International Journal of Applied Dental Sciences 2019; 5(1): 244-248

ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2019; 5(1): 244-248

www.oraljournal.com
Received: 19-11-2018
Accepted: 22-12-2018

Dr. Kondumahanti VN Avinash
Post-Graduate Student, AECS Maaruti College of Dental Sciences and Research Center, Bangalore, India

Dr. Ritika Sampathkumar
Senior Lecturer, Department of Prosthodontics and ora Implantology, AECS Maaruti College of Dental Sciences and Research Center, Bangalore, Karnataka, India

Dr. Venkat Raghu
Post-Graduate Student, AECS Maaruti College of Dental Sciences and Research Center, Bangalore, Karnataka, India

Dr. Chiranjeevi Reddy G
Professor, Department of Prosthodontics and oral Implantology, AECS Maaruti College of Dental Sciences and Research Center, Bangalore, Karnataka, India

Dr. Subash Munireddy
Professor, AECS Maaruti College of Dental Sciences and Research Center, Bangalore, Karnataka, India

Dr. Jayakar Shetty
Professor and Head of the Department, Department of Prosthodontics and oral Implantology, AECS Maaruti College of Dental Sciences and Research Center, Bangalore, Karnataka, India

Correspondence
Dr. Kondumahanti VN Avinash
Post-Graduate Student, AECS Maaruti College of Dental Sciences and Research Center, Bangalore, Karnataka, India

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

Dr. Kondumahanti VN Avinash, Dr. Ritika Sampathkumar, Dr. Venkat Raghu, Dr. Chiranjeevi Reddy G, Dr. Subash Munireddy and Dr. Jayakar Shetty

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

and Modern devices. Chisel and hand mallet, Osteotomes, Surgical burs, micro-saw blade comprise of traditional devices whereas Modern devices consists of Motorized ridge expander, Treaded Bone expanders, Expansion Crest Device, LASER, Ultrasonic/ Piezoelectric Device [14].

The following is a case report on the Alveolar Ridge Split [ARS] by using Piezoelectric Device.

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 bucco-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.

Class	Alveolar ridge width in mm based on CBCT scan	Alveolar ridge deficiency	Indications for Surgery	Immediate Implant Insertion
0	>10	No deficiency	Hard tissue surgery is not indicated. Occasionally, alveolar width (buccal convexity) can be improved for esthetic reasons with a soft tissue graft	Yes
I	8-10	Minimal	Hard tissue surgery is rarely indicated. Occasionally, alveolar width can be improved by particulate bone graft or palatal soft tissue graft for esthetic and prosthetic reasons	Yes
II	6-8	Mild	Particulate (GBR) grafting or ridge - split is often needed to improve labial bone projection and proper occlusal implant position	Yes/no, depends on presence of apical bone for primary implant stability
III	4-6	Moderate	An ideal width for the ridge-split procedure that can be done in a single- or two-stage approach [Figure 3]. Block graft or GBR can also be done	Yes/no, depends on presence of apical bone for primary implant stability
IV	2-4	Severe	Ridge-split or block bone graft is a graft of choice (surgeon's experience)	Not recommended
V	<2	Extreme	Large extraoral block graft is a preferable surgical choice. Alternative is multiple and sequential augmentation procedures	No
VI	6-10/2-4	"Hourglass" (undercut) (buccal or lingual)	GBR at the mid ridge level can be done	Yes/no, depends on the severity of the undercut
VII	2-4/6-10	"Bottleneck"	Ridge reshaping or GBR at the top of the ridge can be done	Usually yes, can depend on the morphology of the top portion of the ridge

CBCT=Cone beam computed tomography, GBR=Guided bone regeneration

Tolstunov's classification of alveolar ridge 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 9mm. 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 3.1mm* 9mm 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 6mm 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 6mm 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 3mm [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 bucco-lingual width of 3mm 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 replacesment 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 1: Pre-op Intra oral pictures

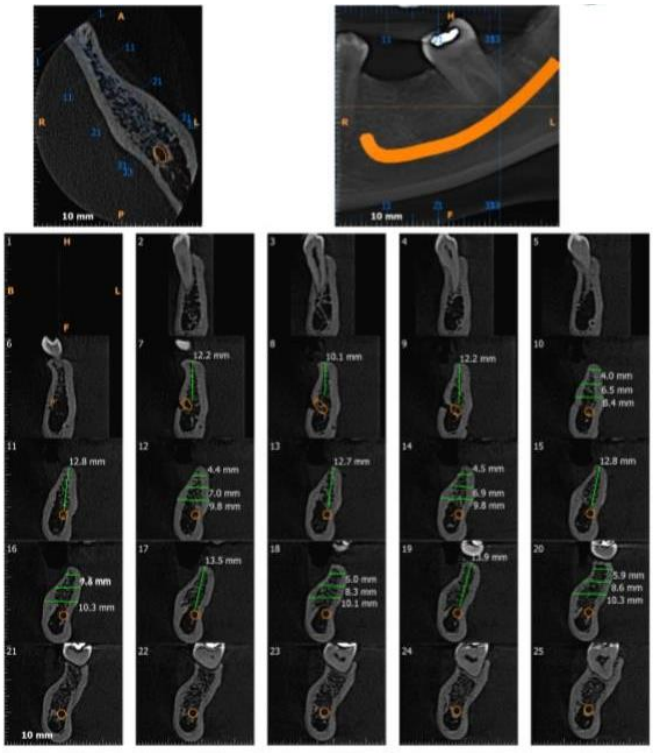

Fig 2: CBCT report showing inadequate bone

Fig 3: Asepsis

Fig 4: Crestal incision

Fig 5: Reflecting the flap

Fig 6: Measuring the width of the alveolar ridge

Fig 7: Piezo-surgical device for ridge split

Fig 8: Increase in bone width

Fig 9: Drill for the implant placem, ent

Fig 10: Checking the depth of the drill

Fig 11: Final osteotomy

Fig 12: Implant Placement

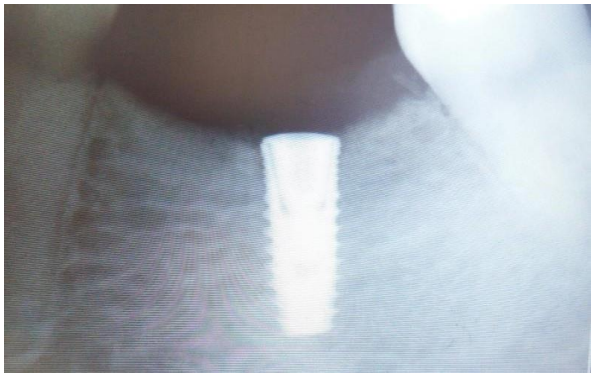

Fig 13: Radiographic verification of implant placement

Fig 14: Patient Frontal and lateral view

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 deices 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

1. Bidra AS. Surgical and prosthodontic consequences of inadequate treatment planning for fixed implant-supported prosthesis in the edentulous mandible, Journal of Oral and Maxillofacial Surgery. 2010; 68(10):2528-2536,
2. Schropp L, Wenzel A, Kostopoulos L, Karring T. Bone healing and soft tissue contour changes following single-tooth extraction: a clinical and radiographic 12-month prospective study, International Journal of Periodontics and Restorative Dentistry. 2003; 23(4):313-323.
3. Dietrich U, Lippold R, Dirmeier T, Behneke N, Wagner W. Statistische Ergebnissezur Implantat prognoseam Beispiel von 2017 IMZ-Implantaten unterschiedlicher Indikation der letzten13Jahre, Zeitschriftf¨urZahn arztliche Implantologie. 1993; 9:9-18.
4. Adell R, Eriksson B, Lekholm U, Br˚anemark PI, Jemt T. Long-term follow-up study of Osseo integrated implants in the treatment of totally edentulous jaws, The International Journal of Oral & Maxillo facial Implants. 1990; 5(4):347-359.
5. Chiapasco M, Romeo E, Vogel G. Vertical distraction osteogenesis of edentulous ridges for improvement of oral implant positioning: a clinical report of preliminary results, International Journal of Oral and Maxillofacial Implants. 2001; 16(1):43-51.
6. Nedir R, Bischof M, Szmukler-Moncler S, Bernard JP, Samson J. Predicting osseointegration by means of implant primary stability: a resonance-frequency analysis study with delayed and immediately loaded ITI SLA implants, Clinical OralImplants Research. 2004; 15(5):520-528.
7. Bassetti MA, Bassetti RG, Bosshardt DD. The alveolar ridge splitting/expansion technique: a systematic review, Clinical Oral Implants Research. 2016; 27(3):310-324.
8. Demetriades N, Park JI, Laskarides C. Alternative bone expansion technique for implant placement in atrophic edentulous maxilla and mandible, Journal of Oral Implantology, 201; 37(4)463-471.
9. Aghaloo TL, Moy PK. Which hard tissue augmentation techniques are the most successful in furnishing bony support for implant placement? Int. J Oral Maxillofac Implants. 2007; 22(l):49-70.
10. Vignoletti F, Matesanz P, Rodrigo D, Figuero E, Martin C, Sanz M. Surgical protocols for ridge preservation after tooth extraction. A systematic review. Clinical Oral Implants Research. 2012; 23:22-38.
11. Tan WL, Wong TL, Wong MC, Lang NP. A systematic review of post-extractional alveolar hard and soft tissue dimensional changes in humans. Clinical oral implants research. 2012; 23:1-21.
12. Anitua E, Alkhraisat MH. Is alveolar ridge split a risk factor for implant survival?. Journal of Oral and Maxillofacial Surgery. 2016; 74(11):2182-91.
13. Cullum D. Review of Ridge Splitting. Journal of Oral and Maxillofacial Surgery. 2008; 66(8):4.
14. Jha N, Choi EH, Kaushik NK, Ryu JJ. Types of devices used in ridge split procedure for alveolar bone expansion: A systematic review. PloS one. 2017; 12(7):e0180342.
15. H. Tatum Jr. Maxillary and sinus implant reconstructions, Dentalclinics of North America, 1986; 30(2):207-229.
16. Simion M, Baldoni M, Zaffe D. Jawbone enlargement using immediate implant placement associated with a split-crest technique and guided tissue regeneration, The International Journal of Periodontics & Restorative Dentistry. 1992; 12(6):462-473,
17. Summers RB. A new concept in maxillary implant surgery: the Osteotome technique, Compendium, 1994; 15(2):152-162.
18. Scipioni A, Bruschi GB, Calesini G. The edentulous ridge expansion technique: Afive-year study, The International Journal of Periodontics & Restorative Dentistry. 1994; 14(5):451-459.
19. Padmanabhan TV, Gupta RK. Comparison of crestal bone loss and implant stability among the implants placed with conventional procedure and using osteotome technique: a clinical study. Journal of Oral Implantology. 2010; 36(6):475-83.
20. Vercellotti T, Nevins ML, Kim DM, Nevins M, Wada K, Schenk RK, Fiorellini JP. Osseous response following resective therapy with piezosurgery. International Journal of Periodontics & Restorative Dentistry, 2005, 25(6).
21. Khairnar MS, Khairnar D, Bakshi K. Modified ridge splitting and bone expansion osteotomy for placement of dental implant in esthetic zone. Contemporary clinical dentistry. 2014; 5(1):110.
22. Anitua E, Begoña L, Orive G. Clinical evaluation of split-crest technique with ultrasonic bone surgery for narrow ridge expansion: status of soft and hard tissues and implant success. Clinical implant dentistry and related research. 2013; 15(2):176-87.
23. Sethi A, Kaus T. Maxillary ridge expansion with simultaneous implant placement: 5-year results of an ongoing clinical study. International Journal of Oral & Maxillofacial Implants. 2000, 15(4).
24. Tolstunov L, Hicke B. Horizontal augmentation through the ridge-split procedure: a predictable surgical modality in implant reconstruction. Journal of Oral Implantology. 2013; 39(1):59-68.