

# Vertical Ridge Augmentation With Mandibular Lingual Torus Block Graft

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## INTRODUCTION

**D**ental implant prostheses often provide an ideal restorative option to replace missing teeth. Severe alveolar ridge resorption—resulting from periodontal infections, iatrogenic trauma from extractions, or subsequent bone loss following prolonged edentulism—often preclude proper implant placement and positioning. Under such conditions, ridge augmentation procedures may be required prior to implant therapy.

Numerous techniques have been developed for alveolar ridge augmentation. An onlay block graft is one of the procedures designed to correct deficient alveolar ridges.<sup>1-4</sup> While allografts, xenografts, and synthetic block grafts are viable options,<sup>5,6</sup> an autogenous block graft may still be considered the gold standard. Autogenous bone grafts harvested from intraoral sources (including mandibular ramus, mandibular symphysis, or maxillary tuberosity) have demonstrated better integration to the recipient site, often with less resorption than bone from extraoral sources.<sup>7,8</sup> However, the risk of donor site morbidity and postoperative complications have raised concerns about their applications.<sup>9-11</sup>

*Tori* are benign outgrowths of bone that could function as an alternative source of autogenous bone, concomitantly diminishing complications associated with harvesting. Several case reports have demonstrated successful horizontal ridge and sinus augmentation when utilizing block or particulate form of tori.<sup>12-16</sup> It is generally accepted that horizontal ridge augmentation and sinus lifting are much more predictable compared to vertical ridge augmentation. Since there is limited literature addressing the feasibility of using tori as an onlay block graft for vertical ridge augmentation, the objective of this case report is to introduce the use of a mandibular lingual torus as an onlay block graft for a vertically deficient alveolar ridge. The successful vertical increase of the deficient mandibular ridge and ultimate implant placement and restoration was demonstrated.

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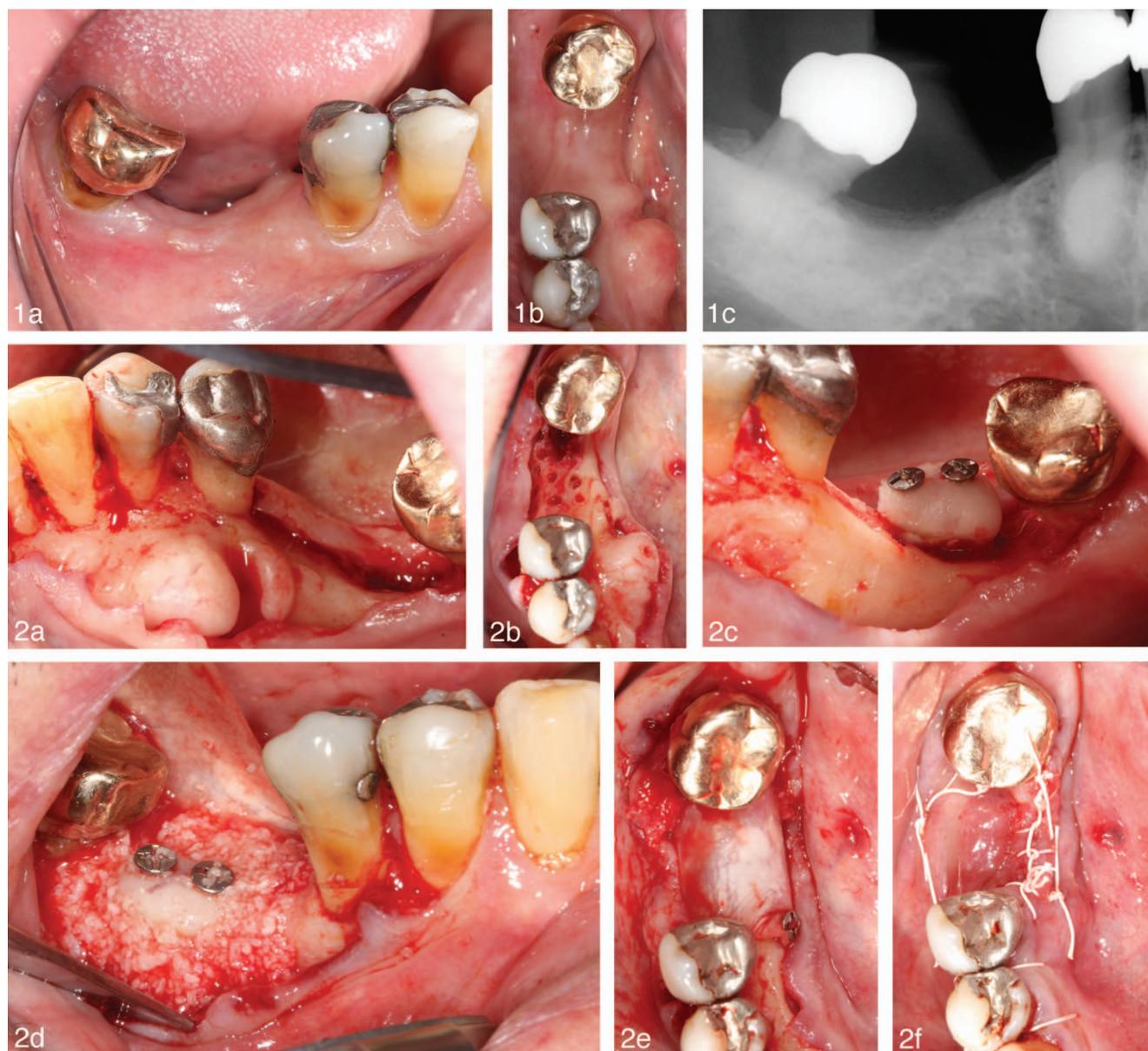
## CASE PRESENTATION

A 79-year-old male presented to the Harvard Dental Center for comprehensive dental care along with a desire to achieve more efficient mastication on the right side of his dentition. Tooth #30 was previously extracted due to severe periodontal disease. After discussing his various restorative options, the patient opted for an implant to replace this missing tooth. A presurgical clinical and radiographic examination revealed deficient bone height of the alveolar ridge in the edentulous site (Figure 1) as well as bilateral tori of the premolar lingual sites. The clinical objective was established to increase the vertical dimension as well as attain leveling of the alveolar ridge in order to accomplish the ideal prosthetic position for the desired implant. The previously mentioned tori were selected as the donor tissue.

Phase 1 periodontal therapy (scaling and root planing) was performed prior to the ridge augmentation procedure. Strategically, tooth #32 and its attachment apparatus was treatment planned for temporary retention to protect the graft from occlusal forces as well as providing additional distal vascularization.

Under local anesthesia, a full-thickness flap was elevated to reveal the edentulous ridge and expose two lingual tori (Figure 2a). The larger torus was selected as the donor block graft. Two screw holes were drilled within the torus for the eventual two 12-mm fixation screws (Pro-fix, Osteogenics, Lubbock, Tex). One of the two screws was inserted once the torus reached the final stages of resection and functioned as a means of managing the tissue.

Cortical perforations of the recipient site were performed to provide blood supply to the graft and function as an anchoring site for the two securing screws (Figure 2b). Being cognizant of critical anatomical landmarks, the torus was carefully dissected from the alveolar bone by utilizing a high-speed handpiece. The donor tissue was contoured for close adaptation to the recipient site. A second 12-mm screw was inserted in the predrilled hole in the donor tissue, slightly protruding from the graft and secured into one of perforated holes on the recipient site. The graft was securely anchored into position by fully screwing the original screw into another perforated site (Figure 2c). Freeze-dried bone allograft material (BIOMET 3i LLC, Palm Beach Gardens, Fla) was used to fill into the crevices between the torus and recipient site (Figure 2d). A resorbable collagen membrane (Osseoguard, BIOMET 3i) was placed over the donor tissues and secured with tacking screw on the lingual surface (Pro-fix, Osteogenics) to help with adaptation of the membrane



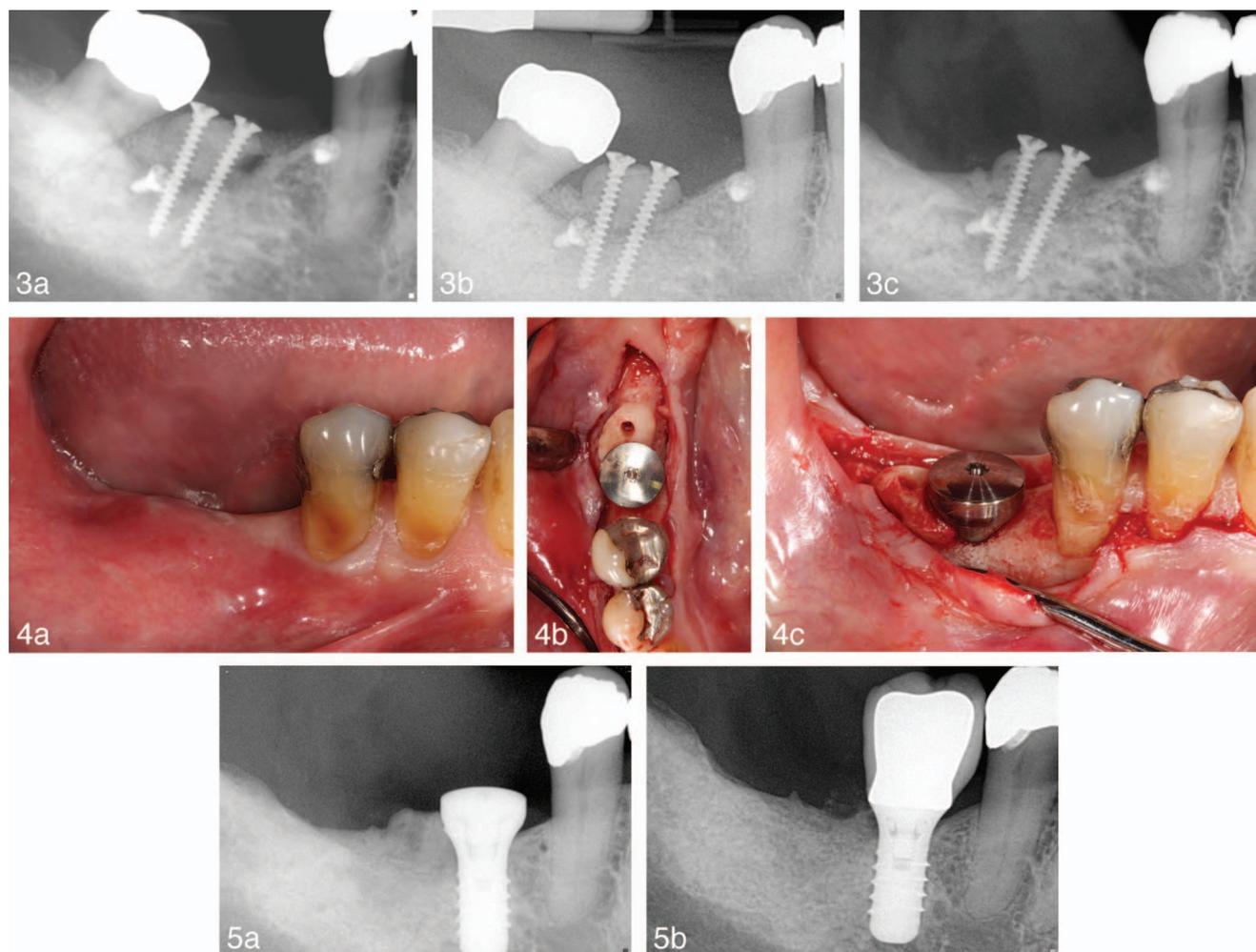
**FIGURES 1 AND 2. FIGURE 1.** Pre-operative clinical and radiographic examination. (a and b) Clinical examination revealed vertical deficiency over an edentulous ridge for future implant site #30 and prominent tori lingual to the mandibular premolars. (c) Radiographic film demonstrated vertical ridge deficiency and radiopacity corresponding to the lingual tori. **FIGURE 2.** Mandibular vertical ridge augmentation with lingual tori. (a) Lingual view after full-thickness flap elevation. (b) Decortication of the recipient site and preparation for the screw holes on torus. (c) Adaptation and fixation of the tori block graft (lingual view). (d) Particulate bone graft in place. (e) Fixation of the resorbable collagen membrane. (f) Suture of the surgical site.

(Figure 2e). Releasing incisions along with internal horizontal matrix sutures and modified continuous sling sutures (GORE-TEX, W. L. Gore & Associates Inc, Newark, Del) were carefully placed to achieve passive, primary closure (Figure 2f).

Postsurgical healing was uneventful. The patient was seen every 2 weeks for a total of 6 weeks. It was decided that tooth #32 was then ready for extraction. This procedure was performed cautiously to avoid disrupting the grafted site. After 8 months, the torus block graft demonstrated radiographic integration (Figure 3). On the radiograph, approximately 6 mm of vertical ridge augmentation was achieved, which resolved

the previous deficient ridge and achieved leveling of the alveolar ridge (Figure 4a).

During implant placement, the fixation screws were removed and an osteotomy performed in preparation for a  $4.8 \times 10$ -mm implant (Standard Plus WN, Straumann USA LLC, Andover, Mass). This implant was placed in the ideal restorative position (Figures 4b, 4c, and 5a). Post-implant placement healing, a 1-mm soft tissue cleft was noted in the retro-implant mucosa. Although this clinical finding never presented with any signs of inflammation or infection, an osteoplasty was performed to allow soft tissue closure over the bone. This procedure reduced the osseous tissue involving the block graft



**FIGURES 3–5. FIGURE 3.** Radiographic examination of the vertical ridge augmentation. (a) Immediate after the procedure. (b) Six-week postsurgical procedure. (c) Eight-month follow-up revealing integration of the tori block. **FIGURE 4.** Implant placement after 8 months. (a) Significant clinical vertical ridge augmentation was noted. (b and c) Buccal and occlusal views after implant placement. Vertical augmentation with successful integration of the tori block graft resolved the deficient ridge for proper implant placement. **FIGURE 5.** Radiographic examination of the implant therapy. (a) Immediate after implant placement. (b) Eleven months postloading with final restoration. Distal crestal bone was intentionally reduced to facilitate soft tissue cleft closure.

in this area by approximately 2 mm in height, resulting in 4 mm net vertical augmentation and eventually leading to closure of the soft tissue.

The implant was restored 5 months after its initial placement and has functioned for 11 months (Figure 5b).

#### DISCUSSION

Tori, also known as *intraoral exostoses*, are benign bony protuberances that are covered with a thin and poorly vascularized mucosa. Histological analysis of tori reveal mature cortical and cancellous bone with a thickened outer cortical plate. In a recent study of 328 samples of American human skulls, mandibular tori were observed in 27% total skulls (42% in dentate skulls).<sup>17</sup> The etiology of tori remains unclear. Genetic factors, environmental factors, presence of teeth, and occlusal stress are postulated as contributing to their presence.<sup>18–21</sup> Tori are mostly asymptomatic, and individuals with

tori are usually unaware of their presence. Removal of tori is not necessary unless they are causing pain, prohibit proper seating of dental appliances, or preclude proper speech articulation.

Using tori as donor tissue for autogenous grafting material is not a novel idea. Several case reports were published using torus block grafts for horizontal ridge augmentation and sinus lifting.<sup>12–16</sup> However, the utilization of torus block graft for vertical ridge augmentation has not been reported. Vertical ridge augmentation is more challenging; thus, the clinical outcome varies, ranging from 2–8 mm.<sup>22,23</sup> In this case, we demonstrated that mandibular lingual tori could be used as an alternative block graft for successful vertical gain of 6-mm bone that is comparable with the use of an extraoral onlay block graft (mean: 6.5 mm).<sup>24</sup>

Utilizing tori as an alternative source of autogenous bone should be considered especially when their presence is in close proximity to the recipient site. In addition, fewer complications may be expected with this approach vs using the mandibular

ramus or symphysis as donor tissue. The lower prevalence and less availability of torus bone volume may limit their application.

This case report demonstrated a significant increase in vertical dimension of the edentulous ridge with mandibular lingual torus block graft. Limited bone remodeling was observed 8 months after the vertical ridge augmentation procedure, yet a residual soft tissue cleft developed after implant placement necessitating its reduction via osteoplasty to facilitate soft tissue closure. The vitality and stability of the block graft should be monitored. Supporting crestal bone demonstrated limited remodeling after successful functional loading.

In conclusion, mandibular lingual tori may serve as a feasible alternative source of autogenous bone grafting for vertical ridge augmentation. Future long-term and larger controlled clinical trials are needed to evaluate the predictability and stability of this approach.

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