ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 10, Issue, 07(E), pp. 33616-33620, July, 2019

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Case Report

RIGDE EXPANSION TECHNIQUE USING UNIVERSAL DENSAH BUR KIT- A CLINICAL CASE REPORT

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DOI: http://dx.doi.org/10.24327/ijrsr.2019.1007.3708

ARTICLE INFO

Article History:

Received 4th April, 2019
Received in revised form 25th May, 2019
Accepted 23rd June, 2019
Published online 28th July, 2019

Key Words:

Alveolar atrophy, edentulous ridge expansion, ridge expansion techniques, osseodensification.

ABSTRACT

Alveolar atrophy may present an anatomical limitation to the placement of endosseous implant. The ridge expansion technique is used to expand narrow edentulous ridge for implant placement. There are many techniques for ridge expansion. Aim of the present case report is to describe a ridge expansion technique using Densah bur kit technology to allow the implant placement in atrophic mandibular edentulous ridges. The Densah Bur technology is based on biomechanical bone preparation technique called "Osseodensification". Osseo densification does not remove bone tissue, rather bone is simultaneously compacted and auto- grafted in outward (expanding) directions from the osteotomy. This is a case report of a patient with narrow edentulous posterior mandibular ridge with 3-4 mm of remaining bone width which is treated with ridge split technique using Densah Bur Kit that results is osseodensification

INTRODUCTION

In Implant Dentistry alveolar atrophy is major problem that has limited the use of endosseous implant. Following the tooth loss the alveolar ridge undergoes bone resorptionin the vertical, transverse and sagittal plane (L. Schropp *et al* 2003). However, due to bone atrophy, periodontal disease and trauma sequelae, alveolar ridges are more often compromised with horizontal deficiency (A.Tallgren *et al* 2003, D. Knezovi´c-Zlatari´c *et al* 2002, M.G.Ara´ujo, F.Sukekava *et al* 2006)

Among the various techniques, the alveolar ridge split technique was introduced for the expansion of alveolar ridges with a horizontal bone deficit. Alveolar ridge split technique was introduced by Tatum Jr. in 1986 to increase the amount of bone in the maxilla (W. G. H. Engelke *et al* 1997, K. S. Oikarinen *et al* 2003).This technique has proved to be a valid procedure and a 98 % to 100 % survival rate has been reported following the contextual insertion of implants. In addition to being an extremely predictable and reliable procedure, the alveolar ridge split technique is characterized by its low invasiveness (A.Sethi and T.Kaus 2000, M. Chiapasco *et al* 2006)

Traditionally used devices includes chisels and (hand) mallet. Recently, electrical or magnetic mallets have been introduced, which are used in combination with the osteotomes. The osteotome is attached to the hand-piece (mallet), that transmits shock waves to the tip of the instrument, creating longitudinal movements on the bone surface. Crespi *et al*.suggested the use of magnetic mallet instead of hand mallet as it provided more comfort and stability to the operator (Crespi R, *et al* 2014).

The modern devices which are used for ridge expansion include motorized ridge expanders, expansion crest device, and piezoelectric devices, various kits with osseodensification of the bone during surgery. These include non-cutting drills that can facilitate width expansion of atrophic ridges without using a surgical mallet; and they can also be used as condensers of trabecular bone. Use of expansion crest devices for ridge expansion can be considered one of the alternatives to conventional techniques. The main advantage of using these devices is that its ability to distribute expansion forces, which help in preventing bone removal from the buccal cortex, and adequate site preparation can be achieved. The device has been used most successfully in areas having cancellous bone in the edentulous ridge (Crespi R, *et al* 2014, Mazzocco F *et al* 2011, Chiapasco M, Ferrini F *et al* 2006).

Various other surgical widening techniques have been employed and described for restoration of atrophic ridges. These include block grafting, lateral augmentation with or without Guided Bone Regeneration (GBR), onlay grafting and

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alveolar distraction osteogenesis (S. Pelo *et al* 2007, D. Buser *et al* 1993, 1995, T. Takahashi *et al* 2004).

The technique used in this clinical case is Densah bur technology which allowed the preparation of implant site by eliminating the use of a surgical mallet. As surgical mallet is more traumatic more invasive technique. There is minimal invasion, less traumatic and easy method to perform. The Densah bur technology is based on a novel biomechanical called "osseodensification". Unlike traditional dental drilling techniques, osseodensification does not excavate bone tissue. Rather, bone tissue is simultaneously compacted and auto-grafted in outwardly expanding directions from the osteotomy, somewhat akin to a traditional hammered osteotome but without the trauma and other limitations. When a Densah Bur is rotated at high speed in a reversed, non-cutting direction with steady external irrigation, a strong and dense layer of bone tissue is formed along the walls and base of the osteotomy (T. Takahashi *et al* 2004, Densah bur kit manual 2014).

DENSAH BUR KIT

The Densah Bur kit includes 12 burs that are designed to create osteotomies for all major dental implants in the market. Each Densah™ Bur is marked with depth markings from 8-20 mm. They are designed to be used in a consecutive increasing order to achieve the desired osteotomy diameter. (Figure 1)

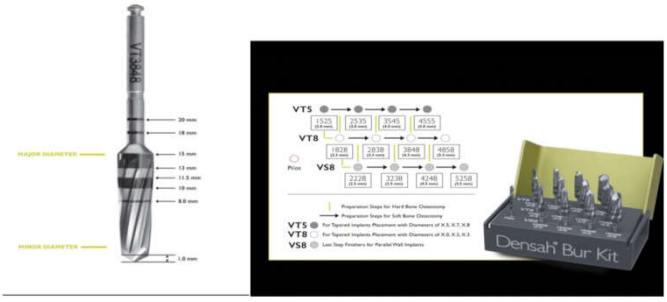

Figure 1 Markings of Densah bur

Densah Burs are designed to be used for osseodensification in small increments (alternate between VT5 and VT8) in dense bone to allow gentle expansion of the osteotomy. In cancellous bone, the final osteotomy drill diameter should be prepared with Densah™ Bur with an average diameter that measure about 0.5-0.8 mm smaller than the implant average diameter. In cortical bone, the osteotomy final preparation diameter should be prepared with Densah™ Bur with an average diameter that measures 0.2-0.5 mm smaller than the implant average diameter. (Figure 2)

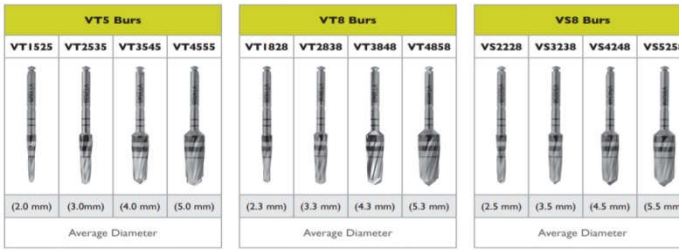

Figure 2 Various Diameter of Densah burs

CASE REPORT

A systemically healthy, 30 years old female patient reported to the Department of Periodontology and Implantology of Bharati Vidyapeeth Dental College and Hospital, Pune, India, with chief complaint of missing teeth in 4th quadant (45, 46, 47, 48). Patient reported that she got these teeth extracted approximately 4 months ago because of pain. Clinical examination and cone beam computed tomography (CBCT) (figure 3 a, 3b, 3c) depicted 3-4 mm of horizontal bone width and adequate vertical height for implant placement. After explaining the treatment plan to the patient and receiving an informed consent from her, treatment was started. Treatment plan included placement of implant (BioHorizon) in 46 region by splitting the ridge with Densah Bur Kit.

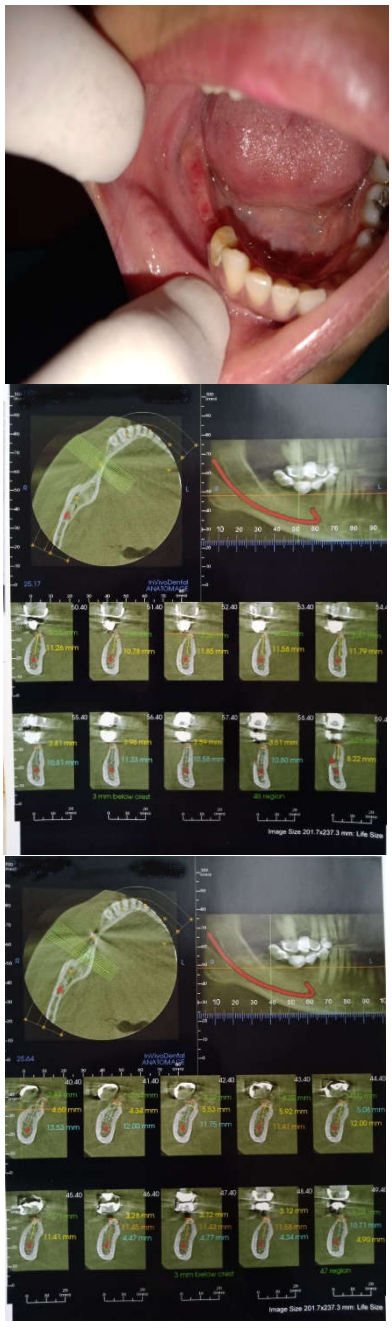

Figure 3 a: Clinical examination, 3b: CBCT of 46 region, 3C: CBCT of 47 region

Surgical Procedure

Under local or general anaesthesia, a crestal incision was performed on the atrophic ridge. This incision was followed by two vertical releasing incisions beyond the muco-gingival line. Then a full thickness muco-periosteal flap was raised, and when the bone surface was exposed the planned osteotomy was outlined with pilot drill. Initial width of the ridge when measured was 3.5 mm.

Initial drill was taken to the desired depth using the pilot drill, depending upon the implant type and diameter (3.5 mm × 10 mm) selected for the site. Beginning with the narrowest Densah Bur (vt1525) which is 2.0mm. Drill motor was changed to reverse - Densifying mode (clockwise drill speed 500-800 rpm with copious irrigation). Bur was then used into the osteotomy till hepatic feedback of the bur (pushing up) out of the osteotomy site was felt. Until reaching the desired depth repeatedly relaxed and reapplied pressure with pumping motion. The bone was slowly expanded to the final diameter as the bur diameter was increased. The torque settings were set to 20-30 Ncm. BioHorizon Implant (diameter of 3.5 × 10 mm) was placed into the osteotomy, using drill motor to tap the implant into place and stopped after reaching the maximum torque. Implant placement was finished to depth with a torque indicating ratchet wrench **(Figure 4).** Interrupted sutures were given. Patient was recalled after 7 days for suture removal and patient was re-evaluated for any post-operative complications.

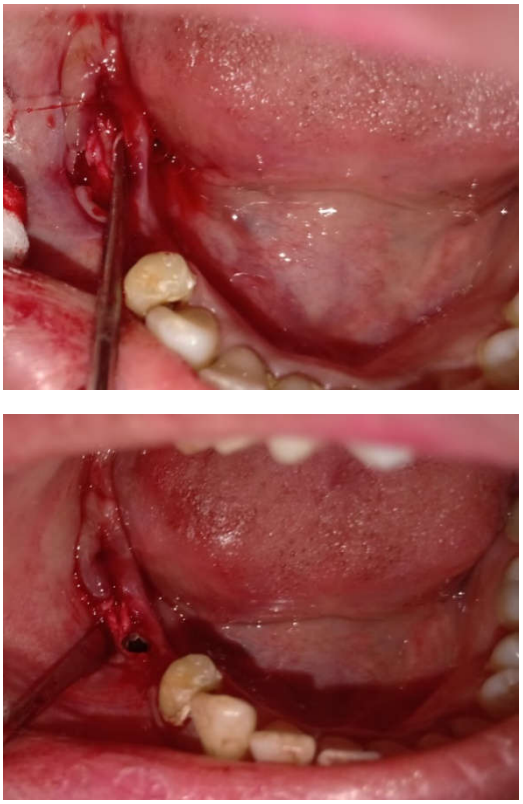

Figure 4 Surgical procedure of ridge split and implant placement

DISCUSSION

Alveolar ridge split technique is used for bone expansion in the treatment of atrophic ridges having horizontal deficits. This technique involves inserting implants simultaneously with ridge split or it can be done in two steps. Alveolar ridge split technique with simultaneous implant placement is carried out usually, to shorten the total treatment time and to eliminate second surgical procedure morbidity. However, there is a higher risk of malfracture of the osteotomized bone segments, especially in the mandible, a lack of initial stability for the implants, and a compromised implant placement in the bucco-lingual and apico-coronal direction. Advantages of the staged alveolar ridge split technique includes- 1. The ability to insert an interpositional graft, 2. To reduce the risk of uncontrolled fractures in vestibular cortex, 3. To evaluate the bone augmentation obtained during the second phase of surgery, 4. Improved stability and osseointegration of the implants. Disadvantages are the increased morbidity, duration and the cost of the therapy (D.S.Sohn *et al* 2010).

Alveolar ridge splitting is classically performed by means of chisel and hammer, rotary burs, diamond disk, reciprocal saw, or piezoelectric device. Use of bone chisels is time consuming procedure and it requires technical skills and a long learning curve. The alveolar ridge split technique performed with burs or rotating saw is more rapid, but soft tissues and delicate anatomical structures can be damaged; close access to adjacent teeth can be difficult, and there is a high risk of losing control over the cutting device (C. Blus and S. Szmukler-Moncler 2006).

Patient has to be carefully selected before carrying out aveolar ridge split technique. Good oral hygiene is crucial for the success of the surgery and the prosthetic rehabilitation (G. W. Coatoam *et al* 2003). A smoker should be considered as a failure risk, as, five years after loading, smokers experienced twice as many implant failures compared with nonsmokers (R.Cavalcanti *et al* 2011) Another fundamental and specific requirement for the alveolar ridge split technique is considered the presence of cancellous bone between the two cortices which ensures a good blood supply (C. M. Misch 2004).This technique is easier to carry out on the upper jaw due to its higher content of cancellous bone and its greater elasticity compared to the mandible. For these reasons, the use of the alveolar ridge split technique requires aminimum bone thickness of 3mm to 4mm. Anatomical requirements are- 1. A minimal vertical bone height and 2. No concavity in alveolar bone profile. Finally the horizontal osteotomies have to end at least 1mm before the neighboring teeth (O.T. Jensen *et al* 2009).

The Densah Bur technology for ridge split is based on a novel biomechanical bone preparation technique which is called “osseodensification.” Unlike traditional dental drilling techniques, osseodensification does not excavate bone tissue. Rather, bone tissue is simultaneously compacted and auto-grafted in outwardly expanding directions from the osteotomy, somewhat akin to a traditional hammered osteotome but without the trauma and other limitations. When a Densah Buris rotated at high speed in a reversed, non-cutting direction with steady external irrigation, a strong and dense layer of bone tissue is formed along the walls and base of the osteotomy. Dense compacted bone tissue produces stronger base for any dental implant and may facilitate faster healing. A biomechanical and histological validation study of

osseodensification done by using Densah Bur was performed by the Experimental Biomechanics Laboratory at Lawrence Technological University in Southfield, Michigan, in 2013-2014 which concluded that, in porcine tibia, osseodensification increased primary stability and created a densification crust around the preparation site by compacting and autografting bone along the entire depth of the hole (Eric G. Meyer *et al* 2014).

The Densah Bur kit has unique characterstics for which it can be used for ridge split technique. Regular twist drills or straight fluted drills have 2-4 lands to guide them through the osteotomy. Densah™ Burs are designed with 4 or more lands, which precisely guide them through bone. More lands means less potential chatter. During osseodensification, Densah Burs produce a controlled bone plastic deformation, which allows the expansion of a cylindrical osteotomy without excavating any bone tissue (Eric G. Meyer *et al* 2014).

CONCLUSION

There are many methods for ridge augmentation for implant placement with ridge width of>3.5 mm. The most important factor that determine the success of ridge split cases is careful patient selection and bone evaluation. Generally, the site heals by filling the gap with blood clot that organizes over a period and is replaced with woven bone and later by load bearing lamellar bone at the interphase. Thus, to satisfy the ideal goals of implant dentistry augmentation of deficient alveolar ridges is an important aspect of dental implant therapy with the end goal to provide functional restoration in harmony with the adjacent natural dentition.

The single phase split ridge technique is a beneficial bone augmentation technique as it shortens the waiting period for consolidation of bone, preceding placement of an implant. A 5year cumulative study carried out by several authors has reported a vivid success rate between 85%-99% forinterposition augmentation. In addition, Densah Bur Technology was employed for ridge splitting for its precision,reduced bleeding, enhanced healing, ease of creating an osteotome site and preserving the bone that acts as a autogenous graft. This justifies the use of Densah Bur Kit Technology as an newer technology for ridge splitting with ossedensitification in patients with reduced alveolar width for implant placement. To elucidate further, the efficacy of Densah Bur kit technology for ridge split and osseodensification, further studies with larger sample size are needed.

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How to cite this article:

Pramod Waghmare and Vivek Singh Tanwar.2019, Rigde Expansion Technique Using Universal Densah Bur Kit- A Clinical Case Report. *Int J Recent Sci Res.* 10(07), pp. 33616-33620. DOI: http://dx.doi.org/10.24327/ijrsr.2019.1007.3708

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