Case Report
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# Maxillary Anterior Ridge-split with Simultaneous Implant Placement: A Case Report

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## ABSTRACT

Dental implants have significantly advanced dentistry by providing a solution for replacing missing teeth. Adequate bone height, width, and volume are prerequisites for successful implant placement. When faced with insufficient horizontal ridge width, clinicians may consider a ridge-split to create the necessary space for placing implants simultaneously. This technique is typically suited for cases where there is a sufficient amount of cancellous bone available. This case report highlights the use of the ridge-split technique for ridge augmentation in a 25-year-old male patient with an edentulous anterior maxilla.

**Keywords**: Bone augmentation; cancellous bone; ridge-split.

## INTRODUCTION

A minimum of 6-7 mm of bone width is necessary for dental implant placement. Numerous methods have been developed to augment bone for implant placement in cases of deficient bone width, including block graft, guided bone regeneration, distraction osteogenesis, and ridge expansion. Ridge expansion, also known as ridge splitting or bone spreading, enhances the site for implant placement by expansion of cortical plates. These procedures can be used alone or in combination.[1,2] This case report describes the replacement of missing teeth 11 and 12 (according to two-digit teeth numbering system) using ridge-split with simultaneous implant placement.

## CASE REPORT

A 25-year-old male presented to the Department of Periodontology and Oral Implantology, College of Dental Surgery at B. P. Koirala Institute of Health Sciences, Dharan, Sunsari, Nepal, seeking replacement of the missing upper front teeth lost due to trauma suffered a year ago. Medical history was non-contributory. On intraoral examination, missing 11, 21, 16, and 46 (according to two-digit teeth numbering system) were found. Intraoral periapical radiographs were taken, and a cone beam computed tomography (CBCT) scan was recommended to assess the ridge dimensions accurately (Figures 1a, 1b, 1c). The buccolingual ridge width was 5.22 mm with respect to (wrt) 11 and 4.93 mm wrt 21 with 1.5 mm to 2 mm of cancellous bone in the crestal region. Due to limited ridge width, ridge-split surgery was planned. Before surgery, the patient underwent oral prophylaxis and routine blood tests. The patient was explained about the treatment plan and informed consent was obtained. Two weeks after the non-surgical phase, surgery was planned.

The patient was asked to rinse with a 0.2% chlorhexidine digluconate mouthwash. The maxillary anterior region was anaesthesised using 2% lignocaine with 1:200000 epinephrine by administering local infiltration and nasopalatine nerve block. A crestal incision slightly palatal, and two releasing incisions were made distal to 12 and 22, followed by a full-thickness flap reflection with periosteal elevators to expose the ridge. A sharp surgical scalpel with a number 15 blade was initially used to split labial and palatal cortical plates, leaving 1 mm margin near the adjacent teeth (Figures 2a, 2b, 2c). The cut was then deepened using a 7 mm diameter rotating saw

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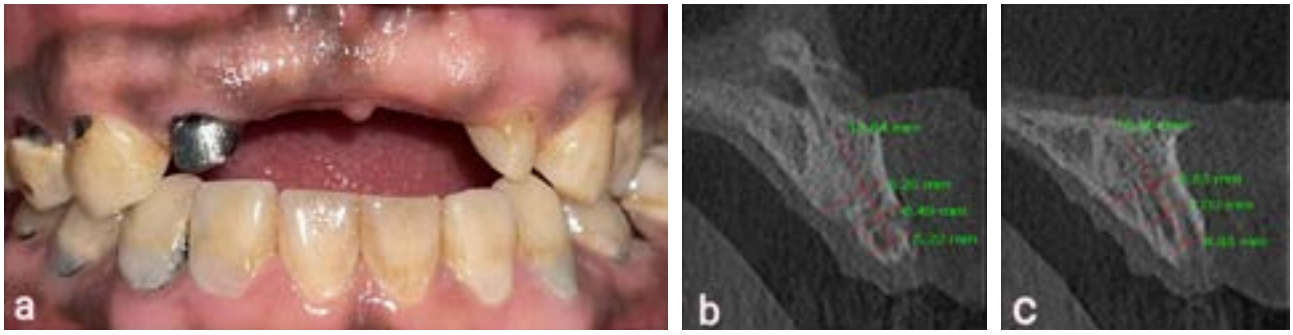


**Figure 1 (a,b,c): Preoperative clinical photograph showing frontal view and CBCT scan showing the ridge dimension buccolingually wrt 11 and 21.**

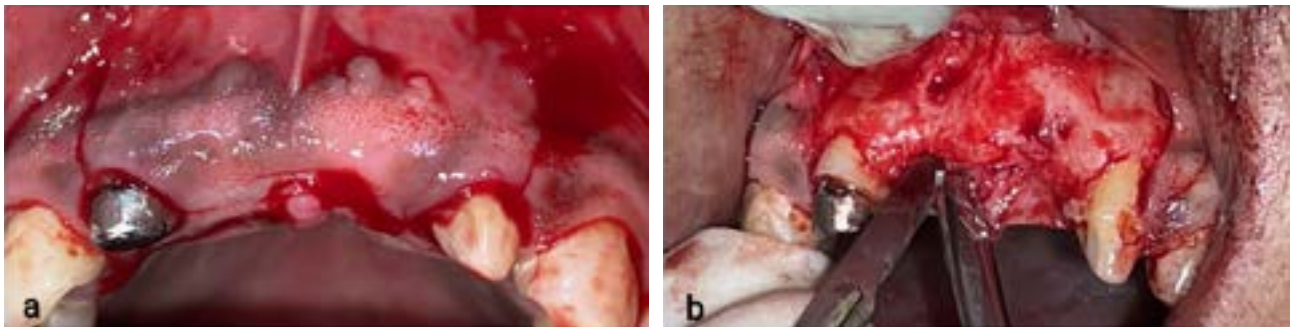


**Figure 2 (a,b): Horizontal and vertical incisions given; #15 surgical blade used to split the ridge.**

from a bone expander kit (NEXUS MEDODENT, India) (Figures 3, 4). For irrigation, 0.9% normal saline was used. The osteotomy cut was further deepened with a 10 mm saw disk. One horizontal and two vertical cuts were made in the bone. A lance drill was used for the initial osteotomy, followed by a 2.6 mm threaded expander (Figure 5). Afterward, a 3 mm expander was employed. The osteotomy site was then progressively enlarged with 2 mm, 2.4 mm, and 2.8 mm drills (i-Fix®, Kamal Medtech, India) in sequence, 2 mm beyond the planned implant length.

Two implants, measuring 3.5 mm x 11.5 mm (i-Fix®, Kamal Medtech, India) each were carefully placed and primary stability of 35 N/cm torque was achieved with torque ratchet. The periosteal-releasing incisions were made from 12 to 22 to allow coronal extension of the flap. The space between the implants and the bone was filled with xenograft (BioOss; Geistlich, Wolhusen, Switzerland) and covered by a resorbable collagen membrane size 25X15 mm (Periocol-GTR™, Eucare Pharmaceuticals, Chennai, India) (Figure 6). A horizontal mattress and interrupted sutures were placed with 4-0 Silk (Figure 7). Pressure was applied over the flap for five minutes to eliminate dead space. An intraoral periapical radiograph was taken (Figure 8). Post-operative instructions were given to the patient. The patient received a combination of medications to ensure proper healing and address any discomfort. The patient was prescribed capsule Amoxicillin 500 mg and tablet Metronidazole 400 mg eight hourly for seven days, tablet Serratiopeptidase 10 mg eight hourly for five days, Paracetamol and Ibuprofen combination eight hourly for three days followed by intake if necessary, and 0.2% chlorhexidine mouthwash for two weeks. Sutures were removed after ten days. The patient was routinely scheduled for check-ups for six months. After six months, healing abutments were placed. One month later, healthy gingival cuffs were formed (Figure 9), then provisional crowns were given. After two months of provisionalisation, the patient was recalled for impression. Customised transfer copings were used for the soft tissue impression (Figure 10) which was taken using a closed tray technique with putty and light body impression material. Prosthetic rehabilitation with Zirconia crowns was done for teeths 11, 12, 21, and 22 (Figure 11).

Figure 3: Bone expander kit (Nexus Medodent).

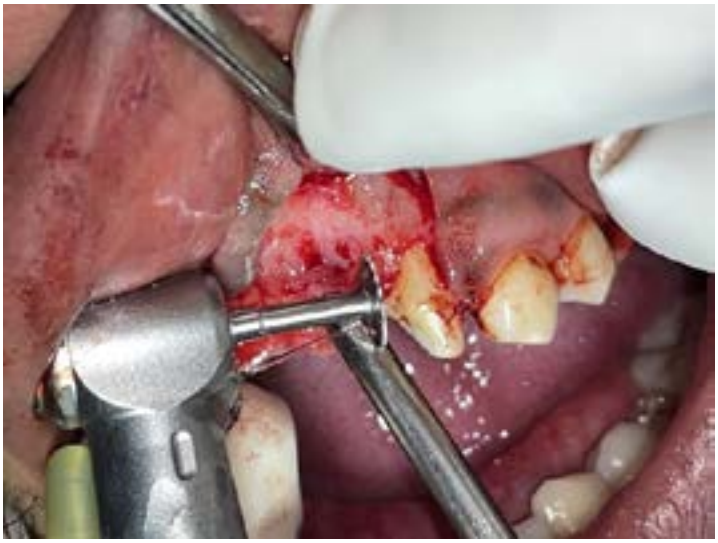

Figure 4: Use of saw disk.

Figure 5: Lance drill for initial osteotomy followed by a 2.6 mm threaded expander.

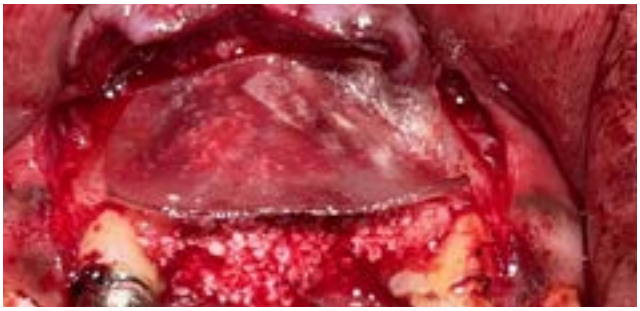

Figure 6: Implants inserted into the osteotomy (i-Fix); periosteal releasing incision given, xenograft and collagen membrane placed.

Figure 7: Silk sutures 4-0 placed.

Figure 8: A periapical radiograph showing the two implants in the incisors location.

Figure 9: Gingival cuff after placement of healing abutment.

**Figure 10: Customised transfer coping in place.**

**Figure 11: Zirconia crowns placed (Frontal and occlusal view).**

**Figure 12: Cone beam computed tomography after 10 months of surgery.**

## DISCUSSION

Tatum introduced the ridge expansion technique using hand osteotomes gradually increasing in size, later modified by Summers. Simion et al. detailed a similar method for alveolar ridge splitting, where the ridge is divided into two parts, inducing a greenstick fracture with small chisels.[2] Scipioni et al. documented an average increase of 2.4 mm to 6 mm in ridge width.[3] The width gains from this procedure, with a full thickness flap was 3.19 ± 1.19 mm and with a partial thickness flap was 4.13 ± 3.13 mm. Implant survival rates ranged from 95.7% to 97%.[4] The mean width gain was 3.2 mm using motorised ridge-split kit.[5] In this case, using a bone expander kit, CBCT evaluation 10 months post-surgery showed increase in ridge width by 2.18 mm wrt 11 and 1.78 mm wrt 21. The patient is under regular follow-up.

The ridge-splitting is an efficient method for managing narrow residual ridges with healing akin to bone fracture repair. Blood clot is formed between split cortical plates which organises and is replaced by woven bone. This woven bone matures into the load-bearing lamellar bone at the implant site. Although this technique can be done in both jaws, it is better suited to perform in the maxilla. It has the added benefit of simultaneous implant placement.[1,6]

However, common complications included insufficient primary implant stability, complete bony segment fractures, and challenges in implant positioning due to confinement to corticotomy sites.[4] To mitigate the risk of bone resorption, bone grafting material, and a barrier membrane was placed around the ridge-split site.

## SUMMARY

Alveolar ridge split can be considered as a predictable approach in the management of horizontally deficient alveolar ridge.

**Conflict of interest:** None.

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