Cortical Tibial Bone Graft for Nasal Augmentation

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Abstract

Background This study sought to determine the efficacy of cortical tibial bone graft for nasal augmentation. Nine cases of augmentation rhinoplasty with cortical tibial bone graft are presented.

Methods This prospective study evaluated the postoperative results of nine patients who underwent augmentation rhinoplasty using cortical tibial bone graft. There were six males and three females aged between 21 and 36 years (mean age 29). All the nine cases were treated through closed rhinoplasty incisions.

Results Nine patients were operated on and the average follow up was 18 months. The results were favorable. The aesthetic results were gratifying; with good nasal projection in every case without any significant postoperative effects or complications requiring surgery were noted during the follow up.

Conclusion The findings of this study support the use of cortical tibial bone graft for nasal augmentation although further studies with more sample size are required.

Keywords Bone graft · Nasal augmentation · Tibial graft

Introduction

Reconstruction of the nasal dorsum requires a material that provides structural support and long term augmentation. Augmentation rhinoplasty procedures have an important

limitation in the use of bone or cartilage grafts, which have different rates of resorption over time. Different grafting materials have been used for augmentation rhinoplasty, such as alloplastic implants, temporalis fascia, dermofat-grafts, cartilage (from septum, rib or concha) or bone (cranial bone, iliac crest and rib) [1–9]. We propose the use of the tibial bone as a cortical bone graft donor site not usually described for the purpose of augmentation rhinoplasty.

Materials and Methods

We present a series of nine patients who underwent augmentation rhinoplasty using cortical tibial bone graft. There were six males and three females aged between 21 and 36 years (mean age 29). All the nine cases were treated through closed rhinoplasty incisions. The causes of the nasal deformities were posttraumatic in six cases, congenital in three cases.

Surgical Technique of Graft Harvesting

This technique has been previously described by the authors [16]. The graft is obtained by a minimal 1.5–2 cm transverse pretibial cutaneous incision placed at the upper-third of the tibial diaphysis [6 cm under anterior tibial tuberosity (ATT)]. The cranial limit of the bone osteotomy is 3 cm under the ATT and the outer limit is the tibial crest (Fig. 1). The tibial crest and the tibial tuberosity are preserved. We do not use a thigh tourniquet. An anaesthetic infiltration is performed. After the skin incision, we perform a subperiosteal dissection of the bone (Fig. 2).

The graft shape and size are drawn out with a pencil and by means of a no. 702 straight fissure bur and perform the

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Fig. 1 Preoperative marking of the donor site

Fig. 2 Exposure of the donor site using subperiosteal dissection

osteotomies. The graft is finally elevated using a chisel. Skilled separation, irrigation and aspiration provide good visibility. Through this minimal incision it is possible to obtain cortical tibial bone grafts of an average size of 6 cm in length and 2 cm wide. We do not leave any drainage device. We create the desired shape of the graft using a contouring burr (Fig. 3, 4A). The graft is shaped as required, reproducing the contour of a normal nasal dorsum (wider at the bridge line than in the tip). The caudal part of the graft is smoothed off to obtain a rounded tip. The donor

site incision is closed with an intradermal running suture. We place a compressive dressing on the leg for 48 h and a non-compressive dressing for 2 weeks. The leg is kept elevated for 48 h. The patient must not do any violent exercise for 2 weeks. General endotracheal anaesthesia was used in every patient but it is possible to obtain the tibial graft under local anaesthesia.

Surgical Technique of Grafting

In the nine cases of endonasal approach, an intercartilaginous approach is performed. A tunnel is dissected in the nose, subperiosteal over the bony nose and subcutaneous at the tip, creating a pocket at the dome. The tip cartilage is not resected. The graft is placed over the nasal bone (Fig. 4A, B, C). The subperiosteal dissection allows a good contact between the tibial graft and the nasal bone to ensure graft 'survival'. We use the term survival to be clearer and comprehensible even though it is well documented that little of the cortical graft osteocytes survive but are, rather, replaced by osteoinduction, osteoconduction and creeping substitution. It is possible to gain more skin for more anterior nasal projection if the subcutaneous dissection is carried out over the cheeks. No lateral osteotomies were made. We had nasal packing in place for 24 h and a nasal splint for 1 week.

Results

Nine patients were operated on and the average follow up was 18 months. The results were favorable. Patients were able to walk in 2 days. The aesthetic results were gratifying; with good nasal projection in every case. There were no complications of the donor site. The postoperative pain at the donor site is perfectly controlled with standard analgesics (non-steroidal anti-inflammatory drugs every 8 h). The initial sinking in the donor site fades progressively, so that it is not noticeable 2 months after the surgery (Figs. 5, 6, 7, 8).

Fig. 3 Harvesting the desired length of the graft and contouring as required

Fig. 4 **A** Contouring the cancellous part of the graft so as to fit the dorsum of the nasal bone. **B** Closed tip rhinoplasty technique used to place the graft. **C** Photograph after placing the graft

Discussion

Cartilage grafts are supposed to improve contour and function and correct deformities, but they may also lead to postoperative defects. Cartilage grafts in augmentation

EXTRAORAL PHOTOGRAPHS

Fig. 5 Preoperative view case 1

rhinoplasty are useful for mild deformities, but autogenous bone is used if a greater augmentation is required [5, 6]. The most frequent defects are graft displacement and asymmetry, tendency to curl (especially rib cartilage), a visible step, and under- or overcorrection [7, 10]. Advantages of cartilage are that there is no need for contact between the graft and the nasal bone for graft survival. Alloplastic implants are another alternative for nasal augmentation. Their advantages are ready availability in shapes and sizes and no donor site morbidity. These materials have a high rate of complications like extrusion, malposition, or unnatural appearance [5, 11, 12]. Bone grafts are the best option for reconstruction of wide defects of the nose with autogenous tissue, maintaining the tip projection with minimal airway problems.

The advantages of the augmentation rhinoplasty with cortical tibial bone graft are:

- No tendency to bend.
- No resorption.
- It is very stable over time.
- Minimal donor site morbidity.
- Inconspicuous donor site scar (1.5 cm incision).
- Easy and quick harvest technique.
- The donor and the recipient sites are in different operating fields.

Fig. 6 Postoperative view case 1

Fig. 7 Preoperative view case 2

Fig. 8 Postoperative view case 2

- Short hospitalization time (no more than 2 days).
- Good cosmetic results.

Bone graft provides a durable and safe reconstruction. Tissue for augmentation rhinoplasty has been obtained from cranial bone, ribs, iliac bone and olecranon. Cranial bone is probably the most used bone graft for nasal augmentation. It has numerous advantages as a donor site: it resorbs less, is an easy to hide donor site, and does not bend. The complication rate reported is low; however, serious complications (intracerebral haematoma, superior sagittal sinus laceration) have been reported [13–15]. The use of tibial bone graft was not usually described in the literature. Tessier et al. [16, 17] published an excellent review of the use of tibial bone in the literature in 1911. The tibial bone has been used for dorsolumbar spine, pseudoarthroses of the limbs, cranial defects, mandibular reconstruction and cleft lip-cleft palate repair. Tessier described a technique with a long vertical scar at the donor site and a combined corticocancellous graft harvesting. We describe a technique of cortical graft harvesting with a donor site short transverse scar (1.5 cm).

The long and flat shape of these grafts, as opposed to the calvarial or costal grafts, is excellent for creating the shape of the nasal dorsum. We did not use columellar struts

because that it is not necessary to maintain tip projection when fixation screws are placed. As with all bony nasal reconstructions, the disadvantage of this technique is that the patient must accept a certain degree of rigidity and immobility in the nose. Our early experience with this short series of cases seems to show that the cortical tibial bone graft is an excellent option for augmentation rhinoplasty [15].

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