. After the tissue flap is elevated over the area of deformity, the native nasal bone is rasped to create an underlying surface more amenable for healing of the graft. The graft is then placed on the nasal bones, extending in a cantilever fashion across the area of the saddle nose deformity without additional fixation. The columellar incision is then closed using 6-0 nylon sutures. The nose is taped and splinted to hold the graft for 10 days.
3 | RESULTS

3.1 | Literature review

The initial database search identified 171 records, from which a total of 18 studies published between 1965 and 2019 met inclusion criteria for review. Of the initial 171 articles, 28 records were not published in English or did not have abstracts available for review. One hundred and forty-three abstracts were screened, resulting in exclusion of an additional 33 manuscripts. One hundred and ten full-text articles were assessed for eligibility, from which 92 were excluded. Ultimately, 18 articles met inclusion criteria (Figure 1).

The 18 articles represent case reports and case series of autogenous reconstruction of saddle nose deformity. Fourteen articles present cartilaginous grafts. Of these, 12 discuss costal cartilage and two discuss septal cartilage. Four articles present bone grafts, two of which discuss calvarial bone, one of which discusses iliac bone, and one of which discusses lower turbinate bone.

3.2 | Vomer only graft for saddle nose deformity reconstruction

Five patients underwent reconstruction using the vomer onlay graft for saddle nose deformity. In all cases where vomer bone was harvested, the vomer onlay graft provided adequate structure to traverse the saddle nose deformity. Desirable aesthetic results following repair of saddle nose deformity can be achieved using vomer onlay grafts (Figure 3). No postoperative complications including graft resorption, infection, extrusion, or hematoma were observed in an 18 month follow-up period.

4 | DISCUSSION

Saddle nose deformities require careful consideration prior to surgical correction. Autogenous cartilage is widely used as a graft material for reconstruction, as it balances rigidity and flexibility, causes little reaction at the recipient site, can resist traction forces of wound healing.
5 | CONCLUSION

Graft options for autogenous reconstruction of saddle nose deformity range from septal and conchal cartilage to costal cartilage to lower turbinate bone, iliac bone, and split calvarial bone. When additional structural support is needed, bone grafts provide for a superior alternative to cartilage. We present the vomerian bone onlay graft as a reconstructive option for saddle nose deformity and nasal dorsum defects. Similar to cranial bone, there is the opportunity for bone to bone healing to the nasal bones, and this graft lacks the risk of the warping that can occur with costal cartilage. In addition, vomerian bone may also be used for smaller defects when septal cartilage is not available. The preliminary aesthetic outcomes following nasal dorsum reconstruction using onlay grafts appear favorable, but long-term outcomes of these grafts require further study.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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BIBLIOGRAPHY

1. Kim DW, Toriumi DM. Management of posttraumatic nasal deformities: the crooked nose and the saddle nose. Facial Plast Surg Clin North Am. 2004;12:111-132.
2. Mao J, Carron M, Tomovic S, Narasimhan K, Allen S, Mathog RH. Cartilage grafts in dorsal nasal augmentation of traumatic saddle nose deformity: a long-term follow-up. Laryngoscope. 2009;119:2111-2117.
3. Daniel RK. Rhinoplasty: septal saddle nose deformity and composite reconstruction. Plast Reconstr Surg. 2007;119:1029-1043.
4. Shipchandler TZ, Chung BJ, Alam DS. Saddle nose deformity reconstruction with a split calvarial bone L-shaped strut. Arch Facial Plast Surg. 2008;10:305-311.
5. Cheney ML, Gliklich RE. The use of calvarial bone in nasal reconstruction. Arch Otolaryngol—Head & Neck Surgery. 1995;121:643-648.

6. Tardy ME Jr, Schwartz M, Parras G. Saddle nose deformity: autogenous graft repair. Facial Plast Surg: FPS. 1989;6:121-134.

7. Rozner L. Augmentation rhinoplasty. Br J Plast Surg. 1980;33:377-382.

8. Paris J, Facon F, Thomassin JM. Saddle nose surgery: long term aesthetic outcomes of support grafts. Rev Laryngol – Otol – Rhinol. 2006;127:37-40.

9. Daniel RK, Brenner KA. Saddle nose deformity: a new classification and treatment. Facial Plast Surg Clin North Am. 2006;14:301-312. vi.

10. Pribitkin EA, Ezzat WH. Classification and treatment of the saddle nose deformity. Otolaryngol Clin North Am. 2009;42:437-461.

11. Jovanovic S, Berghaus A. Autogenous auricular concha cartilage transplant in corrective rhinoplasty. Practical hints and critical remarks. Rhinology. 1991;29:273-279.

12. Murakami CS, Cook TA, Guida RA. Nasal reconstruction with articulated irradiated rib cartilage. Arch Otolaryngol – Head & Neck Surg. 1991;117:327-330. discussion 31.

13. Bilen BT, Killinc H. Reconstruction of saddle nose deformity with three-dimensional costal cartilage graft. J Craniofac Surg. 2007;18:511-515.

14. Furlan S. Correction of saddle nose deformities by costal cartilage grafts—a technique. Ann Plast Surg. 1982;9:32-35.

15. Riechelmann H, Rettinger G. Three-step reconstruction of complex saddle nose deformities. Arch Otolaryngol – Head & Neck Surg. 2004;130:334-338.

16. Gentile P, Cervelli V. Nasal dorsum reconstruction with 11th rib cartilage and auricular cartilage grafts. Ann Plast Surg. 2009;62:63-66.

17. Bottini DJ, Gentile P, Donfrancesco A, Fiumara L, Cervelli V. Augmentation rhinoplasty with autologous grafts. Aesthetic Plast Surg. 2008;32:136-142.

18. Hyun SM, Jang YJ. Treatment outcomes of saddle nose correction. JAMA Facial Plast Surg. 2013;15:280-286.

19. Qian SY, Malata CM. Avoiding pitfalls in open augmentation rhinoplasty with autologous L-shaped costal cartilage strut grafts for saddle nose collapse due to autoimmune disease: the Cambridge experience. J Plast Reconstr Aesthet Surg. 2014;67:e195-e203.

20. Tan O, Algian S, Cinal H, Barin EZ, Kara M, Inaloz A. Management of saddle nose deformity using dermal fat and costal cartilage “sandwich” graft: a problem-oriented approach and anthropometric evaluation. J Oral Maxillofac Surg: Off J Am Assoc Oral Maxillofac Surg. 2016;74:1848.e1-e14.

21. Cevicz R, Ustun Bezgin S, Cakir BO, Kersin B, Bayazit YA. Dorsal augmentation of saddle nose deformity with toothpick-shaped costal cartilage grafts in the secondary septorhinoplasty. J Craniofac Surg. 2017;28:2063-2065.

22. Irmak F, Yazar SK, Sirvan SS, Yazar M, Karsidag S. Use of roof-shaped costochondral cartilage for correction of saddle nose deformity. Plast Reconstr Surg. 2018;142:45-52.

23. Oztruan O, Aksoy F, Veyseller B, Apuhan T, Yildirim YS. Severe saddle nose: choices for augmentation and application of accordion technique against warping. Aesthet Plast Surg. 2013;37:106-116.

24. Gurlek A, Askar I, Bilen BT, Aydogan H, Fariz A, Alaybeyoglu N. The use of lower turbinate bone grafts in the treatment of saddle nose deformities. Aesthet Plast Surg. 2002;26:407-412.

25. Tobisawa Y. A case of saddle nose deformity caused by relapsing polychondritis: a long-term follow-up report after iliac bone grafting. J Plast Reconstr Aesthet Surg. 2013;66:1621-1622.