International Clinical and Medical Case Reports Journal
Case Report (ISSN: 2832-5788)

Combination Regenerative Approach for Lateral Bony Defect Management Along with Bone Grafting Using Resorbable and Non Resorbable Membrane and Enamel Matrix Derivative

Lanka Mahesh*, Rohit Krishna and Sushmita

The Specialist Clinic, New Delhi, India

Citation: Lanka Mahesh*, Rohit Krishna and Sushmita. Combination Regenerative Approach for Lateral Bony Defect Management Along with Bone Grafting Using Resorbable and Non Resorbable Membrane and Enamel Matrix Derivative. Int Clinc Med Case Rep Jour. 2025;4(11):1-8.

Received Date: 31 October 2025; **Accepted Date:** 04 November 2025; **Published Date:** 07 November 2025

***Corresponding author:** Lanka Mahesh, The Specialist Clinic, New Delhi, India

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ABSTRACT

Lateral bony defects resulting from chronic periapical infections or traumatic pathology pose a significant challenge to achieving predictable bone regeneration. This case presents a combination regenerative approach utilizing both resorbable and non-resorbable membranes, bone grafting, And Enamel Matrix Derivative (EMD) to optimize healing and bone formation. Following meticulous debridement of the defect, a bone graft was placed and stabilized using a dual membrane technique to provide spatial stability and barrier function, while EMD was applied to stimulate periodontal regeneration and enhance tissue integration. Clinical and radiographic evaluations demonstrated progressive bone fill, favorable soft tissue healing, and maintenance of ridge contour over time. The combined use of these biomaterials offers a synergistic effect, supporting the concept that a multimodal regenerative strategy can significantly improve outcomes in complex lateral bony defect management.

Keywords: Lateral bony defect; Ossix® Plus; guided bone regeneration; enamel matrix derivative; MinerOss® XP; collagen membrane

INTRODUCTION

Lateral bony defects frequently arise due to chronic infection or failed endodontic therapy and are characterized by loss of the buccal or lateral cortical plate. Such defects lack natural containment and are more prone to collapse and soft-tissue ingrowth, making bone regeneration challenging.

Guided Bone Regeneration (GBR) has become a cornerstone in managing such cases, using barrier membranes to isolate the defect and allow osteoprogenitor cells to repopulate the area [1]. Collagen membranes are widely preferred due to their resorbability and excellent tissue integration [2]. Ossix® Plus is a ribose cross-linked collagen membrane designed to provide extended barrier function (approximately 4–6 months), resisting early enzymatic degradation and maintaining space stability [3]. The Enamel Matrix Derivative (EMD; Emdogain®) further enhances healing by stimulating cementoblast and osteoblast activity and improving angiogenesis [4]. This report presents the regenerative management of a large infected lateral bony defect in the maxilla using

Ossix® Plus, MinerOss® XP, and Emdogain®, stabilized with titanium fixation, to achieve predictable bone regeneration.

CASE REPORT

A 40-year-old male reported with pain and swelling in the right maxillary posterior region. The tooth had been previously treated with root canal therapy and restored with a porcelain-fused-to-metal crown. The patient was systemically healthy (Figure 1).

Figure 1: Clinical pre op image.

Clinical findings

Mild vestibular swelling and tenderness were noted, with a sinus tract on the buccal aspect. The tooth exhibited slight mobility.

Radiographic assessment

CBCT demonstrated a large lateral bony defect extending along the root surface with periapical radiolucency and partial loss of the buccal cortical plate, consistent with a chronic periapical infection (Figure 2).

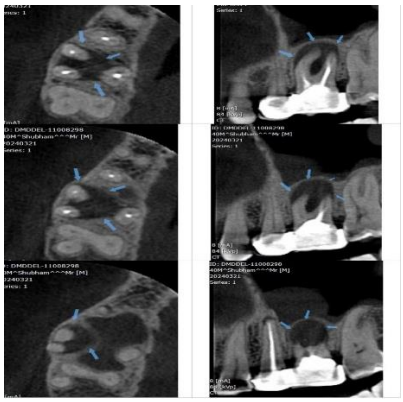

Figure 2: PRE OP CBCT

Treatment plan

Extraction of the affected tooth, thorough debridement, grafting with MinerOss® XP, (Figure 6A, 6B) application of Emdogain®, and coverage with Ossix® Plus membrane stabilized using a titanium screw (Figure 7).

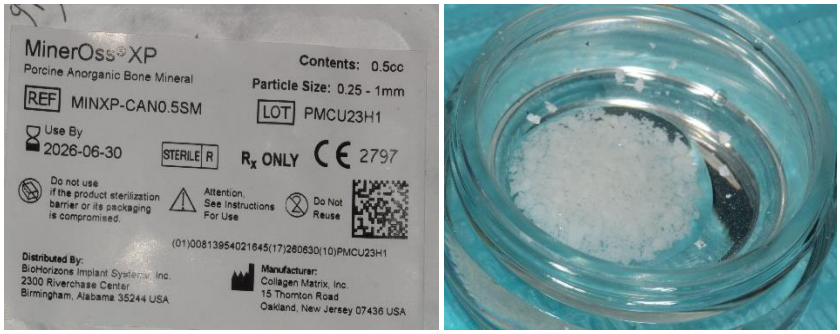

Figure 6A and 6B: Bone graft used.

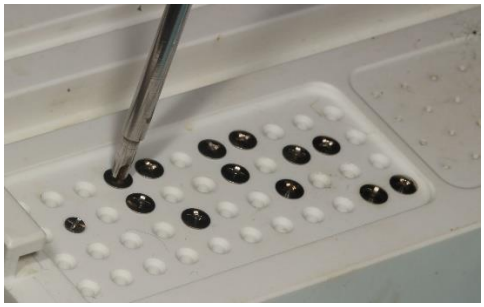

Figure 7: Titanium screw.

SURGICAL TECHNIQUE

After achieving local anesthesia, a full-thickness mucoperiosteal flap was raised to expose the defect. The tooth was atraumatically extracted, (Figure 3) and the infected tissue and granulation debris were completely removed. (Figure 4A, 4B) The site was irrigated with sterile saline and chlorhexidine solution (Figure 5).

MinerOss® XP xenograft was mixed with Emdogain® packed into the defect. A Cytoplast® PTFE membrane was adapted over the graft and fixed with a titanium screw for stability. AND 15 × 25 mm Ossix® Plus membrane to reinforce the barrier, a was placed externally (Figure 8-12 A). The flap was repositioned and sutured with 3-0 monofilament sutures (Figure 13), followed by tissue adhesive (Figure 14) and application of Blue M Gel (Figure 15). Postoperatively, antibiotics and analgesics were prescribed, along with a 0.12% chlorhexidine rinse AND nasal spray for 2 weeks (otrivion). Immediately post – operative CBCT was done to confirm ideal graft placement and ensure procedural accuracy (Figure 16).

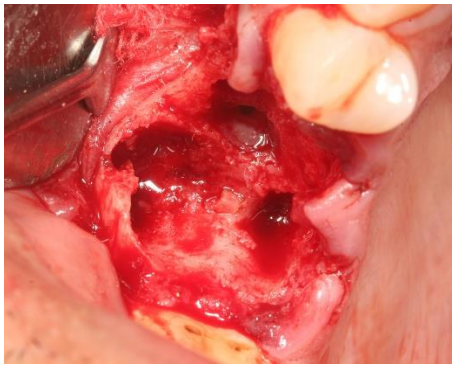

Figure 3: Socket after extraction

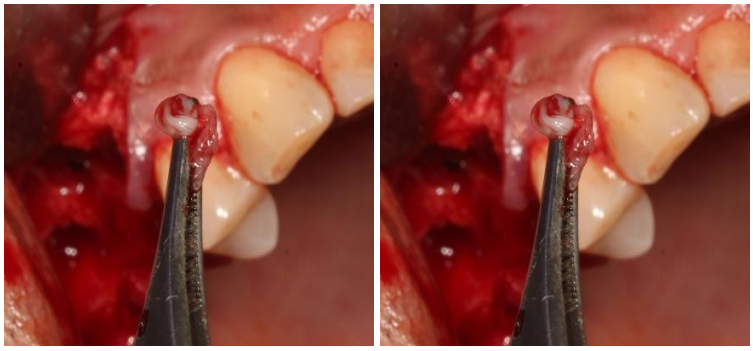

Figure 4A, 4B: Removal of infected antral lining

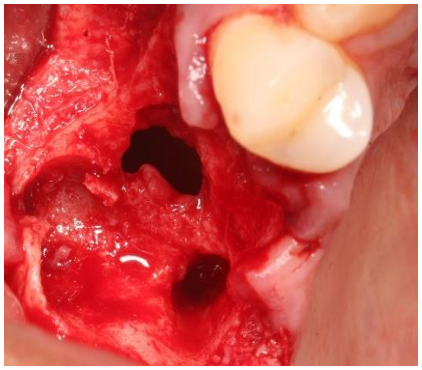

Figure 5: Clean Socket

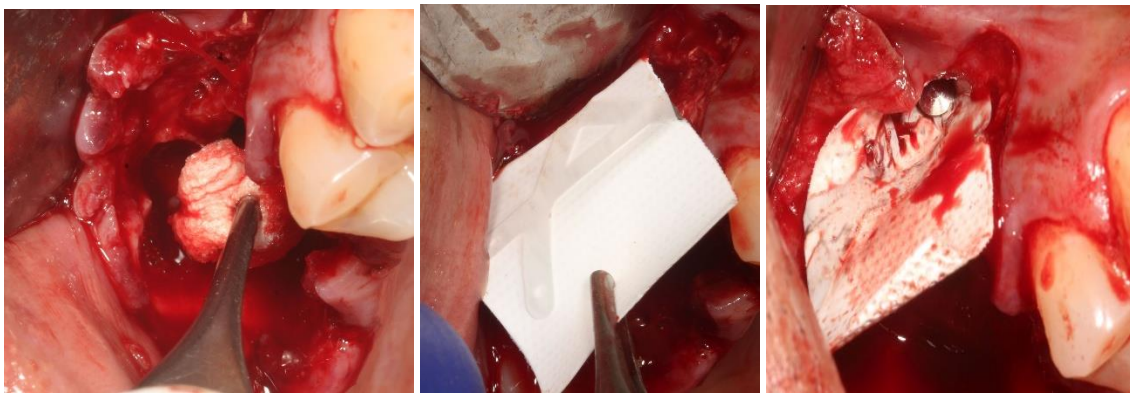

Figure 8, 8A, 8B: Grafting and cytoplast titanium reinforcement placed and stabilized using a titanium screw.

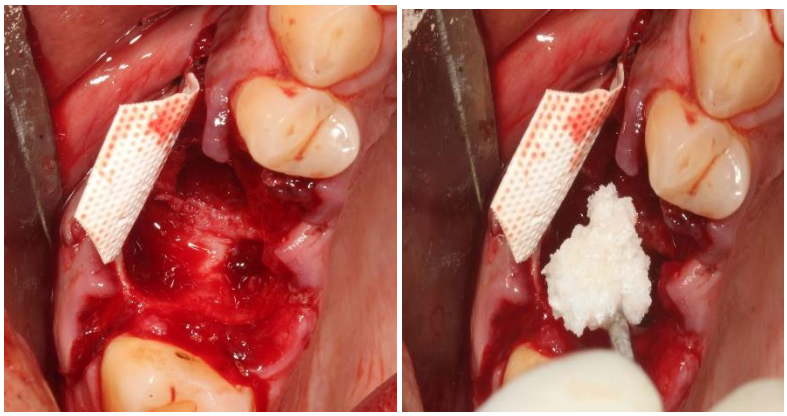

Figure 9, 9a, 9b, 9c: Emdogain mixed with mineross XP and packed into defect.

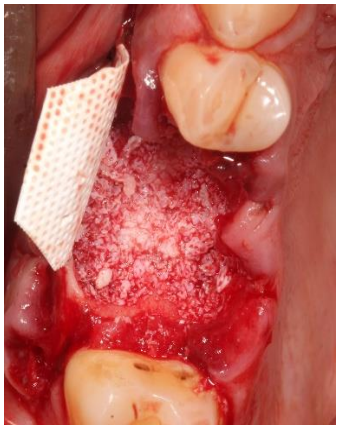

Figure 10: Socket filled with bone graft

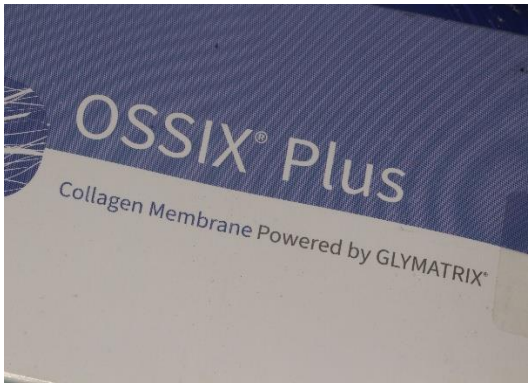

Figure 11: Collagen membrane used.

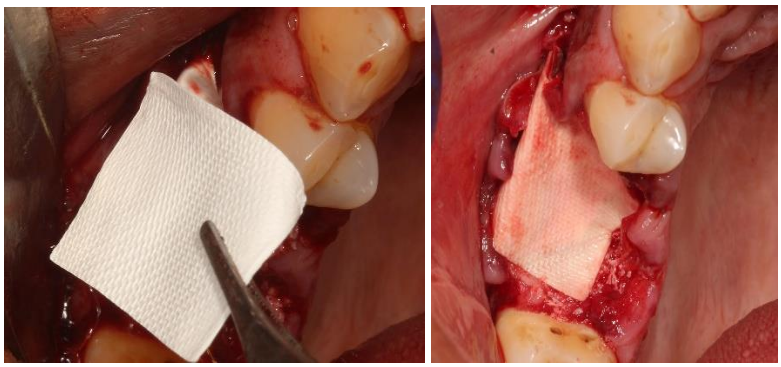

Figure 12, 12A: Placing ossix plus collagen membrane

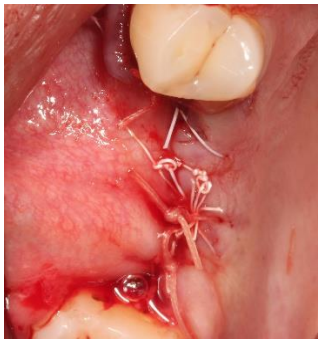

Figure 13: Sutures

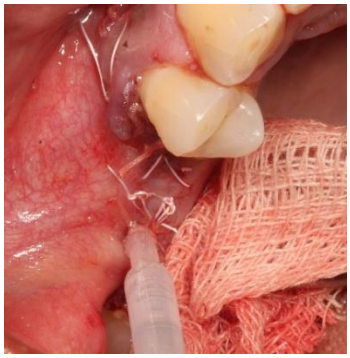

Figure 14: Tissue adhesive

Figure 15: Blue M gel apllied

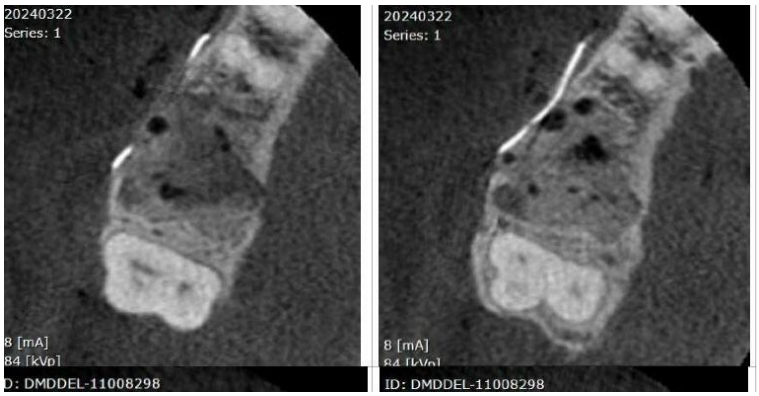

Figure 16: CBCT immediately after grafting

FOLLOW-UP AND RESULTS

At one week, soft tissue healing was satisfactory with no inflammation. Sutures were removed at two weeks.

At one month, complete mucosal coverage was observed with no exposure.

At three months, radiographic evaluation showed progressive bone fill.

At six months, CBCT demonstrated dense trabecular bone formation and restoration of ridge contour, with complete resolution of the radiolucent area.

Based on the favorable bone density and contour, an implant was placed at six months postoperatively, achieving good primary stability and optimal positioning. After three months, the site was evaluated, and scan bodies were placed for digital impression and intraoral scanning (Figure 17). The prosthetic phase was completed with a screw-retained zirconia crown, ensuring precise fit and optimal esthetics (Figure 18). The site

exhibited healthy peri-implant soft tissue architecture and radiographic evidence of osseointegration during follow-up (Figure 19). No postoperative complications such as infection, graft exposure, or membrane displacement were observed. The patient was subsequently followed up for three years, with the area remaining clinically and radiographically stable and uneventful throughout the period.

Figure 17: Scan bodie

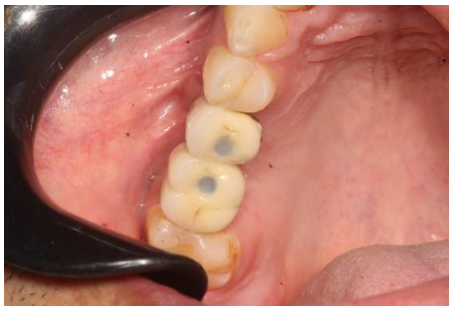

Figure 18: Post op clinical image

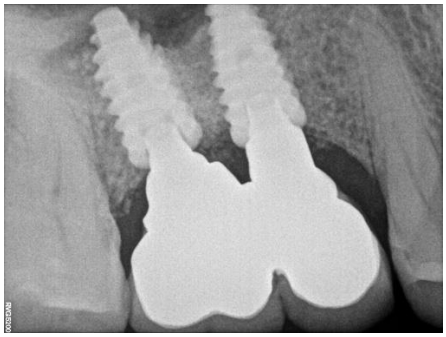

Figure 19: Post op RVG

DISCUSSION

Regeneration of lateral bony defects presents a unique clinical challenge due to the absence of bony walls for graft containment and space maintenance. The use of a long-lasting collagen membrane such as Ossix® Plus, with its extended degradation time and stability, plays a vital role in maintaining the regenerative compartment [5]. Previous studies have documented the superior integration and biocompatibility of Ossix® Plus membranes. Radenković et al. (2021) reported favorable integration behavior and sustained barrier function even with membrane exposure [6]. EMD (Emdogain®) has been extensively evaluated and shown to promote periodontal regeneration, with histologically proven formation of new cementum, periodontal ligament, and alveolar bone [7]. Velasquez-Plata et al. (2002) demonstrated that combining EMD with bovine-derived xenograft resulted in greater bone fill compared to EMD alone [8]. The synergistic effect of EMD with graft material is particularly

valuable in non-contained defects [9]. In this case, the lateral defect required both biologic and mechanical stabilization. The use of titanium screw fixation provided rigid support, preventing micromotion and collapse. The additional PTFE barrier further protected the graft during the early healing phase. The absence of postoperative complications and the radiographic evidence of bone fill at six months followed by successful implant placement support the clinical effectiveness of this combined regenerative approach.

CONCLUSION

The present case demonstrates that the combined use of a sugar cross-linked collagen membrane (Ossix® Plus), xenogenic bone graft (MinerOss® XP), and enamel matrix derivative (Emdogain®) can achieve successful regeneration of a large lateral bony defect. The extended barrier function of Ossix® Plus ensures stable healing, while Emdogain® enhances biologic repair. This combination offers a reliable and predictable option for managing complex lateral defects following extraction, ultimately enabling successful implant placement and functional rehabilitation.

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