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Case Report

Simultaneous Implant Placement with Peri-Implant Augmentation Using Autologous Bone Graft Harvested from the External Oblique Ridge: A Case Report

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Abstract

Introduction

Dental implants have become a well-documented and dependable treatment modality for the rehabilitation of missing teeth; however, adequate alveolar bone volume is essential for successful osseointegration. Following tooth loss, horizontal ridge resorption is common, particularly in the posterior mandible, often necessitating bone augmentation procedures. Autogenous bone grafts are widely accepted as the gold standard for bone regeneration because they provide osteogenic cells, osteoinductive signals, and an osteoconductive scaffold. The external oblique ridge serves as a favourable intraoral donor site due to its dense cortical bone and minimal donor-site morbidity.

Case Presentation

A systemically healthy female patient presented with the absence of the mandibular left first molar accompanied by insufficient horizontal alveolar ridge width. Treatment involved concurrent implant placement and peri-implant ridge augmentation using an autogenous bone graft harvested from the external oblique ridge. The harvested cortical bone was particulated and placed around the peri-implant defect. Healing was uneventful, with satisfactory graft integration and implant stability.

Conclusion

Simultaneous implant placement with peri-implant augmentation using external oblique ridge autografts is an effective and biologically predictable approach for managing horizontal ridge deficiencies in the posterior mandible while reducing overall treatment time.

Keywords: Dental implant; Autologous bone graft; External oblique ridge; Ridge augmentation; Posterior mandible.

1. Introduction

Implant-supported rehabilitation is widely accepted as a reliable approach for replacing missing teeth, offering favorable long-term outcomes and high survival rates.[1] A key determinant of treatment success is osseointegration, characterized by a direct and stable connection between viable bone tissue and the surface of a load-bearing implant.[1] However, extraction of a tooth initiates a cascade of remodelling events within the alveolar ridge, often leading to progressive vertical and horizontal bone resorption. Horizontal bone loss is generally more pronounced, particularly in the posterior mandibular region.[2] Such dimensional changes often result in inadequate ridge volume, compromising ideal implant positioning and limiting the achievement of prosthetically driven implant placement.[3]

To overcome deficiencies in alveolar bone volume, various ridge augmentation procedures have been developed, including guided bone regeneration, ridge splitting, onlay grafting, and simultaneous peri-implant bone augmentation during implant placement.[2,3] These techniques aim to restore sufficient bone dimensions and provide a stable foundation for implant-supported rehabilitation. Bone grafting materials used in implant dentistry can be categorized according to their source as autografts, allografts, xenografts, and alloplastic substitutes. Autogenous bone grafts are widely considered the benchmark or gold standard for bone augmentation procedures because they provide osteogenic cells, osteoinductive growth factors, and an osteoconductive scaffold, while also exhibiting superior biological compatibility and regenerative potential.[4]
Autogenous bone graft material can be harvested from donor sites located either intraorally or extra orally. Although donor sites located extra orally can provide larger quantities of graft material, their use is associated with increased morbidity, hospitalization requirements, and surgical complexity.[4] In contrast, intraoral donor sites are often preferred for localized ridge augmentation due to their proximity to the recipient site, reduced operative time, and lower postoperative morbidity.[5] Common intraoral donor sites include the external oblique ridge (EOR), mandibular symphysis, mandibular ramus, and maxillary tuberosity.[5] Among these, the EOR is particularly advantageous for posterior mandibular augmentation because

it offers dense cortical bone, convenient surgical accessibility, and a relatively low occurrence of postoperative complications.[6]

Case Presentation and Management

A 39-year-old systemically healthy female patient presented to our department with a missing mandibular left first molar (36) and expressed a desire for a fixed prosthetic replacement. The patient had no relevant medical history and did not report any tobacco use. Intraoral examination revealed a partially edentulous ridge in the region of tooth 36 with noticeable reduction in buccolingual ridge width. The soft tissues were healthy, and the adjacent teeth exhibited satisfactory periodontal support (Figure 1A). Cone-beam computed tomography (CBCT) demonstrated adequate vertical bone height in the edentulous for implant placement (Figure1B); however, a horizontal ridge deficiency was evident, indicating the need for simultaneous bone augmentation.

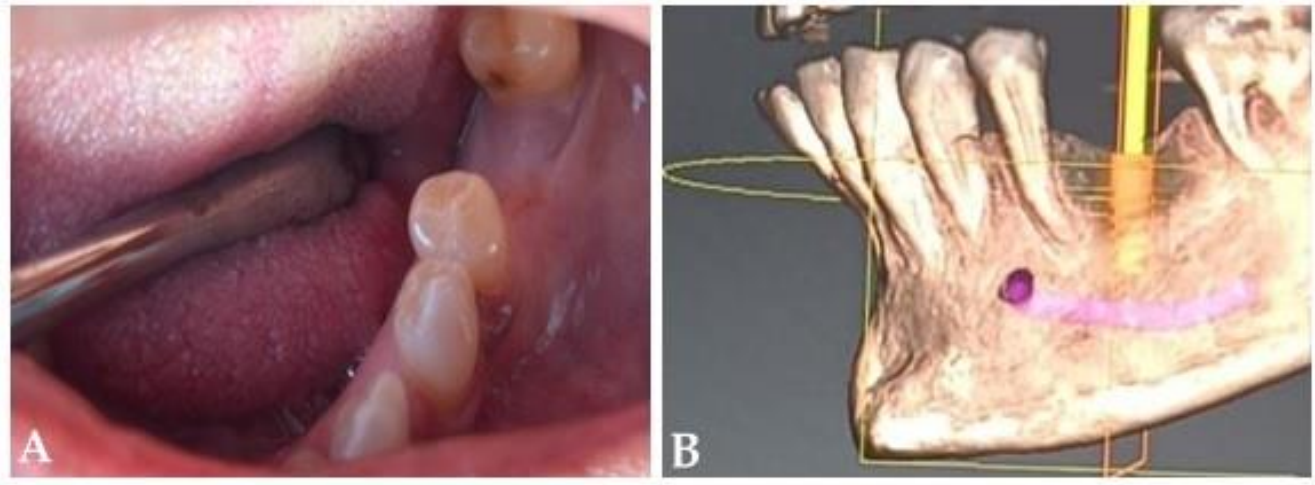

Figure 1 A: Preoperative intraoral clinical view showing the edentulous region of tooth 36 with reduced ridge width. B: Preoperative CBCT image demonstrating ridge deficiency at the planned implant site.

Initial periodontal therapy, including oral prophylaxis, was completed, and the patient received detailed oral hygiene instructions. One week later, following Phase I therapy, a comprehensive clinical evaluation was performed, pre-operative records were obtained, and routine hematological investigations confirmed the patient's suitability for surgery.

Preoperative antisepsis included 0.12% chlorhexidine mouthwash rinsing and disinfection of the perioral region with povidone-iodine solution. Local anesthesia was achieved through inferior alveolar, lingual, and long buccal nerve blocks. A mid-crestal incision was made in the edentulous area using a No. 15 Bard-Parker blade and a full-thickness mucoperiosteal flap was raised to expose the underlying alveolar ridge. Osteotomy preparation was performed according to the manufacturer's protocol for the implant system (Noris), beginning with a 2.0-mm pilot drill and progressing sequentially through 2.8-mm, 3.2-mm, and 3.6-mm drills to a depth of 10 mm. A 4.2 × 10 mm implant was inserted and achieved satisfactory primary stability. Following implant placement, a buccal peri-implant defect was identified, necessitating augmentation.

Attention was then directed to the donor site at the EOR. After reflection of a full-thickness flap, cortical bone was harvested using a trephine bur under copious sterile saline irrigation to minimize heat generation (Figure 2).

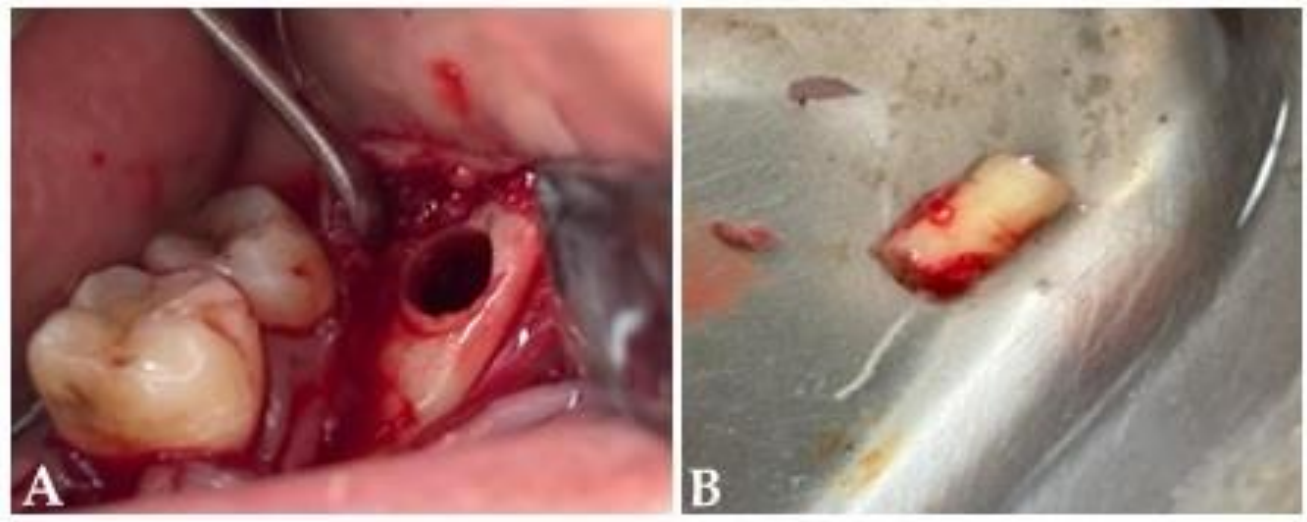

Figure 2: Autologous bone graft harvesting procedure. **(A)** External oblique ridge donor site after bone harvesting. **(B)** Harvested cortical bone graft prior to particulation.

The harvested bone block was subsequently processed using a bone mill to obtain particulate graft material (Figure 3). The particulate autogenous bone was carefully adapted around the buccal aspect of the implant to reconstruct the deficient ridge and fill the peri-implant defect. Guided tissue regeneration membrane was placed and secured. Care was taken to ensure close adaptation to the recipient site while preserving the space necessary for revascularization and graft incorporation. Primary closure was obtained in both the donor and recipient sites using resorbable sutures.

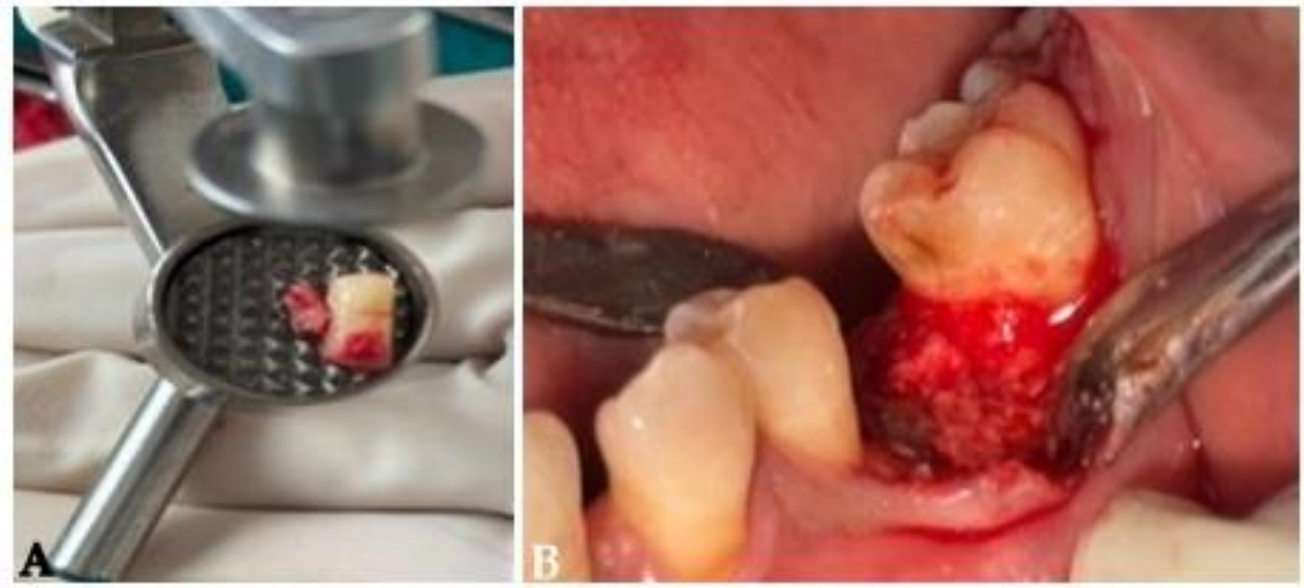

Figure 3. (A) Conversion of the cortical bone block into particulate graft using a bone mill; (B) Placement of the particulate graft around the implant to augment the buccal ridge contour.

Postoperative instructions emphasized meticulous oral hygiene maintenance and avoidance of mastication on the surgical site for two weeks. The patient was prescribed antibiotics, analgesics, and 0.12% chlorhexidine mouth rinse for five days. Follow-up visits demonstrated uneventful healing at both surgical sites, satisfactory graft integration, and stable implant osseointegration.

Clinical Outcome

After an uneventful healing period of three months, the implant demonstrated satisfactory clinical stability and was restored with a definitive prosthesis. The final restoration achieved favorable functional and esthetic outcomes, with harmonious integration into the surrounding dentition and soft tissues. The patient reported satisfactory comfort and masticatory function following prosthetic rehabilitation. The six-month postoperative assessment revealed a stable implant, favorable peri-implant soft tissue health, and no evidence of biological or mechanical failures.

Clinical and radiographic evaluation confirmed successful maintenance of the augmented ridge contour and peri-implant bone levels, indicating a favorable treatment outcome (Figure 4).

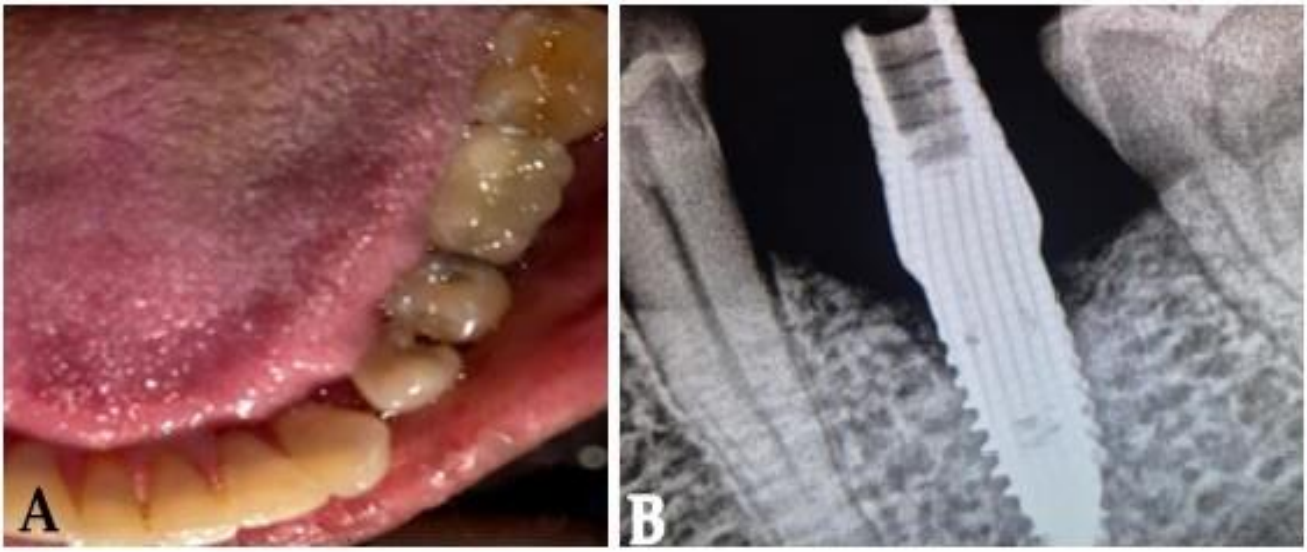

Figure 4. Six-month postoperative clinical (A) and radiographic (B) views showing stable peri-implant conditions and maintenance of the grafted ridge.

Discussion:

Horizontal alveolar ridge deficiencies, primarily resulting from post-extraction bone resorption, frequently present clinical challenges during implant placement in the posterior jaw.[2,3] Such defects may compromise prosthetically driven implant

positioning and primary implant stability, often necessitating ridge augmentation procedures. Among the available treatment approaches, simultaneous implant placement with peri-implant augmentation has gained considerable popularity because it reduces the number of surgical interventions, shortens overall treatment time, and capitalizes on the regenerative potential of the host site.[3] Autogenous bone grafts provide viable osteogenic cells, numerous growth factors, and a natural scaffold that supports bone regeneration. Numerous studies have demonstrated superior integration and more rapid revascularization of autogenous bone compared with alternative grafting materials.[7] Consequently, autogenous grafts remain a highly reliable option for reconstructing deficient alveolar ridges. Particulate autogenous bone grafting and guided bone regeneration (GBR) have been extensively employed to manage horizontal ridge deficiencies either before or simultaneously with implant placement. These regenerative approaches facilitate the achievement of adequate ridge dimensions while maintaining implant stability and optimal prosthetic positioning.[8]

The use of intraoral donor sites, particularly the EOR and mandibular ramus, offers several advantages, including proximity to the recipient site, reduced surgical time, elimination of the need for hospitalization, and lower postoperative morbidity.[9] Among these donor sites, the EOR has emerged as a dependable and versatile source of cortical bone, particularly for reconstruction of localized posterior mandibular defects. Compared with symphyseal or ramus harvesting, it carries a lower risk of neurosensory complications while providing dense cortical bone suitable for particulate grafting.[6] Furthermore, the cortical architecture of the harvested bone contributes to graft stability and serves as a scaffold for the formation of new bone through creeping substitution.[6] Recent studies have demonstrated that simultaneous implant placement and bone augmentation can significantly reduce treatment duration and eliminate the need for multiple staged surgical procedures while maintaining predictable implant survival rates.[10] 16–19 The success of oral implants relies on the ability of graft materials to promote rapid revascularization, early bone remodeling, and intimate integration with the host bone. Clinical evidence consistently indicates that autogenous bone provides superior regenerative results and dental implant survival rates when matched with allografts, xenografts, or alloplastic substitutes.[4]

The present case highlights the benefits of a sequential surgical approach involving implant placement followed by peri-implant augmentation. This strategy permits precise assessment of the peri-implant defect and facilitates targeted graft placement in deficient areas. Following implant placement, particulate autogenous bone harvested from the EOR was adapted to the buccal defect to restore ridge width while preserving primary implant stability. In contrast to block grafts, particulate grafts allow intimate adaptation around the implant surface, thereby enhancing vascularization and promoting favorable bone remodeling. The clinical effectiveness of simultaneous implant placement combined with autologous bone augmentation has been supported by several investigations. Nkenke et al. (2002) reported predictable bone regeneration with minimal donor-site morbidity following retromolar bone harvesting, while Cordaro et al. (2002) demonstrated favorable peri-implant bone fill and stable implant survival rates using mandibular autogenous grafts. These findings support the biological rationale for utilizing cortical bone harvested from the EOR for the management of localized horizontal ridge deficiencies. [6,11]

An additional advantage of concurrent implant placement and augmentation is the reduction in overall treatment time by eliminating the need for staged procedures and prolonged healing intervals between grafting and implant placement. This approach enhances patient comfort and compliance while minimizing surgical trauma, factors that are essential for optimal healing and long-term implant success.[3] In the present case, both donor and recipient sites healed uneventfully as a result of meticulous flap design, atraumatic harvesting techniques, and tension-free primary wound closure. Follow-up evaluation revealed stable implant positioning, satisfactory peri-implant bone fill, and maintenance of the augmented ridge contour, thereby confirming the clinical predictability of this treatment approach. Moreover, the use of the EOR as a donor site avoided complications associated with extraoral bone harvesting, including increased surgical morbidity, prolonged hospitalization, and potential neurosensory disturbances. Overall, the combination of simultaneous implant placement and autogenous bone grafting represents a biologically sound and clinically effective approach for the management of horizontally deficient posterior mandibular ridges. The present case reinforces the importance of appropriate case selection, meticulous surgical execution, and adherence to fundamental regenerative principles in achieving predictable and successful outcomes in implant dentistry.

Conclusion:

This case report demonstrates that ridge augmentation using autologous bone graft harvested from the EOR can effectively facilitate implant placement in horizontally deficient posterior mandibular sites, with minimal morbidity for the donor-site and favorable clinical outcomes. Predictable treatment success relies on appropriate selection of case, meticulous surgical procedure, and adherence to established regenerative principles. This case report reinforces the use of external oblique ridge-derived autogenous bone as a reliable and biologically advantageous grafting option for the regeneration of localized horizontal ridge defects prior to implant rehabilitation.

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