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Original Article

Radial bone graft usage for nasal septal reconstruction

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ABSTRACT

Background: Although various techniques have been described for correction of crooked and saddle nose deformities, these problems are challenging with high recurrence and revision rates. Conventional septal surgery may not be adequate for nose reconstruction in crooked and saddle nose deformities. **Materials and Methods:** Between December 2005 and October 2009, six patients with crooked nose and five patients with saddle nose deformities underwent corrective surgery in our clinic. All patients were male, and the mean age was 21 years (range, 19-23 years). We used rigid radial bone graft to prevent redeviation and recurrence following corrective nasal septal surgery. **Results:** The mean follow-up period was 28 months, ranging from 18 to 46 months. Mean operation time was 4 hours (3-4.5). All patients healed uneventfully. None of the patients required secondary surgery. **Conclusions:** We believe that radial bone grafts offer a long lasting support in treatment of challenging cases with crooked and saddle nose deformities.

KEY WORDS

Crooked nose; nose reconstruction; radial bone; saddle nose

INTRODUCTION

Conventional septal surgery may not be adequate to prevent recurrences in the management of severely deviated nose with crooked and saddle nose deformities.[1,2] In order to correct the crooked nose deformity, dorsal hump resections,[2] a variety of modified osteotomies,[3] septal cartilage manipulations,[4] suture correction technique,[5] and spreader grafts[6] have been recommended in the literature

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In a true septal saddle nose deformity, dorsal grafts alone cannot restore dorsal nasal height. Dorsal improvement in such patients could be achieved by dorsal onlay grafts combined with columellar strut[7] or L-shaped dorso-caudal frame.[1]

Although; various techniques have been described for correction of the crooked and saddle nose deformities, these problems still have high recurrence and revision rates. We used rigid radial bone graft to prevent redeviation and recurrence following corrective nasal septal surgery.

MATERIALS AND METHODS

Between December 2005 and October 2009, six patients with crooked nose and five patients with saddle nose deformities underwent corrective surgery. All patients were male and the mean age was 21 years (range, 19-23 years).

Patients had both functional and cosmetic nasal problems. In all patients, the deformity was secondary to past nasal trauma. Patient-related assessments were performed before operation and follow-up.[8]

Surgical technique

All surgeries were performed under general anaesthesia. After local anaesthetic infiltration the nasal structures were exposed through an open rhinoplasty approach. Following hump resection, the septum was dissected subperichondrially and resected leaving a 0.8 to 1-cm dorsal and caudal L-strut. Deviated caudal segment of the septal cartilage was straightened medialized and secured to the periosteum of the anterior nasal spine. Radial bone graft was accessed from the lateral antecubital region, and bone graft was harvested from the lateral side of radial bone [Figure 1]. Radial bone is triangular in cross section. The anterior and posterior surfaces of the radius are generally smooth, whereas an oval roughening for the attachment of pronator teres marks approximatelly the middle of the lateral surface of the radius. Bone graft was harvested a segment (about 5×1 cm) located between the insertion of the pronator teres and the brachioradialis muscles. Lateral antecubital nerve, flexor and extensor muscles were protected during bone graft harvesting procedure. Bone graft was thinned by bone filing and shaped in the form of a L-strut as "key in the keyhole pattern" [Figure 2]. The dorsal strut was placed by tongue in groove technique on the anterior nasal spine. L-strut frame was sutured under the upper lateral cartilage remnants and between the domes of two lower lateral cartilages to hide palpable edges and secure it in place. Lateral and median osteotomies were also performed if bony pyramid was also deviated. Any residual irregularities on the dorsum were camouflaged with Erol's Turkish delight.[9] Tipplasty was performed if necessary. Following closure, nasal packing and plaster cast were applied. A plaster cast was also applied on the forearm and removed 1 week later. The packing and the nasal splint were removed at 4th and 7th days, respectively.

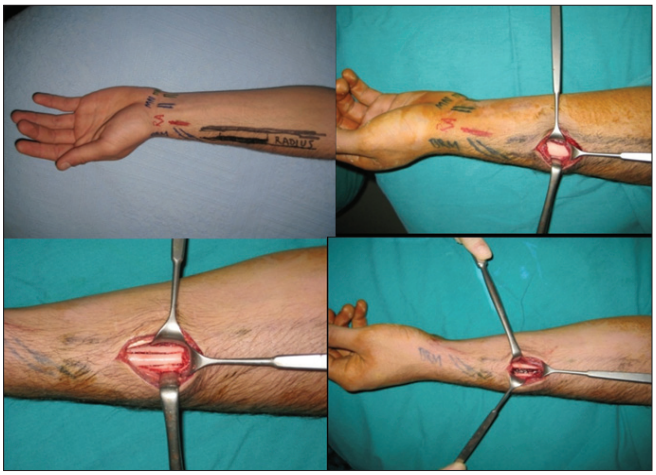

Figure 1: Intraoperative view of the radial bone graft taking side, L-strut bone graft is taken from the lateral side of radial bone.
Abbrevations: MN: Median nerve, RA: Radial arter, BR: Brachioradial muscle.

RESULTS

The mean follow-up period was 28 months, ranging from 18 to 46 months. Mean operation time was 4 hours (3-4.5). Intraoperatively, it was found that septal cartilage was thickened and distorted in all cases. All patients healed uneventfully [Figures 4,5 and 6]. None of the patients required secondary surgery. The graft did not get displaced in any case, and did not develop unsightly irregularities over

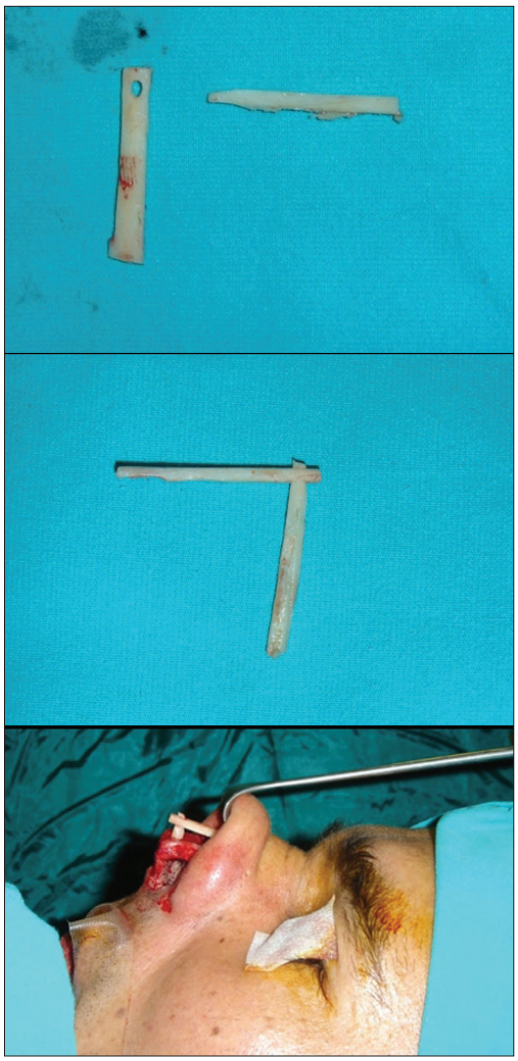

Figure 2: Two pieces of L-strut bone graft (above). An interlocked design (key in the keyhole pattern) of L-strut is introduced (center). L-strut bone graft was placed the nose (below)

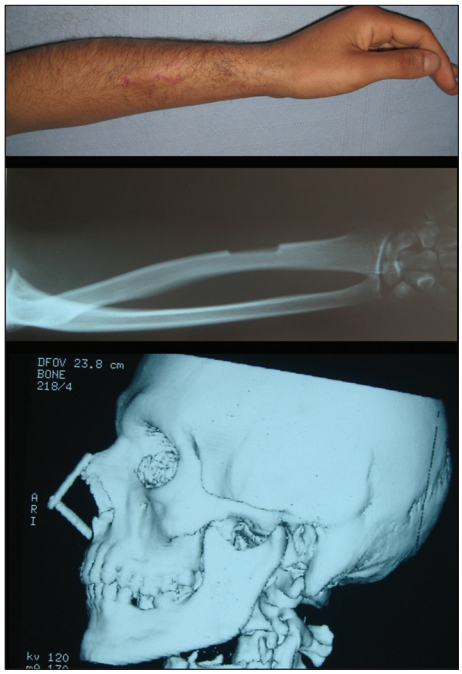

Figure 3: Late view of radial bone graft donor site (above), radiological appearance of radial bone graft donor site (center), three-dimensional CT imaging of L-strut bone graft (below).

Figure 5: Preoperative anterior view and inferior view of the patient with crooked nose deformity (above; right and left). Postoperative 24 later (below; right and left).

time. No absorption or extrusions of the grafts or infection were seen in follow-up period. Radial bone fractures were not seen in follow-up [Figure 3]. None of the cases had further neurovascular complications in follow-up. We have satisfactory results in our series of septal reconstruction using radial bone graft in 11 patients according to patient-related assessments.[8]

DISCUSSION

Septum is the key for operative management of complicated

Figure 4: Preoperative anterior view of the patient with saddle nose deformity (above, and below; left). Postoperative 26 months later (above, and below; right).

Figure 6: Preoperative anterior view of the patient with crooked nose deformity (above, and below; left). Postoperative 20 months later (above and below; right).

nose reconstruction.[1,2] Besides straigtening the septum, maintaining its support is also crucial for long-lasting results.[2] The most popular method is reinforcement of corrected septum with spreader grafts.[1,2,10] The spreader grafts restore the integrity of septal L-struts[11] and resist the memory of the septal cartilage.[12] Byrd *et al*. [13] used unilateral spreader-extension grafts by placing them unilaterally on the concave side of the deformity. Rohrich *et al*.[2] placed asymmetric spreader grafts to camouflage any residual deformity and to restore dorsal aesthetic lines. Unilateral spreader graft known as the "crossbar graft" has also been described to keep the realigned septum in correct position over time.[6] However, in case of severely deviated cartilaginous septum, relatively weak cartilage

grafts (obtained from septum itself or from ear concha) can not maintain adequate support. It is also technically difficult to harvest long and straight pieces of spreader grafts from a severely distorted osseocartilaginous septum. Additionally, flexible cartilage has unpredictable tendency to retain its curvature attributed to its memory. A more rigid framework is necessary against the deforming forces during the healing period. Some authors preferred using alloplastic materials as spreader grafts for more rigid stabilisation.[14,15] However, there is concern about using alloplastic materials in the literature.[16]

Saddle nose is one of the difficult nasal deformities as crooked nose. Onlay grafts were used in mild to moderate dorsal depression treatment.[17] Using only dorsal struts can not maintain adequate support for severe saddle nose deformity. Columellar support is also necessary to prevent downward tilting of distal end of the dorsal strut.[1] Ribs are carved and shaped as pistol like spreader grafts and columellar struts, and most preferable method of saddle nose deformity correction. However, rib cartilage has an unpredictable tendency to bend and thus gives the nose a twisted appearance.[18] The boney component too is plagued with the problem of bone resorption with time. Other disadvantages of rib harvest are of pneumothorax and conspicuous contour deformity.

Different bone graft sources were described for nasal reconstruction.[19,20] Radius is a longutidinal bone, and it is not curved as olecranon[20] and calvarial harvesting.[19] Lateral aspect of radial bone provides a source of straight framework when shaped properly. The dorsal strut was placed as tongue in groove technique, and it was interlocked with caudal strut as "key in the keyhole" pattern. L-strut-shaped bone graft supports the realigned caudal-dorsal septum despite the cartilaginous memory of the previous position. Also, it does not obstruct airway because of its delicate shape.

Recently, mastoid bone graft was described in rhinoplasty.[21] Although mastoid bone graft may be useful for augmentation of nasal dorsum, this technique has some limitations including difficulty in working with the inherent curvature of the mastoid bone and also unavailability of adequate nasal septal support for reconstruction of crooked nose. Mastoid bone is provided only 30-40 mm autologous bone graft. Injury of the facial nerve is a potential complication in donor site. Radius provides enough bone graft source for straight bone frame preparation (5 cm length). In addition; radial bone graft can be shaped for L-strut frame easily.

Successful rhinoplasty is best achieved through careful analysis of the problem and clear communication with the patient regarding expectations of surgery. Our experience with these patients of using bone grafts was that they were not disturbed by the rigid L-shaped bony strut. They were happy about a straight nose with a natural appearance.

Radial bone fractures were not seen in our cases. The radius must be carefully split during harvest in order to prevent postoperative fracture at the donor site. Length is generally enough to a segment located between the insertion of the pronator teres and the brachioradialis muscles (about 5 cm). The split radius is adequate to prepare L-strut frame. Unsightly scar formations at the doner site were not seen in our series.

CONCLUSIONS

We believe that radial bone grafts offer long-lasting results in treatment of challenging crooked and saddle nose deformities. More clinical studies with more patients are necessary to highlight the real impact of this technique.

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