SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

Dental Medicine

One-Stage Mandibular Lateral Ridge Expansion for Implant Placement: A Case Report

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DOI: https://doi.org/10.36347/sasjs.2025.v11i01.020 | **Received:** 04.12.2024 | **Accepted:** 09.01.2025 | **Published:** 29.01.2025

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Abstract **Case Report**

Insufficient bone thickness in atrophic mandibles poses a significant challenge for dental implant placement. While various techniques exist to address this issue, mandibular ridge expansion, specifically through a two-stage process involving corticotomies and ridge splitting, has been commonly used. This case report explores the outcomes of a one-stage mandibular lateral ridge expansion technique to enhance bone structure for implant placement. A 57-year-old female patient with significant bone resorption in the mandible underwent a one-stage procedure involving full-thickness mucoperiosteal flap elevation, corticotomies, and lateral ridge expansion using osteotomes. The space between the cortical plates was maintained with fixation screws, allowing for blood clot formation and bone healing. Postoperative care was followed by cone-beam computed tomography (CBCT), which showed a bone width gain of 2–5 mm after six months. Dental implants were successfully placed after a sufficient healing period, demonstrating the efficacy of this technique in reconstructing severely narrow mandibular ridges without the need for bone harvesting. This approach presents a simplified, cost-effective alternative to more invasive bone augmentation methods with minimal morbidity and comparable outcomes to other ridge expansion techniques.

Keywords: Mandibular Ridge Expansion, Atrophic Mandible, One-Stage Procedure, Corticotomies, Dental Implants.

INTRODUCTION

Insufficient bone thickness in atrophic mandibles is a common challenge when placing screw-type dental implants. A narrow alveolar ridge, typically less than 4 mm in width, necessitates horizontal augmentation. Various surgical methods have been proposed in the literature to address this issue, including Guided Bone Regeneration (GBR), onlay block bone grafting, ridge splitting or expansion techniques, and distraction osteogenesis. In the litterature, mandibular ridge expansion aims to create an implant bed through a two-stage process: the first involves elevating a full-thickness mucoperiosteal flap and performing horizontal and vertical corticotomies; the second, performed after about a month, involves ridge splitting and expansion using osteotomes [4]. The space between the buccal and lingual cortical plates is fixed, allowing for blood clot formation, simulating an extraction site [1]. Implant placement is typically performed 3–5 months later. This case explores the outcomes of a one stage mandibular lateral ridge expansion technique in enhancing bone structure for implant placement.

CASE STUDY

A 57-year-old female patient was referred for fixed mandibular prosthetic rehabilitation involving dental implants. Clinical examination revealed persistent of only 33,34 and 35 teeth with a third grade mobility with pronounced labial and buccal bone resorption, classified as Lekholm and Zarb's class D atrophy (Figure 1).

Figure 1: Endobuccal examination

Radiographic analysis indicated adequate bone height for implant placement; however, the mandibular region displayed a knife-edge morphology (Figure 2).

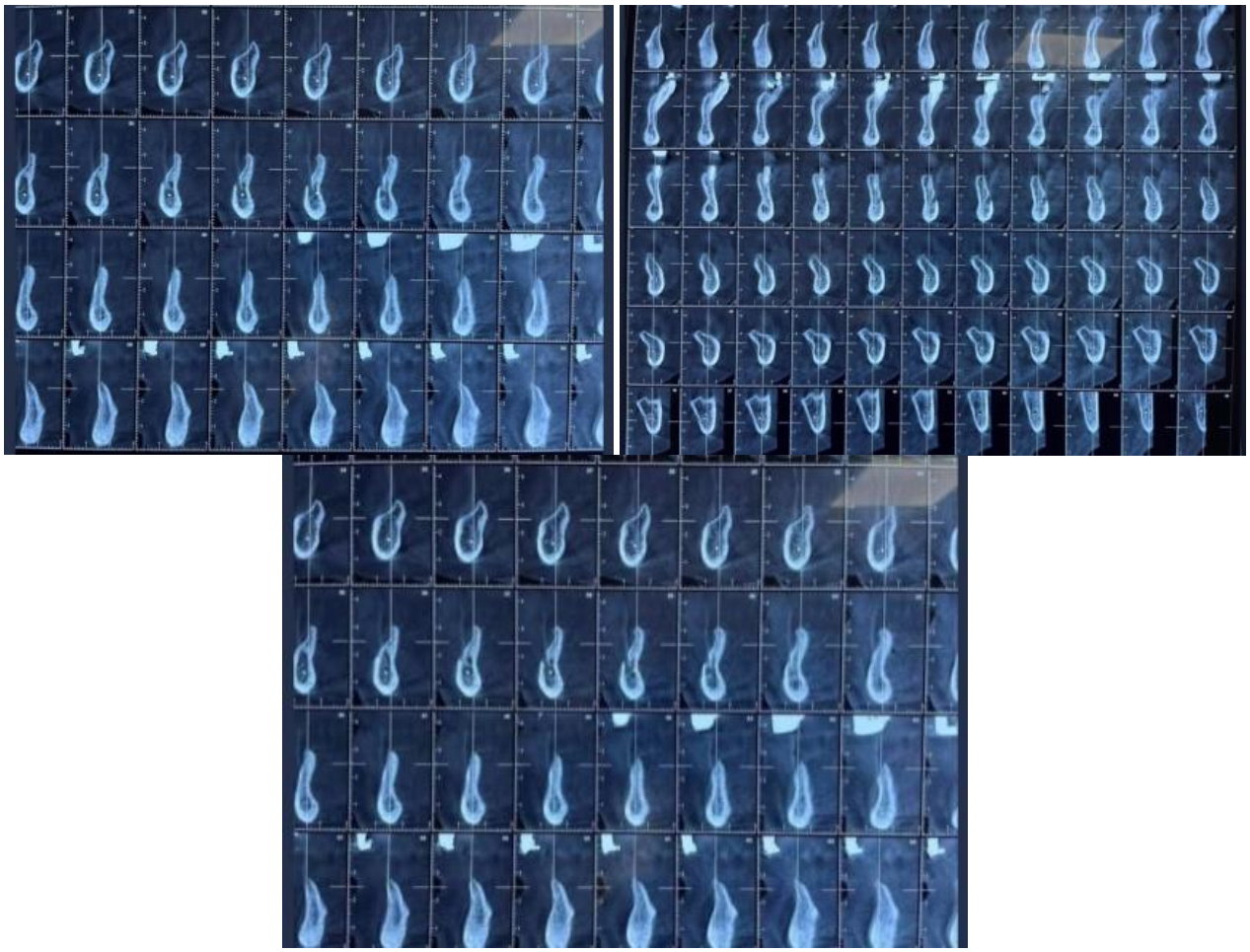

Figure 2: Radiographic examination

The surgical site was prepared by extracting of 33, 34 and 35 and then by creating a mucoperiosteal flap with a midcrestal incision and vertical incisions for enhanced access.

The lateral ridge was exposed to a height of at least 10 mm to facilitate the osteotomy. the mental nerve was visible, it was carefully exposed and protected. Crestal, vertical and apcal corticotomies were performed using a variety of tools, such as piezoelectric devices, as recommended for high-density bone like the mandible.

The lateral cortical plate was split and expanded by approximately 3-5 mm laterally using osteotomes. The space is maintained with fixation screws. The resulting space was sutured, allowing for blood clot formation between the separated bone plates, similar to a fresh extraction socket (Figure 3).

Figure 3: Surgical procedure

Postoperative care included antibiotics (500 mg amoxicillin three times daily for 5 days). Clinical monitoring was carried out 1 week after surgery for suture removal, then 1 and 3 months post-surgery with visual examination of the healing tissues for any signs of inflammation (Figure 4).

Figure 4: Endobuccal examination after 3 months

Furthermore, cone-beam computed tomography (CBCT) was carried out after 6 months, before implant insertion stage. Bone width gain has been observed in this case with width gaining between 2 and 5 mm (Figure 5).

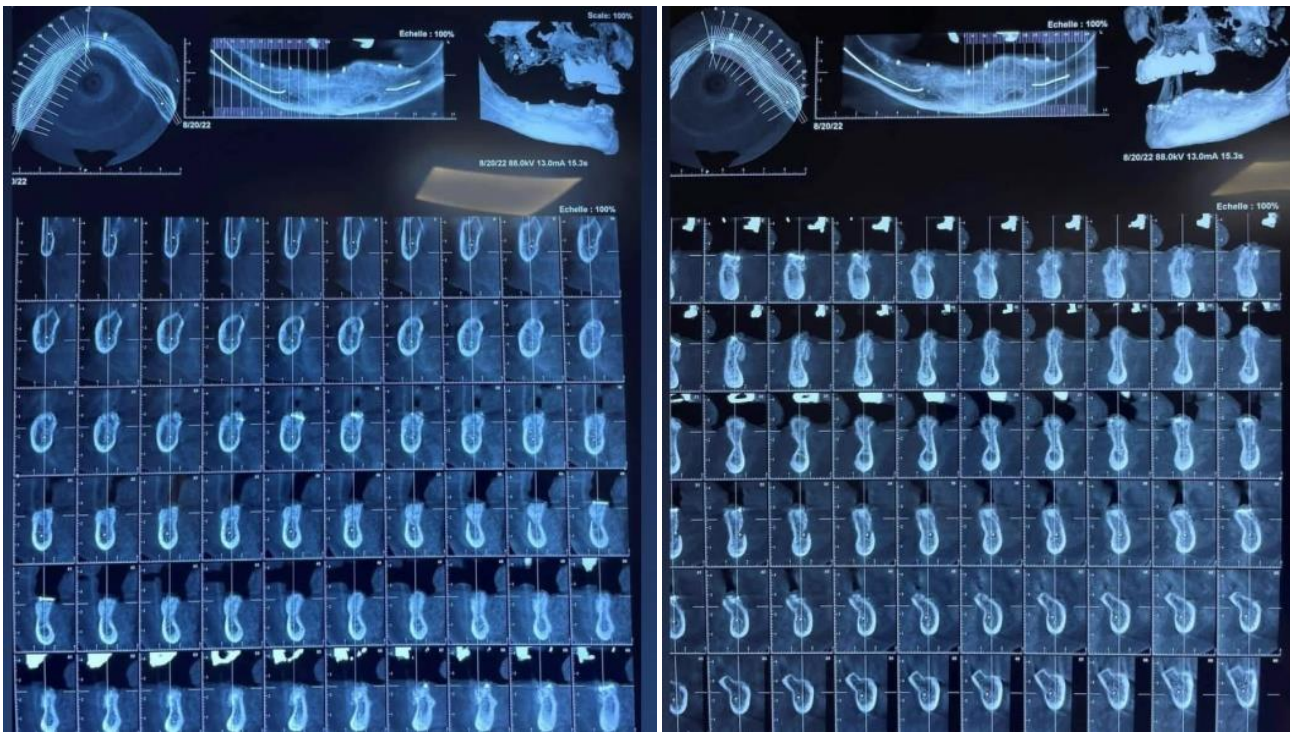

Figure 4: Cone-beam computed tomography (CBCT) after 6 months

Three months at least are needed for bone healing. Removable total prosthesis are not allowed to be used during the whole healing period. Once the bone was properly regenerated, six dental implants were inserted by two stage surgery technique (Figures 5).

Figure 5: Three months after implants and healing abutments placement

DISCUSSION

Ridge splitting and expansion techniques for the mandible are infrequently discussed in the literature. Although these techniques are more commonly performed in the maxilla, the mandibular cortical bone's greater thickness and rigidity often complicate the procedure. In the current case, a full-thickness mucoperiosteal flap was raised to facilitate complete corticotomy. While this temporarily disrupts blood supply, angiogenesis during the healing phase in the two stage procedure restores vascularity and reduces the risk of complications during plate lateralization [2]. However, in this case, we performed one stage procedure and apical corticotomy but vascularization is still possible due to the adhesion of the periosteum to the buccal cortical plate during the healing period. However, this requires an experienced surgeon to reduce the operating time and thus improve the chances of subsequent vascularization [5]. The buccal cortical plate remained viable as a pedicle graft after ridge splitting, which is consistent with findings from Enislidis *et al*., In a report by Kheur *et al*., bone grafts were used to maintain the space between cortices, but in this case, only fixation screws were used to support the expanded ridge, with the mucosa sutured in place to stabilize the plate. The delayed expansion technique presented here proves to be an effective alternative for reconstructing severely narrow mandibular ridges, offering the advantage of avoiding bone harvesting from a second surgical site [7]. This reduces morbidity and postoperative complications while allowing for greater bone expansion compared to more invasive bone harvesting methods. In contrast to guided bone regeneration (GBR) procedures, which are often limited by membrane collapse and exposure leading to infection, the split expansion technique bypasses these issues. It provides adequate bone width for successful implant placement, with outcomes comparable to other augmentation techniques. While the corticotomy may cause some loss of bone height, studies suggest that implant success rates with short implants (10-13 mm) are not significantly lower than those with longer implants [3]. Proper treatment planning remains the most critical factor in ensuring successful outcomes.

CONCLUSION

This case highlights the successful and relatively rare application of the lateral ridge expansion technique in the mandible. The modified approach demonstrates its simplicity, effectiveness, and low morbidity, offering an alternative to more complex procedures. Additionally, it is cost-effective and avoids the need for foreign materials, making it a viable option for a broader range of patients.

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