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CASE REPORT

Ridge expansion with motor driven bone expanders: A clinical case report

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ABSTRACT

Implant placement often requires bone augmentation procedures due to the presence of bone defects on the future implant site. The aim of the present case report is to describe a ridge expansion technique using sequential motor driven bone expanders to allow the implant placement in an atrophic maxillary ridge. The use of the motorized expanders avoided a bone augmentation surgical procedure prior to implant placement and, as a result, reduced the overall treatment time. The results were followed-up for 2 years after the implant supported the crown delivery.

Key words
Implantology, osseointegration, osseous surgery, ridge augmentation

INTRODUCTION

Nowadays, dental rehabilitation of partially or totally edentulous maxillary regions through dental implants has become common practice with reliable long-term results. However, due to bone atrophy, periodontal disease, and trauma sequelae, maxillary alveolar ridges are more often compromised with horizontal deficiency. These deformities affects implant fixture placement, stability, and long-term success. Under these conditions, bone augmentation procedures are indicated.[1]

Maxillary crystal ridge bone augmentation is an alternative bone expansion technique that can be used to augment the atrophic maxilla prior to implant placement. This method was first introduced by Tatum in the 1986 and was commonly referred to as ridge splitting, bone spreading, or ridge expansion technique.[2]

Since their introduction, osteotomes have been utilized in a variety of techniques designed to elevate the floor of the maxillary sinus using a crystal approach. Summers[3-6] subsequently adapted the use of osteotomes for the preparation of implant sites in the maxilla as an alternative to traditional drilling procedures. These procedures have also been modified by other clinicians over the years.[7-9]

The technique performed in this clinical case allowed the preparation of implant sites by eliminating the use of a surgical mallet. This procedure was based on the use of a proprietary ridge expansion system (i.e. BTI, Blue Bell, PA). The expanders were introduced into the bone with motor driven rotation, which decreased surgical trauma while providing more control over the expansion site. The thread pattern was designed to compact bone laterally as the instrument advanced into the osseous crest.

CASE REPORT

On December, 2012, a systemically healthy 45-year-old female, was referred to the Department of Oral Surgery of the Dental School of the University of Granada in Spain, with the chief complaint of "missing tooth" (maxillary left first premolar). Patient reported that had this tooth extracted approximately 3 years ago. After comprehensive periodontal evaluation, that included radiographic full mouth evaluation and complete periodontal charting, patient was periodontally stable, presented appropriate occlusion clearance, and adequate interproximal space for replacement of missing tooth with a dental implant fixture [Figure 1a-d].

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Figure 1: Case presentation: (a) Panoramic view. (b) Periapical X-ray of upper left first premolar area. (c) Buccal close-up. (d) Occlusal view

Treatment plan

After explaining to the patient her treatment options that included single implant placement, three-unit fixed prosthesis, and removable partial denture, she decided to pursue dental implant therapy to replace the missing tooth.

Impressions were taken; casts and wax-up were done to provide an adequate restorative treatment plan. After that, a radiographic/surgical guide was fabricated, and cone beam computed tomography scan was taken to finalize the surgical plan for proper implant fixture placement.

Surgical procedure

Upper left premolar area was anesthetized with a subperiosteal infiltration; the number 15C blade was used to perform a crystal incision followed by reflection of a full-thickness flap. Initial ridge width was around 5.0 mm [Figure 2a]. Site preparation began with the use of the initial pointed bur of the system at a speed of 700 rpm to 800 rpm with irrigation. This bur was used to a depth of 10 mm, creating an osteotomy of 1.5 mm in diameter. After that, expander #1 was utilized, and a periapical X-ray was taken to check the direction of the site preparation [Figure 2], after that, expanders #2 and #3 were used.

These expanders (#1, 2 and 3) are all self-tapered, with diameters of 1.4 and 2.0 mm, 1.6 and 2.6 mm, and 2.1 and 3.1 mm in the apex and in the body, respectively [Figure 3]. There is also an expander #4 which the diameters are 2.8 mm in the apex and 3.8 mm in the body that was not used in this clinical case. All bone expanders were driven by an electric hand piece using speeds of 15–30 rpm without irrigation. The torque setting on the

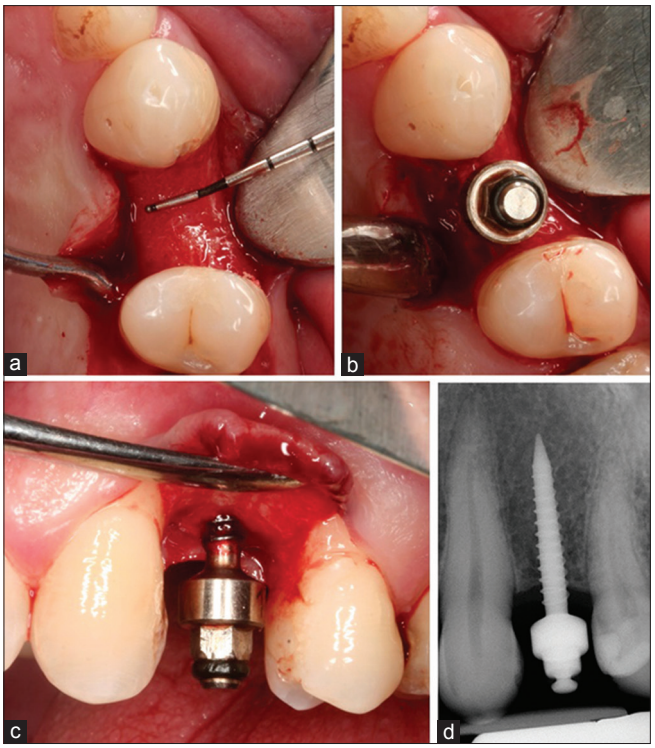

Figure 2: (a) Full thickness flap reflected and measurement of alveolar ridge dimensions. (b) Expander #1-Buccal view. (c) Expander #1 Occlusal view. (d) Periapical X-ray of expander #1

surgical motor remained around 30 Ncm. The expanders were inserted in intervals, pausing for 10 s to allow time for the bone to expand.

Finally, the implant fixture was placed (BTI, Interna Universal, 3.75 mm × 13 mm, platform diameter 4.1 mm) with a primary stability >35 Ncm. The final bone crest width achieved was 2–3 mm greater than the initial crystal bone available [Figure 4].

Clinical outcomes

After 3 months the fixture was successfully restored with a screw retained prosthesis, and the 2 years results are presented [Figures 5 and 6].

DISCUSSION

Implant placement in atrophic ridges is a challenging procedure and often involves prior bone graft augmentation, resulting in a long time treatment plan. The ridge expansion technique is an advantageous bone manipulation technique because it provides an overall shorter treatment period and less surgical trauma when compared to conventional bone graft techniques. In addition, this technique does not require a waiting period of 4–6 months for bone consolidation prior to implant placement and decreases the morbidity since it avoids a second surgical donor site for bone harvesting.[10]

However, this technique presents some limitations. It is not applicable if there is insufficient bone height for implant placement and implementing the technique on atrophic ridges < 3.0 mm wide may result in unfavorable bone fractures that lead to bone resorption.[11] Being thus, in cases of significant bony ridge defects and unfavorable ridge relationships, patients may benefit from an onlay bone graft augmentation technique.[12]

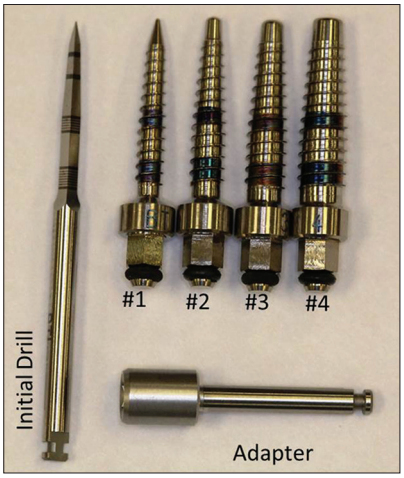

Figure 3: Motorized bone expanders sequence and dimensions. #1-1.4 mm (apex), 2.0 mm (body); #2-1.6 (apex), 2.6 mm (body); #3-2.1(apex), 3.1 mm (body); #4-2.8 mm (apex), 3.8 mm (body)

Concerning the surgical technique, motor driven bone expanders provide an increased control over the expansion site, therefore, allows treatment of more severely atrophic ridges, which would not be possible with the use of traditional osteotomes.

In addition, this technique allows a gradual and controlled fracture of the buccal plate if the plastic capacity of the bone has been exceeded. The displacement of the fractured segments may be closely monitored and as long as adequate implant stability is achieved, the fracture site can also be grafted.[13]

Thus, the use of motor-driven bone expanders serves as an alternative to the traditional techniques, such as ridge augmentation and use of traditional osteotomes in cases of a maxillary horizontal bone deficiencies.

CONCLUSION

In the present case report, the surgical drilling expander instrumentation technique provided increased control

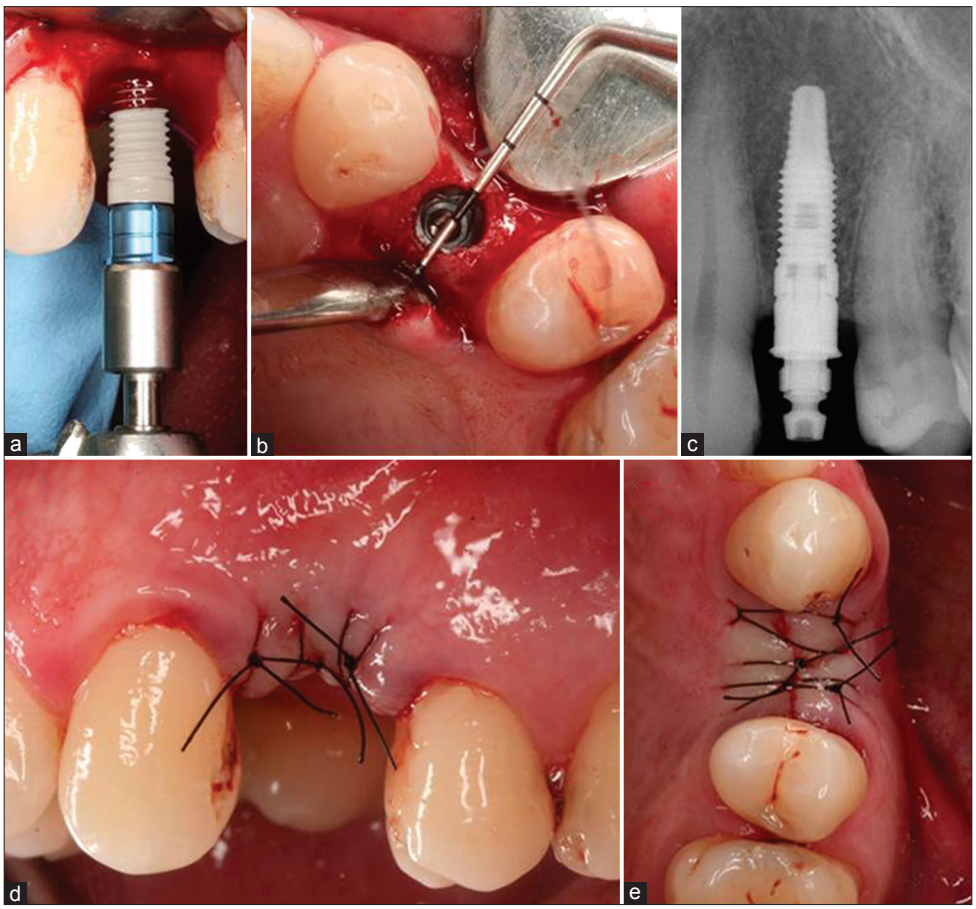

Figure 4: (a) Implant placement. (b) Implant placed and ridge dimension after expansion. (c) Immediate postoperatory periapical X-ray. (d) Sutures – buccal view. (e) Sutures – occlusal view

Figure 5: Final restoration-2 years follow-up. (a) Buccal view. (b) Occlusal view

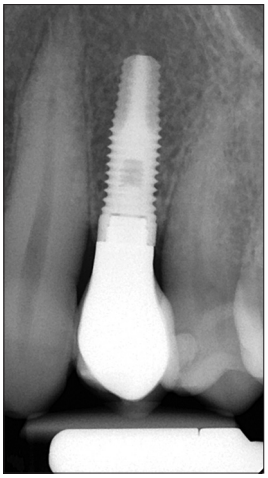

Figure 6: Final restoration pericpical X-ray-2 years follow-up

of the bone expansion, which facilitated implant site preparation and appropriate placement of a dental implant fixture, with stable results over time.

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