Implants in narrow ridge situations: A piezo-surgical approach for alveolar ridge split

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Abstract
Insufficient bone width often reduces the survival of the implant. In such situations the width of the bone has to be increased. There are various methods to increase bone width like guided bone regeneration, onlay grafts, horizontal and vertical distraction osteogenesis and Alveolar ridge split. Alveolar ridge split technique has proven to be successful. It can be performed by using conventional methods as well as modern methods like Piezo surgical methods. This is a case report of one such case where Piezo surgical method was utilized to augment the bone.

Keywords: Narrow ridge, Piezo-surgical, approach

Introduction
The success of the implant therapy will be greatly enhanced when the principle that “Implant placement must be prosthetically driven not bone driven” is followed [1]. Upon the loss of tooth the residual alveolar bone undergoes bone resorption in vertical, sagittal and transverse phases [2]. Initially the resorption in transverse direction is predominant. This phenomenon results in reducing the width of the residual alveolar ridge. Placement of implant in such scenarios is often a challenging task.

A minimum of 1.5 mm bone should be present on around the implant [3]. Hence it should be understood that ridge augmentation procedures are necessary for the situations where the bucco-lingual thickness of available bone is less than 6mm, [4-8]. For the reconstruction of ridge width, height or both various pre-implant bone augmentation techniques were introduced. They include guided bone regeneration (GBR) with a cancellous graft, onlay/veneer block graft, inlay grafting, alveolar ridge split, and vertical and horizontal distraction osteogenesis [9].

Ridge preservation
These ridge preservation approaches have utilized GBR principles using the following regenerative techniques;
Resorbable and non-resorbable barrier membranes alone, Resorbable barrier membranes in combination with bone substitutes, Bone substitutes alone and Bone substitutes in combination with soft tissue grafts technologies “Any therapeutic approach carried out immediately after tooth extraction aimed to preserve the alveolar socket architecture and to provide the maximum bone availability for implant placement” [10] hard and soft tissue changes occurring 6 months after tooth extraction in humans and demonstrated a horizontal bone loss 29–63% vertical bone loss 11–22% [11].

Bone regeneration in fresh extraction sockets Immediate and early implant placement (type 1 and 2) protocols have been indicated as the most suitable for implant placement following tooth extraction Eduardo Anitua and Mohammad H. Alkbraisat stated that the alveolar ridge split is an effective technique for the treatment of atrophic ridge [12]. The advantages of the minimally invasive techniques are excellent esthetics, minimal discomfort, avoiding grafting or barriers, decreased healing interval and better patient acceptance [13].

There are various devices for ridge split procedure. They are classified as Traditional devices
Case Report

A 23-year-old female came to the department of prosthodontics with the chief complaint of missing tooth in the lower left jaw region. All the treatment modalities were explained to the patient. She chose the replacement of the missing tooth with implant followed by crown. Primary diagnostic procedures were conducted and in CBCT report it was found that on 4.4 mm of buccal-lingual bone availability. On examination it was found that it belongs to Class III of Tolstunov’s classification of alveolar ridge width. Hence it was planned to augment the alveolar ridge using piezoelectric device in order to increase the alveolar bone width.

Surgical Procedure

Initially asepsis of the surgical field was done. Inferior alveolar nerve block was given to incorporate the local anesthesia. Upon successful onset of local anesthesia a crestal incision was given using number 15 BP instrument. Relieving incisions were also given. The flap was reflected. The center of the ridge is marked. The tip of the piezoelectric device was placed on the top of the ridge at the denoted mark and the device was activated. The tip was inserted into the bone and the ultrasonic vibrations of the tip make it possible to cut through the bone. The proposed length of the implant is 9 mm. hence the tip is inserted into the bone till the required depth of the drill is achieved. Once the depth is achieved the drills of the implant surgical kit were used in order to increase the width. An implant of dimensions 3.1 mm* 9 mm was placed. Cover screw was placed and the flap is sutured back. The position of the implant was checked using radiograph.

The post-operation instructions, with special emphasis on the maintenance of oral hygiene, were given and the patient was scheduled for a recall after 1 week, 1 month and 3 months.

Discussion

It is established that the width of the bone should be greater than 6 mm for the successful treatment. If the sufficient bone width is not available, implant placement may result in dehiscence or off axial loading of the force. Hence any situation less than 6 mm bone requires transverse bone augmentation [4-8]. Although there are various protocols are available ridge augmentation with ridge split techniques were proven to be successful.

In 1970 Dr Hit Tatum used D-shaped osteotomes to split the alveolar bone. In 1985 he expanded the atrophic ridges of greater than 3 mm [15]. In 1992 Simon et al. used longitudinal green stick fracture in order to extend the socket, performed through osteotomies [16]. Later Summers and Schipani in 1994 revived this procedure and achieved 98% success rate [17, 18]. Summers has described the technique with progressively increasing osteotomes to create osteotomy that is closely receptacle to implant dimension. Padmanabhan and Gupta had found greater crestal bone loss associated with this technique [19].

In 2000 Vercellotti introduced piezo surgery in the treatment of atrophic jaw. This made the split technique easier, safer, and also reduced the risk of complications [20]. The indications of the ARS are situations that don’t require vertical bone augmentation and situations where the buccal-lingual width of 3 mm is available. The advantages of this technique are it maintains the integrity of the periosteum and this procedure never allows the loss of patient bone. The disadvantages of this technique are it cannot achieve vertical height and also this technique is difficult to perform in single tooth replacement situations rather than long edentulous
areas where the operator can take the advantage of elasticity of bone [21].

Anitua E, Begoña L, Orive G found that there is 100% success rate in implant survival rate after ridge-split procedure. This was regardless of implant system and complications. Sethi has reported 97% success rate of this procedure [23].

Buccal bone fracture can happen as a complication of this procedure. Excessive bleeding may occur. Other complications are rare [24].
Fig 7: Piezo-surgical device for ridge split

Fig 8: Increase in bone width

Fig 9: Drill for the implant placement

Fig 10: Checking the depth of the drill

Fig 11: Final osteotomy

Fig 12: Implant Placement

Fig 13: Radiographic verification of implant placement
Conclusion
The advantage of ARS technique is that implants can be placed at the time of primary surgery. This is possible as the bone is widened and it reduces the morbidity and cost. Although the osteotomes are simple and cost effective, the usage of modern devices like piezo surgical devices are also being used on larger scale. This is mainly because of the advantages like prevention of trauma to mucosa, nerves and blood vessels. There is also less trauma to the bone when these devices are employed. This results in faster healing. Considering all the advantages, these devices should be used more.

References