

Reconstruction of Post-traumatic Anterior Maxillary Osseous Deficits, using Corticocancellous Tibial Graft in Preparation for Implant Rehabilitation

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ABSTRACT

Dentoalveolar fractures of the anterior maxilla usually result in a scooped out defect of the region. This causes loss of lip support and a less than optimal condition for implant placement. The present study aims to study the merits and demerits of using autogenous tibial graft for augmenting the anterior maxillary region. The study was carried out in 10 patients with post-traumatic anterior maxillary defects. The results of using tibial bone graft are presented.

Keywords: Anterior maxilla, Post-traumatic defects, Tibial-B one graft.

INTRODUCTION

The objective of this study is to demonstrate the use of autogenous bone harvested from tibia to reconstruct alveolar defects of the premaxilla in preparation for dental implant placement. Dentoalveolar fractures involving anterior maxillary region many times result in a scooped-out deficiency, resulting in loss of upper lip support and more importantly, less than optimal bone in the region for implant placement.

The choice of graft material is always a matter of diverse opinion and speculation. However, autogenous bone has been widely accepted as the 'gold-standard'.

Our study is based on 10 patients who had residual deficits in the anterior maxillary (Fig. 1) region from dentoalveolar trauma grafted with autogenous bone from tibia. The results following one year postrehabilitation are presented.

MATERIALS AND METHODS

A prospective study on 10 patients requiring bone reconstruction using tibial bone harvested with bone trephines/peizosurgery is presented (aseptic procedures, surgical guidelines, postoperative care and review, etc.).

Skin markings were made with marking ink after identifying patella, upper end of the shaft of the tibia and patellar tendon.¹

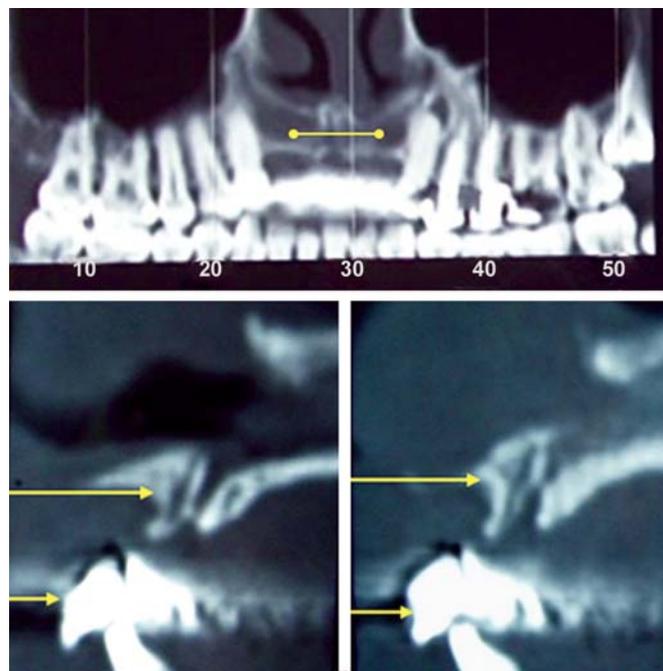


Fig. 1: The dentascans CT shows the loss of bone volume in anterior maxilla and reduced anteroposterior width of cortical bone

The tibial tuberosity was identified and marked for location of a site just medial to it for access for graft harvest (Figs 2 and 3).

Following standard presurgical scrub routine (Betadine × 3 times) as prescribed for regular orthopedic procedures,



Fig. 2: Skin markings overlying the donor area. Landmarks—Patella, tibial tuberosity, aponeurosis, medial/lateral boundaries of tibia and the incision marked on the skin



Fig. 4: Cancellous bone harvested from the tibial medullary space



Fig. 3: Skin incisions, musculocutaneous flap elevation and bony window made to access the marrow space of tibia



Fig. 5: Tibial block bone grafts secured with titanium screws over the deficient anterior maxilla

sterile drapes were placed and the donor area left exposed. Lignocaine 2% was used for local infiltration anesthesia, and then using a number 10 scalpel, a 2 inch vertical incision was placed over the region marked previously.

Subcutaneous dissection was carried down to the periosteum after dissecting past the fatty tissue and the shaft of the tibia was identified at its upper 1/3rd. A periosteal incision was made and the bone subsequently exposed by raising the periosteum off with a sharp elevator.

Having a secured self-retaining retractor *in situ*, a bony window was made (either using a sharp bone trephine or using peizosurgery with a saw tip) to access the cancellous portion inside. Generous scoops of cancellous tibial bone were obtained when only cancellous bone was desired (Fig. 4), and the entire corticocancellous block (Fig. 5) was harvested when there was need for a block.^{2,3} Figure 6 shows harvest donor site scar after one year.

Gentle irrigation with normal saline was carried out and a Betadine wash given before closing the wound in layers (Vicryl 3-0 for deeper layers and Ethilon 3-0 for skin).



Fig. 6: One-year postharvest donor site scar

A mild compressive occlusal crepe dressing (elastoplast) was placed over the wound for the next 7 to 10 days. Suture removal was routinely done between the 7th and the 12th day depending on the clinically evident healing at the time.

Prophylactic antibiotic protocol was Amoxicillin + Clavullanic acid (2.0 gm orally, 1 hour before the procedure, followed by a 625 mg, 12th hourly schedule for the next 6 days).

NSAIDs (diclofenac sodium 50 mg in combination with paracetamol 500 mg) and proteolytic enzymes (trypsin + chymotrypsin) were used supportively as adjuncts.

Inclusion Criteria

1. Healthy adults (controlled diabetics and hypertensive patients included) in the age group of 30 to 55 years.
2. Optimal oral hygiene (no clinical evidence of severe pre-existing periodontal disease or foci of infection). Absence of suppuration and periodontal probing depths of less than 4 mm was taken as an indication of patient in controlled or maintenance stages of periodontal health.
3. Volume of bone required ranging from approximately 5 to 30 cc.

Exclusion Criteria

1. Osteoporosis/bone disorders/metabolic disorders, affecting bone turnover rate.
2. Poor oral hygiene maintenance.
3. Smokers and patients with a history of any other disease or disorder known to influence bone metabolism directly or indirectly were excluded.
4. Patients with known blood dyscrasias and those on anticoagulant therapy were identified and excluded.
5. Patients not complying with review and follow-up protocols were not included.

Postoperatively, patients were examined on the 1st, 3rd, 7th, 12th, 30th, 60th, 90th days and at one year.

Intraoral examination was done to assess the healing of the recipient site clinically, and radiographic corroboration of the same was by means of an OPG or intraoral X-rays.

Tibial shaft (upper 1/3) radiographs (AP and lateral views) were taken to document the healing status of the donor area.

TIBIAL GRAFT HARVEST TECHNIQUE

Surgical Reconstruction Technique

A 29-year-old female reported to hospital with a post-traumatic deficit in anterior maxillary region. She had noticeable loss of upper lip support and complained of an unacceptable cosmetic appearance. She had been rehabilitated with a removable prosthesis, which filled the void and supported her upper lip and created a fullness of her midface.

After a thorough evaluation, the problems encountered were listed as follows:

- a. Loss of teeth #7-10 (with associated, severe ridge resorption)
- b. Impacted teeth #16,17

- c. Increased nasolabial angle
- d. Inward 'curling' of upper lip with poor pink mucosal show
- e. Forceful 'engagement' of lower lip by the patient to achieve competent lips.

Preoperative Dentascan

Under general anesthesia, the patient was prepared and the graft harvested with standard aseptic protocols. The tibial tuberosity and Girdie's tubercle were identified as the landmarks for location of the donor area (see Figs 2 and 3) and a vertical incision made (approximately 2 inches) along the shaft of the tibia at the tubercle.⁴ Layered dissection carried down to the bone using a cautery with the flap edges held in place by means of a self-retaining retractor. A bony, "trapdoor-like" window was made using the piezosurgery saw.

The anterior maxilla was exposed using a standard vestibular sulcus incision, visualizing the pyriform rim, anterior nasal spine and the deficient maxillary basal-alveolar ridge.

The corticocancellous bone thus harvested was used to reconstruct the deficient maxillary region (which was exposed simultaneously by the other operating team via a vestibular incision).

The graft was fashioned to fit into the recipient site and secured using 12 mm long 1.4 mm titanium screws (see Fig. 5). The donor being endochondral in its origin, an alloplast was used adjunctively to slow the rate of resorption of the entire 'regenerative mixture' during the healing period (Fig. 7).

A collagen membrane was placed over the graft to barrier it from the connective tissue (Fig. 8). Closure was done with standard resorbable (3-0 vicryl) sutures (see Fig. 7).

Radiographs of the donor site (tibia) as well as the recipient site (anterior maxilla) were taken preoperatively, and postoperatively (7th and 90th day) (Figs 9 and 10).



Fig. 7: Alloplastic bone-substitute + cancellous (tibial) bone incorporated around the autogenous blocks



Fig. 8: Collagen membrane covering the grafted anterior maxillary site

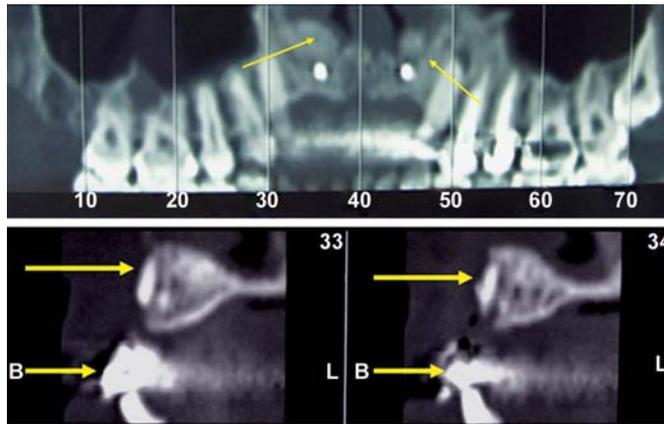


Fig. 9: First month postoperative

Clinically restoration of lip fullness and facial form as well as the radiographic evidence of a cortical labial plate being restored evidenced satisfactory results. The presence of ‘healthy’ intrabony bleeding during drilling and good

primary stability of the implants upon their subsequent placement after 4 months, was taken as a sign of graft uptake. Four, 3.7 × 13 mm, zimmer, tapered screw vent implants were then placed using prescribed protocol (Fig. 11).

Postoperative Denta Scan

Six months later, following the osseointegration of the implants, the maxillary anterior edentulous region was rehabilitated with a functionally and esthetically acceptable prosthesis. The presence of good attached gingival around the implant precluded the need for any additional connective tissue augmentation.

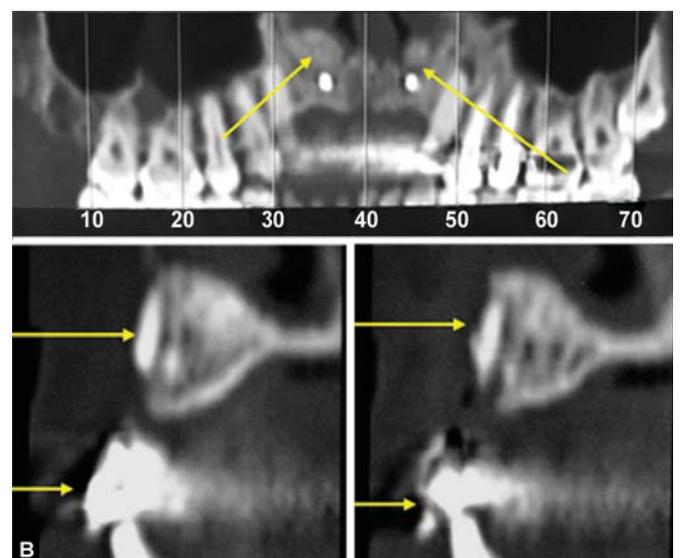
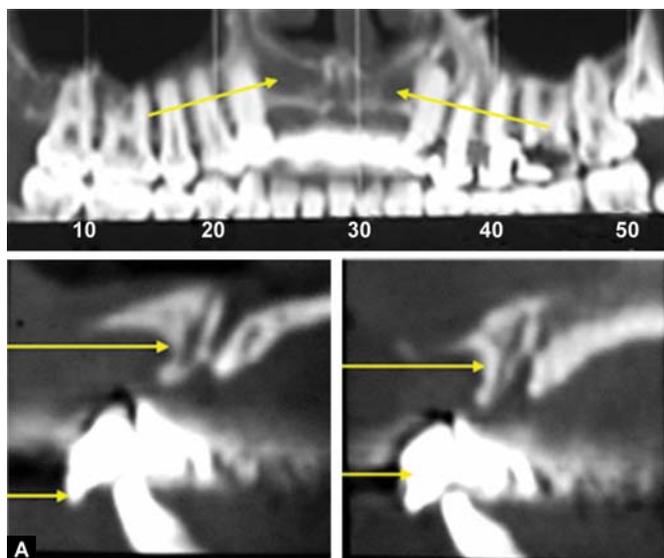
DISCUSSION

The advantages of using tibial bone graft were:

1. When carried out as in-office dental treatment, under local anesthesia, the procedure was well-tolerated by the patients.
2. Adequate amounts of cancellous as well as cortico-cancellous bone available.
3. The grafts being autogenous in nature, the uptake was as predictable and generated bone volume comparable with other modalities.
4. Immediate mobilization of patient after surgery added to patient’s acceptance of the procedure.
5. A distinct lack of postural or gait disturbances post-operatively, compared with that which is usually associated with the iliac harvest.

Complications encountered during the procedure and postoperative period were:

1. Wound dehiscence (1 of the 10 patients—10%).
2. Delayed healing (2 of the 10 patients—20%).



Figs 10A and B: Third month postoperative



Fig. 11: Dental implants *in situ*

Both were attributable to noncompliance regarding postoperative care instructions regarding exercise and mobilization of the leg in the immediate postsurgical period.

CONCLUSION

Compared to the merits, the demerits of using tibia as a donor site for autogenous bone graft were less. This justifies, the use of tibia as donor site of choice for augmentation of corticocancellous bone volume at site of implant placement in the anterior maxilla.

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