OSSEODENSIFICATION- A REVIEW

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Abstract: A dental implant's primary stability is crucial for osseointegration to be successful. Among the most frequent elements that influence primary stability are surgical technique and bone quality. In order to attain primary stability, it is also essential to achieve high-insertion torque. In order to achieve the requisite bone-to-implant contact and acquire a biomechanically stable implant, maintaining adequate bone bulk and density is crucial. Osseodensification, a novel osteotomy concept, has been at the forefront of advancements in surgical site preparation in implantology. To aid in improved osteotomy preparation, bone densification, and indirect sinus lift as well as achieving bone expansion at various sites with variable bone densities, this relatively novel concept with universally compatible drills has been developed.

INTRODUCTION

The subject of oral rehabilitation has been completely transformed by dental implants. Endosseous implants can now be used reliably and predictably to replace missing teeth in the oral cavity, with a success rate of over 90% over the past ten years. The ability of the bone to remodel at the bone-implant contact is necessary for dental implants to survive.[1]

Osseointegration, which is regarded as a need for implant loading[2], is the direct structural and functional connection between living bone and the titanium implant surface.[3]

The absence of movement at the surgery time that is obtained by the friction between the implant and the bone walls is called primary stability, and the biologic stability achieved through the osseointegration process is called secondary stability[4]

The Osseodensification drilling protocol is a new-generation technique able to increase the primary stability in poor-density bone. This procedure had been proposed to increase the quality of the osteotomy, densification of the bone site, indirect sinus augmentation, and bone expansion.[4]

RATIONALAE

The concept of improving the quality/quantity of bone around the implant to increase its stability has been previously explored and mainly focused on achieving improved initial stability in sites where sinus elevation is necessary, The osteotome technique compresses the surrounding bone by gradual expansion using the hand driven devices leading to enhanced insertion torque values that is often perceived by clinicians as an indication of improved primary stability.[1]

The osseodensification drilling technique presented different Outcomes. While interfacial remodeling was observed where primary engagement existed between the bone cortical shell and both implant types regardless of surgical instrumentation, no negative bone response features such as extensive micro-cracks and extensive remodeling left large void spaces between implant and native bone that could potentially compromise the system biomechanical competence was observed, regardless of implant type and surgical instrumentation employed.[10]

BIOMECHANICS

Unlike traditional drills, this drill design creates an environment which increases the primary stability by means of non-subtractive drilling. Densifying burs combine the advantages of

osteotomies with the speed and tactile control of the drills during osteotomy.The osseodensification technique generates a layer of condensed autograft surrounding the implant along the surface of the osteotomy making it valuable in clinical settings where there is an anatomic paucity of bone. The logic behind osseodensification concept is that compacted, autologous bone immediately in contact with an endosteal device will not only have higher degrees of primary stability due to physical interlocking between the bone and the device but also facilitate osseointegration due to osteoblasts nucleating on instrumented bone near the implant[5]

A conically tapered body with a maximum diameter adjacent to the shank and minimum diameter adjacent to the apical end. This taper design controls the expansion process, as the bur enters deeper into the osteotomy. [7] The apical end includes at least one tip to grind bone when rotated in the counterclockwise/non-cutting/burnishing direction and cut bone when rotated in the clockwise/ cutting/ drilling direction. [18] Helical flutes and interposed lands are disposed about the body. Each flute has a burnishing face and an opposing cutting face. The burnishing face burnishes bone when rotated in the burnishing direction and the cutting face cuts bone when turned in the cutting direction[12].

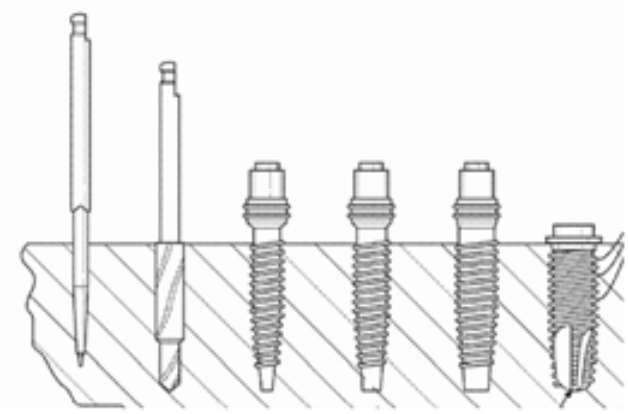
When forcedly advanced into an osteotomy while continuously rotating in a burnishing direction, at least one of the tip and the lands is designed to produce an opposing axial reaction force. Due to the push-back phenomenon created, the user has improved control over the expansion process.[13]

With a conventional surgical engine, densifying burs can be used to densify bone by revolving at 800-1200 rpm in an anticlockwise, non-cutting/burnishing direction (Densifying mode), or in a clockwise, cutting direction (Cutting mode), acting as a drill to cleanly cut the bone if necessary.[14]

BACK GROUND OF THE INVENTION

More recently, a technique has been developed that allows the atraumatic preparation ofimplant sites by eliminating the use of a Surgical mallet. This procedure is based on the use of a ridge expansion system that includes a bur kit and instruments known as motor-driven bone expanders, such as those marketed by Meisinger split control bone management system (Neuss, Germany).[8]

First a pilot hole is drilled at the implant site, then a series of progressively larger expander screw-taps are introduced into the bone by hand or with motor-driven rotation, which decreases Surgical trauma (as compared with hammer taps) while providing Superior control over the expansion site.[8]SeeforexampleFIG.1.



Thus, even though a Surgical motor may be used to drive the expander tap, there is a veryreal possibility that the surgeon will introduce some tilt or wobble inadvertently as theexpandertapisadvanced(orwithdrawn)thusdistortingtheintendedshapeoftheosteotomyor even worseprovokingalateral fracturein thebone.[8]

This inexorable linking of tool rotation rate to bone expansion rate in all prior art rotaryexpander Systems limits Surgical control over the implant process, and in Some cases mayleadto unnecessarypatient discomfort.

INDICATION

- Ridgewith < 3 mm of width
- Poorbone density
- Excessiveboneresorption.
- Posteriormaxilla.
- Inmaxillarysinus, itenhancesexpansion of

verticalridge.[9]

CONTRAINDICATIONS

- Corticalbone
- Xenografts
- Compromisedimmunesystem
- Bleedingdisorders
- Titaniumallergy.[9]

ADVANTAGES

- Undersized implant site preparationand the use of osteotomes to condense boneare surgical techniques proposed to increase primary implant stability and poor densitybone.
- Narrow ridges are shown to expand in width along with Osseodensification thus facilitating forplacement of large diameter implants and avoiding of fenestration and dehiscencedefect

FI www.versah.com)

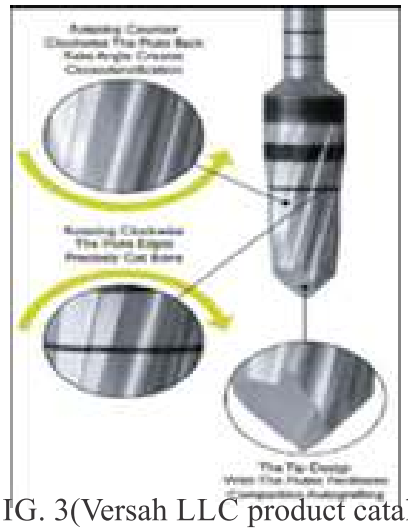


FIG. 3(Versah LLC product catalogue, www.versah.com)

This specially designed bur is termed as Densah bur. Densah burs have more than four lands and a large negative rake angle, work in non-cutting mode, and tapered shank(FIG.3), they enter deeper in the bone they expand the osteotomy.

It creates a layer of compacted bone along the periphery and apex of the implant surface. Bouncing motion of the bur which moves in and out of the osteotomy in counter-clockwise has 800to 1200 rpm.[9]

COMPARISON OFOSSEODENSIFICATION vs CONVENTIONALDRILL

i) REGARDING BONE DENSITY

Poor density bone is commonly seen in the posterior jaw, especially in elderly patients which represents a high percentage of implant treatment seekers. Implant primary stability can be influenced by cortical bone thickness, quality and quantity of trabecular bone and implant geometry, and implant surface roughness. Consequently, satisfactory primary stability in low-density bone is difficult to reach and higher rates of implant failure are usually observed in those cases. Hence, machined implants when combined with osseodensification may experience at least similar osseointegration success rates of textured implants in low bone density.[15]

ii) Regarding primary stability

The osseodensification strategy enhances primary stability by raising the density of the osteotomy site walls by non-subtractive drilling, unlike conventional technique.[16]

The osseodensification technique provided better primary stability in the low-density bone cases thus, it can be considered as a trustworthy treatment for speeding up the healing processwhile also maintaining marginal bone integrity following loading by using a specialized bur.[17]

iii) Regarding to crestal bone loss

Osseodensification showed enhancement of bone density by the novel Densah bur that works safely in low-density bone and decreases the possibility of creating bone dehiscence.osseodensification technique is a reliable method to enhance rapid healing and

maintain the marginal bone integrity after load.[18]

CONCLUSION:

Osseodensification is a specialized procedure for osteotomy preparation that is inherently bone preserving. Unlike conventional osteotomy, it uses specialized high-speed densifying burst o prepare osteotomy and autograft bone in the phase of plastic deformation.

This results in an expanded osteotomy with preserved and dense compacted bone tissue that helps maintain ridge integrity and allows implant placement with superior stability.[19]

Use of versah drills in osseodensification led to the formation of undersized osteotomy when compared to conventional drills. It helped to improve the bone density and also increased the percent of Bone volume and increased bone-to-implant contact, thereby improving implant stability.

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