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CASE REPORT

A functional and aesthetic solution for saddle nose deformity: the use of the inferior turbinate bone

Semer burun tamirinde alt konka kemiğinin kullanımı: Fonksiyonel ve estetik bir çözüm

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The use of a new autologous material, the inferior turbinate bone, for nasal augmentation is presented together with surgical treatment of a 24-year-old male patient with moderately severe saddle nose deformity. In the postoperative period, no complications were observed. Photographs and three-dimensional computed tomography views obtained 13 months after the operation showed that the reconstruction area was highly free of postoperative resorption. The patient's complaints disappeared, and he was satisfied with functional and cosmetic results. Moreover, a histologic evaluation which was made to assess the depth of the glandular component showed that the inferior turbinate bone could be used over the nasal dorsum in a smoother shape, retaining its overlying soft tissue.

Key Words: Bone transplantation; nose/surgery; nose deformities, acquired/surgery; rhinoplasty/methods; skin transplantation.

Bu yazıda, hafif ve orta derecede bozukluk gösteren semer burunların tamirinde başvurulabilecek yeni bir materyal olarak alt konka kemiğinin kullanımı, orta derecede deformitesi olan 24 yaşındaki erkek hastanın tedavisiyle birlikte sunuldu. Ameliyat sonrası izleminde hastada komplilkasyon gelişmedi. Ameliyattan 13 ay sonra alınan fotoğraf ve üç-boyutlu bilgisayarlı tomografi görüntülerinde, rekonstrüksiyon alanının rezorbe olmadığı görüldü. Ameliyat öncesindeki şikayetleri tamamen geçen hasta, fonksiyonel ve kozmetik sonuçlardan memnun olduğunu belirtti. Ayrıca, alt konka kemiğinin yumuşak dokusunda bulunan glandüler yapıların derinliğini ortaya koymak amacıyla yapılan histolojik çalışmada, kemiğin kısmen soyularak daha düzgün şekilli olarak burun sırtında kullanılabileceği görüldü.

Anahtar Sözcükler: Kemik transplantasyonu; burun/cerrahi; burun deformiteleri, edinsel/cerrahi; rinoplasti/yöntem; deri transplantasyonu.

Saddle nose reconstruction represents a significant challenge for the surgeons. Since many more demands are received for reduction rhinoplasty, augmentation procedures appear less in the literature.

The most common cause of saddle nose is surgical or accidental trauma. The former is mainly associated with excessive submucous resection of the septal cartilage or reduction of the nose in rhinoplastic surgery. The occurrence of saddle nose deformity following submucous resection of the septal cartilage ranges from 0% to 2.6%.[1] Other rare diseases that cause distortion of the nasal bone and cartilages include Wegener's granulomatosis, relapsing polychondritis, leprosy, and syphilis.

No consensus exists regarding the most suitable and advantageous surgical graft material for saddle

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nose. Various graft materials, either biologic or alloplastic, have been used for nasal augmentation. The ideal nasal graft material should not be carcinogenic, immunogenic, or resorbable; should have a low extrusion rate and a high biologic integration with surrounding tissues; should be easy to handle and to shape, and finally be cost-effective. Autogenous graft materials seem to meet most of the above-mentioned properties; however, each has advantages and disadvantages. Hence, the best material for nasal augmentation still remains controversial.[2]

The aim of this paper is to present a case of saddle nose deformity and to introduce a new autologous material, the inferior turbinate bone, for nasal augmentation in minimally or moderately deformed noses.

CASE REPORT

A twenty-four-year-old male patient presented with saddle nose deformity that occurred four years ago following a nasal trauma and eventual development of hematoma and septal abscess. He complained of moderate, but frequent bilateral nasal obstruction. Examination revealed a depressed cartilaginous dorsum with a broad middle vault, a small hump on the bony dorsum, and a low projected nasal tip (Fig. 1 a, b). The internal nasal valve angles were blunted, and the inferior turbinates were bilaterally hypertrophied. Reconstruction of the nose was performed by an external rhinoplastic approach under general anesthesia. Following bilateral infracartilaginous and upright-V-transcolumellar incisions, nasal tip and dorsum skin was adequately elevated at supraperichondrial and subperiosteal levels, leaving the ligaments and soft tissues intact between the medial crura. To preserve tip support, no cephalic resections from the lateral crura of the lower lateral cartilages were performed. Under endoscopic view, bilateral total inferior turbinectomy was accomplished. The soft tissue covering the inferior turbinate bone was stripped off to remove glandular

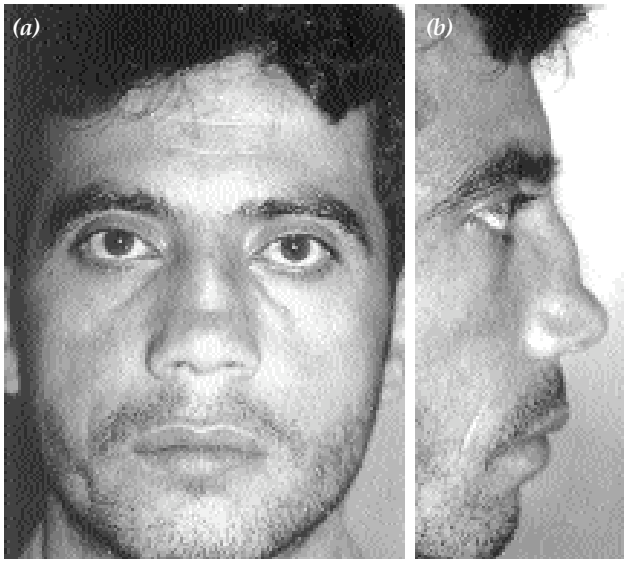

Fig. 1 - *The appearance of post-traumatic saddle nose.* ***(a)*** *Frontal and* ***(b)*** *lateral views.*

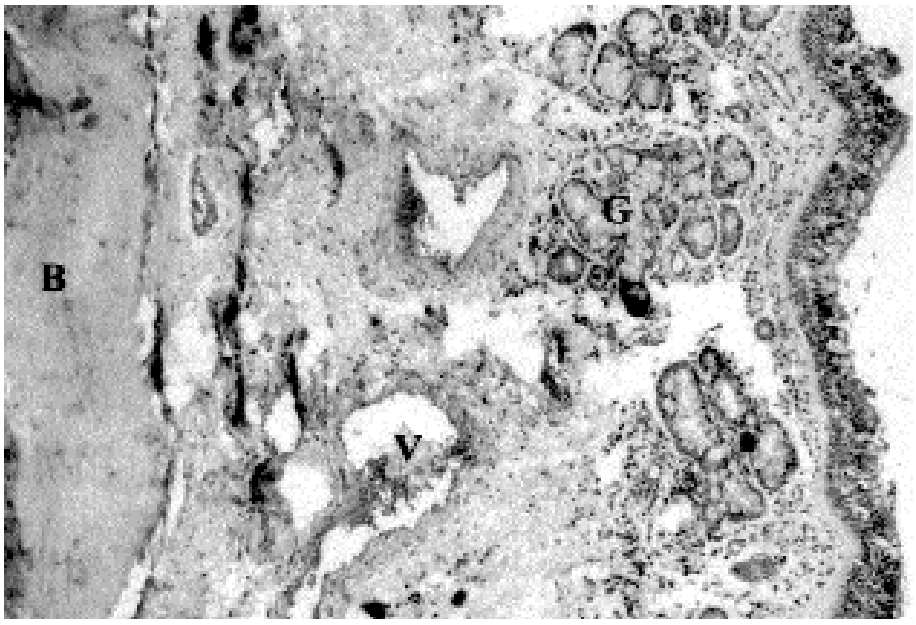

Fig. 2 - *Histopathologic appearance of the inferior turbinate bone. B: Inferior turbinate bone; V: Vascular structures; G: Glandular content.*

content (Fig. 2). A small hump near the rhinion was reduced with the use of a fine rasp. Bilateral medial oblique and endonasal lateral osteotomies were performed. The spinal extensions of the inferior turbinate bones were trimmed with the aid of a rotating cutting burr and reasonably smooth bony pieces were obtained. In order to create a thick bony graft for augmentation, a small piece of bone was attached caudally to the bottom of a longer one with an absorbable thread. This graft was placed over the cartilaginous dorsum and fixed transcutaneously with a 5-0 Vicryl suture. The nasal tip was refined with double-dome 5-0 polypropylene sutures. After a vertical incision to the columellar skin, tip projection was increased by inserting a bar of inferior turbinate bone piece tightly into the soft tissue between the medial crura, parallel to the adjacent middle crura. The transcutaneous sutures in the supratip area and transcolumellar sutures were removed on the fourth postoperative day. In the postoperative period, no complications were observed apart from an unexpected skin mark on the middle nasal vault caused by the transcutaneous suture. Photographs and three-dimensional computed tomography views were obtained 13 months after the operation (Fig. 3a, b; 4a, b). The reconstruction area was highly free of postoperative resorption. The patient's complaints about nasal obstruction and crusting disappeared and he was satisfied with functional and cosmetic results.

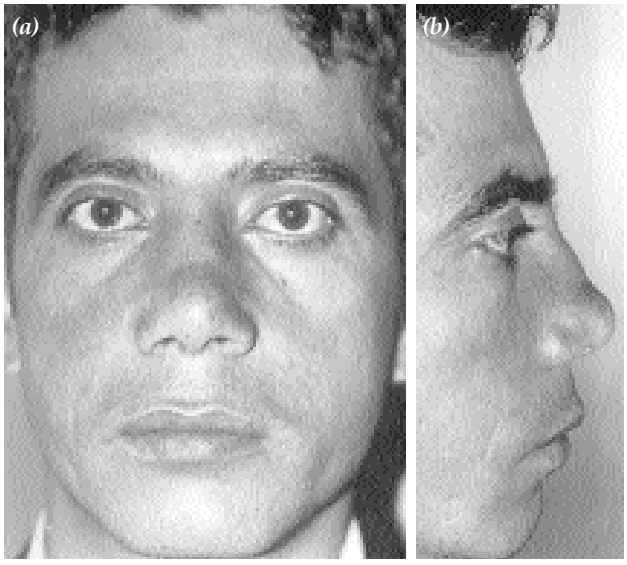

Fig. 3 - ***(a)*** *Frontal and* ***(b)*** *lateral views of the patient 13 months after surgery.*

DISCUSSION

Surgical correction of saddle nose deformity is based on the use of space-occupying and/or supporting grafts in order to obtain a desired aesthetic nasal contour and an increased nasal airway patency. Tardy et al.[3] classified these deformities into three types as minimal, moderate, and major deformities. Minimal deformities demonstrate a supratip depression of 1 to 2 mm. Moderate deformities are characterized by a significant loss of dorsal height as well as the existence of columellar retraction and a broadened bony pyramid. A major deformity has all

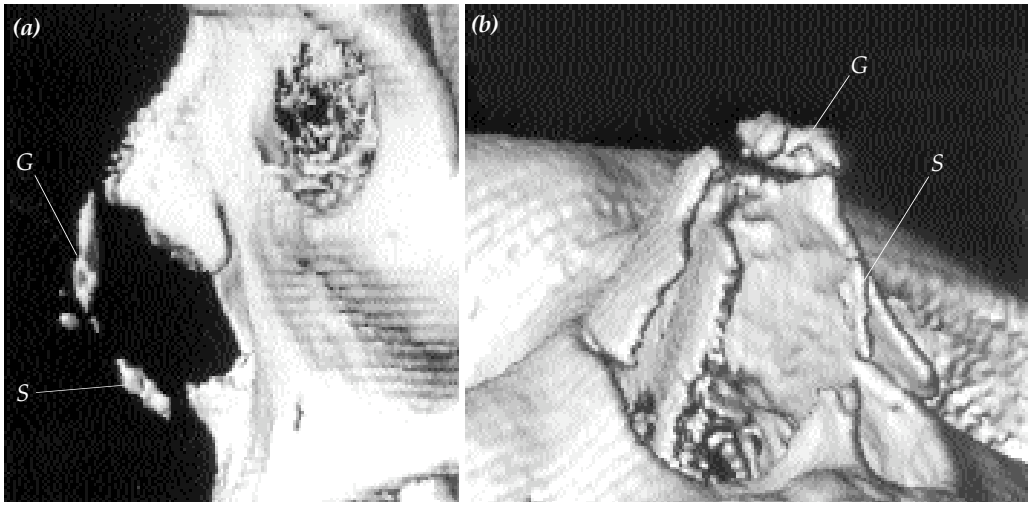

Fig. 4 - *Three-dimensional computed tomography views obtained in the postoperative 13th month.* ***(a)*** *Lateral and* ***(b)*** *basal oblique. G: Supporting graft for saddle nose; S: Columellar strut graft.*

the stigmata seen in the moderate type, but to a significantly greater extent.

The reconstruction of minor and moderate deformities that do not induce nasal airway obstruction can often be achieved only by a variety of onlay grafts.[4] However, as the severity increases, more reconstructive structural approaches may be required including restoration of the middle vault function, reconstruction of the internal nasal valve, and reinforcement of the nasal tip and dorsal support mechanisms.[4] Our patient's deformity was of a moderate type.

The supporting grafts may be harvested from various sources. Autologous materials are always preferable to alloplastic implants because of their low infection and extrusion rates, and better biocompatibility. Autologous septal cartilage is generally accepted as the gold standard for nasal grafting.[5] It is a highly compliant material, with an additional advantage of being in the surgical field, which excludes distant donor site morbidity. Unfortunately, previous traumas or surgeries may often leave an inadequate amount of septal cartilage than needed.[2,5-8]

In general, onlay bone grafts are difficult to shape, exhibit unpredictable resorption rates, and result in additional morbidity associated with harvesting at a distant donor site.[9] Apart from the septal cartilage, the autologous materials described hitherto in the literature have the same disadvantages. Harvesting autogenous auricular cartilage requires an additional surgical site and a separate incision, posing potential complications. Its twisted shape and availability in insufficient amounts are the major drawbacks.[9] Although autogenous rib cartilage is easily shaped and rarely resorbs, it has a high tendency to warp and to cause distant donor site morbidities including pleural tears and severe pain.[9-11] Calvarial bone graft is also used for augmentation rhinoplasty[6,12] and its resorption rate is lower than that of the iliac crest bone.[12] However, it is associated with donor site morbidities such as dural tears and intracranial hemorrhage.[11,13] Thomassin et al.[12] emphasized the need for preoperative cranial computed tomography studies in prospective patients to determine whether the cranial vault is monocortical or not. Additionally, the calvarial bone graft should be avoided in bald patients because of the eventual donor site scar. Iliac bone grafts have a tendency to resorb due to the process of enchondral ossification.[14] Significant postoperative pain and limping occur for weeks at iliac crest donor sites.[6,10]

Despite the advantage of abundant availability, alloplastic non-self grafting materials are thought to be more prone to infection and extrusion. Supramid, Mersilene, Proplast, Plasti-pore, Silastic, Gore-Tex, and porous high-density polyethylene (PHDPE) are synthetic materials used for augmentation. Supramid and Proplast may cause tissue discoloration.[15] The major disadvantage of Gore-Tex is that it is extremely soft and lacks the necessary structural support.[16] Godin et al.[17]reported that they had to remove Gore-Tex in 3.9% of patients who underwent augmentation rhinoplasty. Silicone is another alloplastic material, but its high infection, extrusion, and displacement rates, and translucent appearance limit its use in saddle nose reconstruction.[18] Its major drawback is that it is an inert material without porous structure and induces capsular formation.[5] Being a member of the polyethylene class, PHDPE is a porous alloplastic material that enables fibrous ingrowth of tissues.[5] Despite the presence of several promising results, the long-term viability of this material has yet to be evaluated.[5,19]

Saddle noses are of a platyrrhine (short broad nose) appearance, with a low wide dorsum, a poor tip projection, and an acute nasolabial angle.[20] Since the angles of the internal nasal valve are usually blunted, the inferior turbinates function as the main nasal airflow regulator in saddle noses. The hypertrophied inferior turbinates have been implicated as the main reason for nasal obstruction in platyrrhine noses,[21] which makes them a surgical target for total removal or reduction.

With the help of this case illustration, we propose a novel autogenous graft material, the inferior turbinate bone, to achieve augmentation and functional goals in saddle noses. Inferior turbinoplasty or total turbinectomy is frequently required to widen the internal nasal area which is significantly narrowed in saddle noses. The safety of these surgical techniques has been presented before.[22,23] The inferior turbinate has clear advantages. It does not require an additional incision, it is time-saving, and is not associated with distant donor site morbidity. Although the inferior turbinate bone undergoes enchondral ossification, we did not detect any remarkable resorption in our patient by three-dimensional computed tomography obtained 13 months after surgery (Fig. 4 a, b). The potential drawback of the inferior turbinate bone is

the glandular component of the overlying soft tissue that may potentially lead to cystic formation, thereby requiring soft tissue removal before it is placed.

To get better insight into the the glandular structure of the inferior turbinate bone, a histologic study was undertaken by the authors on resected specimens obtained from four patients with chronic hypertrophic rhinitis. The specimens were cut in coronal planes at four levels along the anterior-posterior axis. Microscopically, the location and depth of the glandular structures were evaluated by two pathologists. The length of the glandular component of the soft tissue was rated according to the distance between the mucosal surface and the periosteum. The distances based on the assessment of two individual pathologists varied from 1/2 to 1/5 (Fig. 2). Further histologic evaluations demonstrated that complete stripping was not mandatory, and that deep stripping may be required on the lateral surface and in the tail of the turbinate, where the ratio of the glandular content was found as 1/2 of the soft tissue depth. Thus, removal of the soft tissue may be shallow in the anterior part and medial surface of the turbinate where the glandular structures are superficially located. Consequently, a thin layer of soft tissue may be safely left over the bone, except for the tail, and this technique not only provides a smoother surface resulting in an improved nasal contour but also utilizes a novel harvesting source.

The use of the inferior turbinate bone merits consideration in the correction of saddle nose deformity. However, its value should be validated by multiple applications and longer follow-up of patients.

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REFERENCES

1. Tzadik A, Gilbert SE, Sade J. Complications of submucous resections of the nasal septum. Arch Otorhinolaryngol 1988;245:74-6.
2. Deva AK, Merten S, Chang L. Silicone in nasal augmentation rhinoplasty: a decade of clinical experience. Plast Reconstr Surg 1998;102:1230-7.
3. Tardy ME Jr, Schwartz M, Parras G. Saddle nose deformity: autogenous graft repair. Facial Plast Surg 1989;6: 121-34.
4. Romo T 3rd, Sclafani AP, Sabini P. Reconstruction of the major saddle nose deformity using composite alloimplants. Facial Plast Surg 1998;14:151-7.
5. Romo T 3rd, Sclafani AP, Jacono AA. Nasal reconstruction using porous polyethylene implants. Facial Plast Surg 2000;16:55-61.
6. Baser B, Shahani R, Khanna S, Grewal DS. Calvarial bone grafts for augmentation rhinoplasty. J Laryngol Otol 1991;105:1018-20.
7. Mendelsohn M, Dunlop G. Gore-tex augmentation grafting in rhinoplasty-is it safe? J Otolaryngol 1998; 27:337-41.
8. Lohuis PJ, Watts SJ, Vuyk HD. Augmentation of the nasal dorsum using Gore-Tex: intermediate results of a retrospective analysis of experience in 66 patients. Clin Otolaryngol 2001;26:214-7.
9. Gunter JP, Rohrich RJ. Augmentation rhinoplasty: dorsal onlay grafting using shaped autogenous septal cartilage. Plast Reconstr Surg 1990;86:39-45.
10. Romo T 3rd, Jablonski RD. Nasal reconstruction using split calvarial grafts. Otolaryngol Head Neck Surg 1992; 107:622-30.
11. Sherris DA, Kern EB. The versatile autogenous rib graft in septorhinoplasty. Am J Rhinol 1998;12:221-7.
12. Thomassin JM, Paris J, Richard-Vitton T. Management and aesthetic results of support grafts in saddle nose surgery. Aesthetic Plast Surg 2001;25:332-7.
13. Young VL, Schuster RH, Harris LW. Intracerebral hematoma complicating split calvarial bone-graft harvesting. Plast Reconstr Surg 1990;86:763-5.
14. Cheney ML, Gliklich RE. The use of calvarial bone in nasal reconstruction. Arch Otolaryngol Head Neck Surg 1995;121:643-8.
15. Queen TA, Palmer FR 3rd. Gore-Tex for nasal augmentation: a recent series and a review of the literature. Ann Otol Rhinol Laryngol 1995;104:850-2.
16. Berman M, Pearce WJ, Tinnin M. The use of Gore-Tex E-PTFE bonded to silicone rubber as an alloplastic implant material. Laryngoscope 1986;96:480-3.
17. Godin MS, Waldman SR, Johnson CM Jr. Nasal augmentation using Gore-Tex. A 10-year experience. Arch Facial Plast Surg 1999;1:118-21.
18. Adams JS. Grafts and implants in nasal and chin augmentation. A rational approach to material selection. Otolaryngol Clin North Am 1987;20:913-30.
19. Turegun M, Sengezer M, Guler M. Reconstruction of saddle nose deformities using porous polyethylene implant. Aesthetic Plast Surg 1998;22:38-41.
20. Romo T 3rd, Shapiro AL. Aesthetic reconstruction of the platyrrhine nose. Arch Otolaryngol Head Neck Surg 1992;118:837-41.
21. Courtiss EH, Goldwyn RM. The effects of nasal surgery on airflow. Plast Reconstr Surg 1983;72:9-21.
22. Mabry RL. Inferior turbinoplasty: patient selection, technique, and long-term consequences. Otolaryngol Head Neck Surg 1988;98:60-6.
23. Talmon Y, Samet A, Gilbey P. Total inferior turbinectomy: operative results and technique. Ann Otol Rhinol Laryngol 2000;109(12 Pt 1):1117-9.