

# VERTICAL BONE AUGMENTATION USING THE AUTOGENOUS SPLIT BONE BLOCK GRAFT (KHOURY'S TECHNIQUE) IN THE ESTHETIC ZONE: A CASE REPORT

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## Introduction:

Severe periapical infections in the anterior zone can lead to extensive vertical and horizontal bone defects. These defects pose a significant challenge for clinicians when placing dental implants and restoring the aesthetic requirements of both soft and hard tissues.

Dental implants are a highly successful and predictable treatment for replacing single or multiple missing teeth (Albrektsson et al., 1986). For optimal outcomes, an implant must be positioned with at least 1 mm of bone on both the buccal and lingual aspects to maintain the crestal bone level and achieve good primary stability (Spray et al., 2000). However, insufficient bone height and width at the implant site can hinder proper implant placement. Implant placement in a deficient ridge is associated with higher failure rates and compromised aesthetic results (Esposito et al., 2006). Therefore, vertical augmentation of alveolar bone defects is critical to provide sufficient bone volume for implant placement and to meet aesthetic demands (Urban et al., 2016). Various ridge augmentation techniques have been developed, including particulate bone grafting with guided bone regeneration (GBR), distraction osteogenesis, and autogenous bone block grafts (Esposito et al., 2009). Additionally, different types of bone graft materials are available, such as allografts, xenografts, alloplasts, and autogenous grafts (Misch, 2015).

Among these, autogenous bone grafts remain the most predictable and are considered the gold standard for alveolar ridge augmentation due to their osteoconductive, osteoinductive, and osteogenic properties (Buser et al., 1990; Chiapasco et al., 2006). However, conventional autogenous bone block grafts may contain fewer viable cells and exhibit greater resorption compared to autogenous split bone block grafts, such as those used in Khoury's technique (Khoury & Hanser, 2015).

## Case Presentation :

A 45-year-old female patient presented to Sok Chea Dental Clinic with a chief complaint of pain and swelling in the upper front teeth (#11 and #12) due to a periapical infection. The pre-operative CBCT (Figure 1-2) revealed significant alveolar bone resorption in the region of teeth #11-#12. The treatment options presented to the patient included a removable prosthesis, a fixed prosthesis (bridge), and an implant-supported fixed prosthesis following extraction of teeth #11 and #12. The patient chose the implant-supported fixed prosthesis.

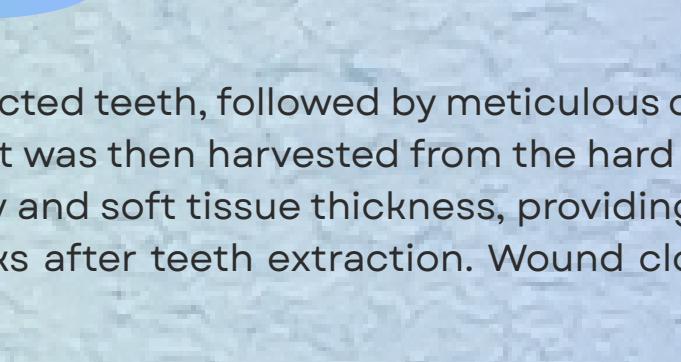
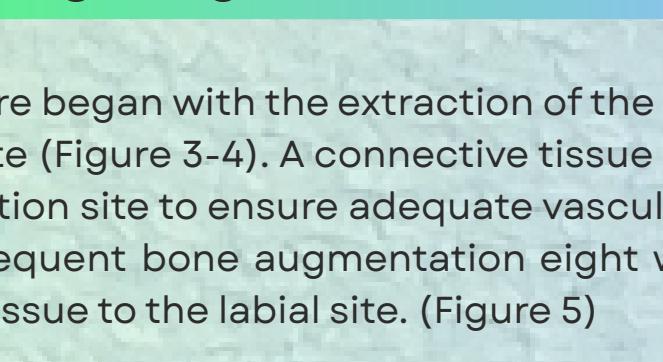
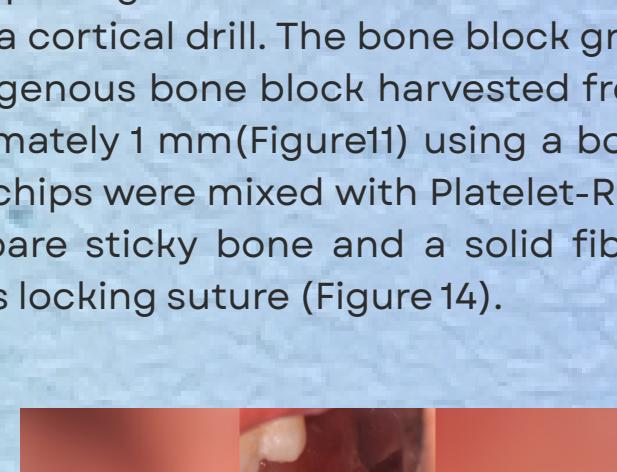
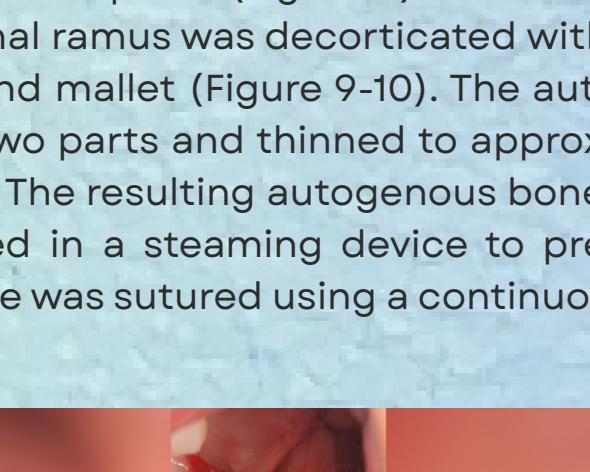
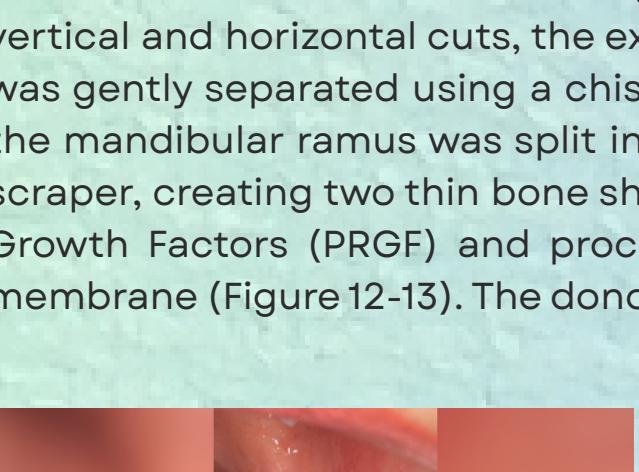


Figure 01: Pre-operative clinical view showing a labial sinus tract

Figure 02: Pre-operative CBCT extensive bone loss

## Vertical Ridge Augmentation Procedure:

The procedure began with the extraction of the affected teeth, followed by meticulous debridement of the extraction site (Figure 3-4). A connective tissue graft was then harvested from the hard palate and rotated to the extraction site to ensure adequate vascularity and soft tissue thickness, providing optimal coverage for the subsequent bone augmentation eight weeks after teeth extraction. Wound closed after rotating connective tissue to the labial site. (Figure 5)



### Donor Site :

The bone defect was mapped on CBCT images before harvesting the bone block. The external ramus was selected as the donor site. After administering local anesthesia with 4% Articaine, an incision was made from the retromolar pad forward to the first molar along the mucogingival junction. A full-thickness flap was then elevated using a periosteal elevator until the external ramus was exposed (Figure 6-7). Two vertical cuts were made using a microsaw with a straight handpiece to outline the bone block, followed by a horizontal cut made with an angled handpiece (Figure 8). After completing the cross-cut between the vertical and horizontal cuts, the external ramus was decorticated with a cortical drill. The bone block graft was gently separated using a chisel and mallet (Figure 9-10). The autogenous bone block harvested from the mandibular ramus was split into two parts and thinned to approximately 1 mm (Figure 11) using a bone scraper, creating two thin bone shells. The resulting autogenous bone chips were mixed with Platelet-Rich Growth Factors (PRGF) and processed in a steaming device to prepare sticky bone and a solid fibrin membrane (Figure 12-13). The donor site was sutured using a continuous locking suture (Figure 14).

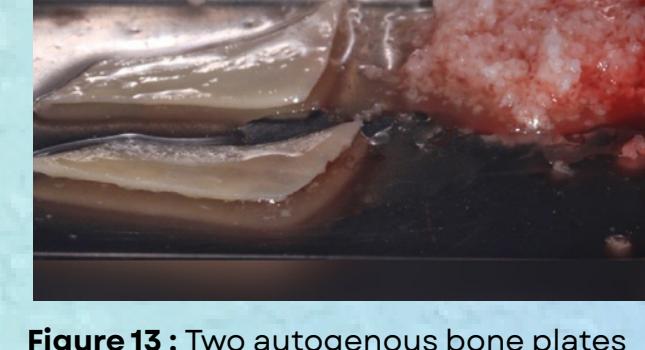
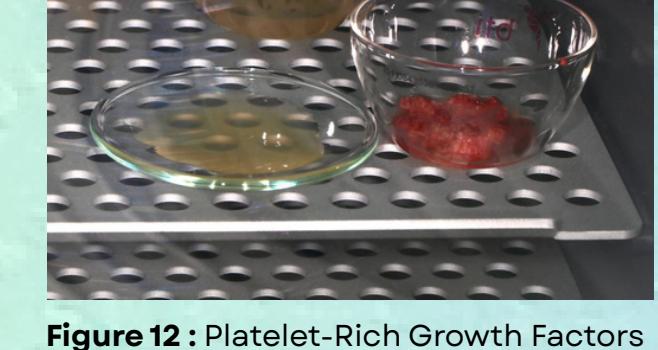


Figure 06: Pre-operative clinical view on retromolar.

Figure 07: External Ramus was exposed

Figure 08: Osteotomy was done to harvest the block graft

Figure 09: Chisel was gently used to pop out the graft

Figure 10: Bone Block was harvested

Figure 11: Bone Block was split with microsaw

Figure 12: Platelet-Rich Growth Factors (PRGF)

Figure 13: Two autogenous bone plates and autogenous bone chips

Figure 14: The donor site was sutured using a continuous locking suture

### Recipient Site :

After administering local anesthesia with 4% articaine, a crestal incision was made with two vertical releasing incisions, providing excellent visibility of the operative site. The flap was fully elevated with a periosteal elevator until the boundaries of the bone defect were clearly visible (Figure 15-16). Based on the configuration of the bone defect, the first autogenous bone plate was fixed with micro-screws on the palatal aspect of the defect (Figure 17), and the second autogenous bone plate was fixed on the buccal aspect, leaving a 6 mm space between the palatal and buccal plates (Figure 18). Sticky autogenous bone chips were then packed into the space between the two bone plates (Figure 19). Finally, a fibrin membrane was placed over the graft, and a periosteal releasing incision was made to achieve tension-free with primary closure (Figure 20). A seven days antibiotic therapy was prescribed along with analgesics. Cold packs were used in order to reduce post-operative edema. There were no post operative complications and the sutures were removed 14 days after the surgery.

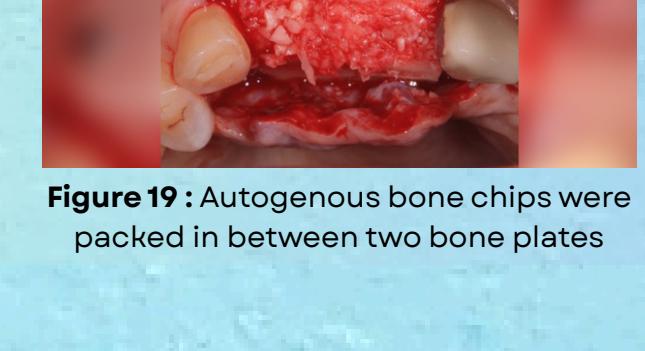


Figure 15: Clinical view eight weeks after extraction and connective tissue graft

Figure 16: Extensive vertical bone defect

Figure 17: Bone plate was fixed on palatal aspect with microscrews

Figure 18: Bone plate was fixed on labial aspect with microscrews

Figure 19: Autogenous bone chips were packed in between two bone plates

Figure 20: Graft was covered with good primary closure with tension free

## Discussion:

For a vertical bone defect in the anterior esthetic zone, the author performed vertical bone augmentation using an autogenous split bone block graft (Khoury's technique). This method was selected because, as an autologous graft, it eliminates the risk of disease transmission and host rejection [10]. Furthermore, autogenous bone possesses both osteoinductive and osteogenic potential, promoting faster bone regeneration compared to allografts or particulate grafting materials [11,12].

In this case, a microsaw was used to harvest the graft from the external ramus rather than a piezoelectric device or round bur. The microsaw is easier to handle, allows faster harvesting, and minimizes thermal and mechanical trauma to the donor site. It also provides a narrow and precise cut, reducing bone loss during graft preparation [13].

According to Khoury and colleagues, the autogenous bone plates should be slightly larger than the defect to ensure full coverage and support. The two cortical plates are positioned approximately 6 mm apart and fixed with microscrews to achieve rigid stability [14]. The gap between the plates is then filled with autogenous bone chips mixed with platelet-rich growth factors (PRGF) to create a sticky bone graft, which is easy to manipulate and enhances bone regeneration through the release of growth factors [15,16].

A PRGF membrane was placed over the graft to promote soft tissue healing and enhance angiogenesis [17]. Finally, a periosteal releasing incision was performed to achieve tension-free primary closure, which is essential for optimal healing and graft integration [18].

## Conclusion:

Despite the technical difficulties and challenges that implant surgeons and restorative clinicians may face, dental implants in the anterior aesthetic zone are an ideal treatment modality for replacing missing teeth. However, the clinician must have a strong foundation in surgical and restorative principles to manage the inherent complications of this procedure.

## Consent :

All written informed consent for publication and clinical images was obtained from the patient

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