osseo2026.03500b2

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Regeneration of Vertical Bony Defect and Buccal Cortical Bone in the Esthetic Zone Using Allograft Bone Substitute

Introduction

Vertical bony defects and buccal cortical plate loss in the esthetic zone present a major challenge in implant dentistry and periodontology. Loss of buccal bone leads to:

- Soft tissue collapse
- Gingival recession
- Compromised papilla
- Poor esthetic outcome

Guided Bone Regeneration (GBR) using **allograft bone substitutes** has become a predictable technique to reconstruct such defects while maintaining soft-tissue harmony in the anterior maxilla.

Abstract

Vertical bony defects in the anterior esthetic zone present a significant clinical challenge due to the combined need for periodontal regeneration and preservation of soft tissue architecture. This case demonstrates the management of a deep vertical intrabony defect associated with buccal cortical plate deficiency in the maxillary anterior region. Clinical examination revealed a narrow, deep intrabony defect following flap reflection. Cone-beam computed tomography (CBCT) confirmed the presence of vertical bone loss with buccal cortical plate compromise.

Materials and Methods

1. Preoperative Assessment

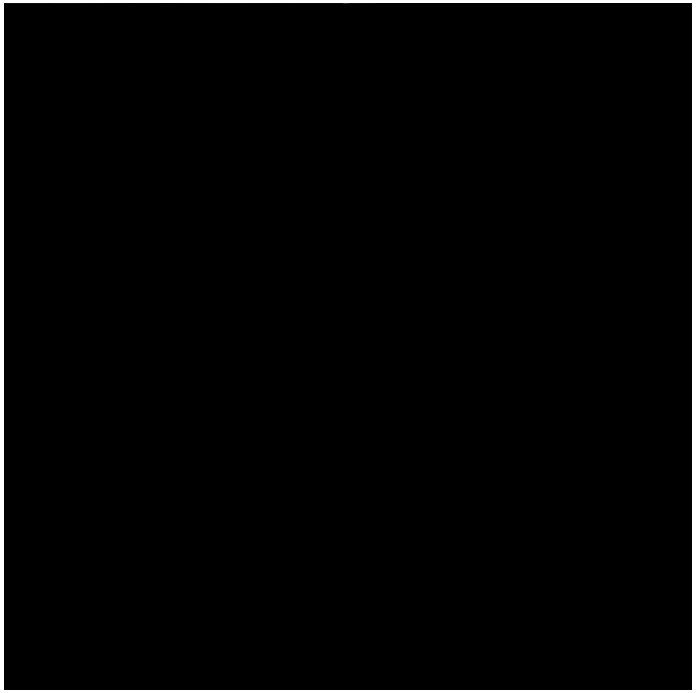
- Clinical findings:
- Deep vertical intrabony defect in anterior region
- Narrow defect morphology
- Soft tissue inflammation
- Radiographic evaluation:
- CBCT revealed:
- Angular vertical bone loss
- Buccal cortical plate deficiency
- Residual interproximal bony walls

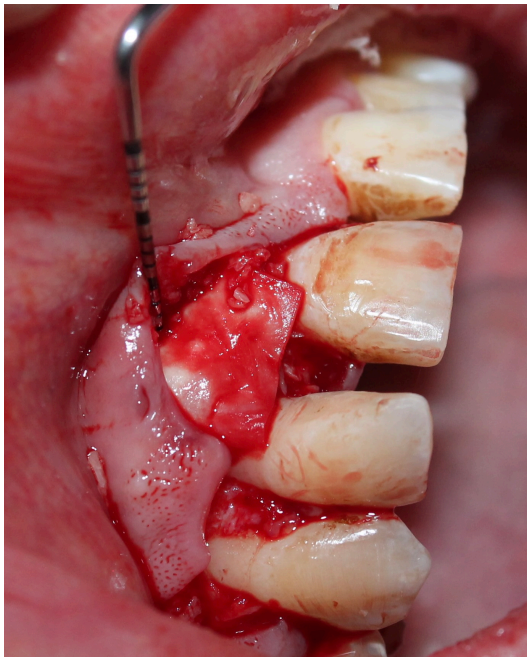
2. Surgical Procedure

- Local anesthesia administered.
- Full-thickness mucoperiosteal flap elevation (buccal and palatal).
- Thorough degranulation of the defect.
- Mechanical root debridement and surface detoxification.
- Intrabony defect morphology confirmed (contained vertical component).

3. Regenerative Protocol

- Placement of **particulate Demineralized allograft bone substitute** into:
- Vertical intrabony component
- Buccal cortical defect
- Graft condensation to achieve intimate adaptation
  covered by resorbable collagen membrane
- Flap repositioning for tension-free primary closure.
- Interrupted sutures placed using 0.4 polypropylene suture





Discussion

Management of vertical intrabony defects in the anterior esthetic zone remains one of the most technique-sensitive procedures in periodontal regenerative therapy. The clinical and CBCT findings in this case demonstrated a deep angular defect with associated buccal cortical plate deficiency, creating both a regenerative and esthetic challenge.

Defect Morphology and Regenerative Potential

The success of periodontal regeneration is highly dependent on defect configuration. The presented defect exhibited a narrow vertical component with residual bony walls, which is biologically favorable for regeneration due to:

- Enhanced blood clot stability
- Increased availability of progenitor cells from surrounding bone
- Improved containment of graft material

Contained or partially contained vertical defects provide a scaffold-like environment that promotes osteoconduction and supports new bone formation.

Buccal Cortical Plate Considerations in the Esthetic Zone

In the anterior maxilla, the buccal cortical plate is often thin and susceptible to resorption. Loss of buccal plate integrity may lead to:

- Midfacial soft tissue recession
- Compromised papillary architecture
- Esthetic deformities

In this case, CBCT imaging confirmed buccal plate deficiency. Reconstruction of this contour was critical not only for bone regeneration but also for long-term soft tissue stability. Re-establishing buccal convexity supports gingival tissue and helps maintain harmonious emergence profile.

Rationale for Allograft Selection

Particulate mineralized allograft bone substitute was selected based on:

- Osteoconductive properties
- Biocompatibility
- Gradual remodeling into vital host bone
- Absence of second surgical site morbidity

In narrow anterior defects, particulate graft material allows intimate adaptation to root surfaces and defect walls, improving graft stability and space maintenance.Conclusion

This case demonstrates that vertical intrabony defects associated with buccal cortical plate deficiency in the esthetic zone can be predictably managed using particulate allograft bone substitute when defect morphology is favorable.

Meticulous surgical debridement, graft stabilization, and tension-free primary closure are essential for successful regenerative outcomes. Reconstruction of buccal cortical contour plays a critical role in maintaining soft tissue stability and achieving optimal esthetic results.

Within the limitations of clinical and radiographic evaluation, this case supports the use of allograft bone substitute as an effective regenerative approach in anterior vertical defects with buccal plate compromise.

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