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Review Article

Osseodensification- A review

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ABSTRACT

Osseointegration is a significant component which adds to the drawn out progress of dental inserts. Many variables, including careful strategies, bone amount and quality are major areas of strength for a for accomplishing essential dependability. Furthermore, this essential steadiness is viewed as a essential for laying out great osseointegration. Osseodensification (OD), an as of late evolved fascinating procedure improves the bone thickness around dental embeds and increments essential security. Many investigations have been completed on the viability of this new careful strategy.

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1. Introduction

Osseointegration is defined as a direct structural and functional process connection between ordered living bone and the surface of a filler wearing an implant Osseointegration is crucial for the stability of the implant which determines the long-term success of dental implants. Albrektsson T et al mentioned six main parameters such as implant material, implant surface, implant design, host factors, surgical implant technical and biomechanical factors that play a major role in achieving osseointegration.[1]

Standard drill models used in osteotomies are designed to do this hollow out the bone to make room for implant placement. Remove them however, they generally do not effectively produce away from the bone Precise circumferential osteotomy. In contrast to conventional bone drilling Technologies, OD does not excavate bone tissue. OD is a no Extraction technique developed by Huwais S.[2,3] He is Manufactured with specially designed burs to increase bone density Expand the osteotomy site. The main concept of the OD technique is that the fountain design creates an environment that enhances that initial primary stability through compression of the osteotomy site bone autograft walls.

2. Osseodensification Concept

An osteotomy preparation procedure is recognized as Osseodensification which is a novel, biomechanical, nonexcavation. He also developed specially designed densifying burs known as Densah burs (by Versah LLC-The osseodensification company). This drill increases the primary stability via non-subtractive drilling unlike traditional drills.[4] Densifying burs have the advantage during osteotomy to control the tactile and speed of drills. OD process produces a layer of autograft around the implant with an osteotomy surface. The reason behind OD conception is that autologous bone contacts through an endosteal device accelerate osseointegration because of osteoblasts nucleating on instrumented bone adjacent to the implant and have increased primary stability because of interlocking between the device and bone.[5]

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2.1. Features of densifying burs

1. While the bur goes downwards in the osteotomy site this design controls the expansion process because of its conical tapered body.
2. When rotated in a non-cutting/burnishing/counterclockwise direction, the apical end should incorporate at minimum 1 lip to grate bone and when turned in the cutting/drilling/clockwise direction it cuts the bone.
3. Each helical flute comprises a burnishing and cutting face. When rotated in the burnishing direction it burnishes bone and when turned in the cutting direction cuts the bone.
4. Minimum 1 lip and the lands are designed to produce an opposing axial response when constantly rotated in a burnishing direction to generate a push-back phenomenon, which produces expansion.[6]

Primary stability is achieved when there are no micromovements of the implant in its fully seated position. The implant makes this possible to secondarily interlock mechanically with bone tissue stability is achieved. The stabilization of the implant is a very important factor to consider Formation of fibrous tissue around the implant. some factors that Bone density, implant design, Insertion torque (IT) and surgical technique. due to an operation trauma, 1 mm bone around the implant body is devital, resorbed and remodeled in the initial phase of osseointegration, this reduces the primary stability. Later, the bone begins to form around the implant body, increasing the BIC. This organic product Implant stability, referred to as secondary stability, results in osseointegrated implant.[7]

Primary implant stability has been considered as an indicator for future osseointegration, hence the key to long term clinical success. Primary implant stability at the time of placement is often analysed by judging the presence of any mobility of implant. The primary stability on chair side can be evaluated by mobility using a blunt instrument such as a mirror handle and during follow-up visits, it can be estimated by devices such as periotest, periometer, Resonance Frequency Analysis (RFA), and placement torque.[8,9]

2.2. Bur design and technology

1. The Densah burs cut the bone in a clockwise manner and densify the same in a non-cutting anticlockwise manner along with copious irrigation during the surgical procedure.
2. The design incorporates helicalflutes separated by lands, each having a burnishing face and an opposing cutting face withina taperedgeometry.[10]
3. This ensures lesser heat productionand a faster feed rate. Bone condensation is obtained by noncutting action of the lands with a negative rake angle and cutting is obtained by chisel edge.
4. The expansion of the osteotomy site is obtained by a tapered shank (maximum diameter adjacent to the shank and minimum diameter adjacent to the apical end). This feature allows the operator to lift away from contact instantly to allow for irrigation.[11]
5. The bur producesan outward pressure that creates a hydrodynamic compression wave when combined with irrigation at the point of contact. This drives the bone chips and debris into the implant bed rather than removing it.[12–14]

2.3. Bone density and Osseodensification

Secondary stability of bone and dental implant by the process of osseointegration is vital for the success of implant placement.

The maxillary posterior region with low bone density affects histomorphometric parameters such as the percentage of bone-implant contact and bone volume, however, the increase of bone density by osseodensification has improved the negative effect thereby having a potentiating effect on secondary stability.

2.4. Stability and ossedensification

The implant primary stability is a crucial factor to achieve implant osseointegration.[15] High primary implant stability is critical in immediate loading protocols, and it was reported that an implant micromotion above 50–100 um potentiated peri-implant bone resorption or implant failures. Li et al.[16] reported in a review no significant difference in crestal bone resorption and failure rate for inserted implants low insertion torque values. They also demonstrated the ability of OD Bits to increase %BV and % BIC for dental implants placed in low-density bone compared to traditional osteotomies that can help improvement of osseointegration.[17,18]

2.5. Convetional osteotomy and osseodensification

The biomechanical capabilities of implants are influenced by several factors factors such as the macro/micro geometry of the implant, Nanosurface Modifications and Osteotomy Techniques.[19,20] Standard drills used at the implant site osteotomy Hollow out the bone to facilitate implant placement. They produce effective bone cutting, but lack design. Ability to create a precise circumferential osteotomy. Consequently, the osteotomies are elongated and elliptical due to inaccurate cutting of the holes. This leads to a reduced torque during implant placement, resulting in low primary stability and adds to the potential due to the non-integration of the implant.

Undersizing the implant bed preparation and using the bone condensation osteotomes[21,22] are among them recommended surgical methods to increase primary stability

of Implants and % BIC in low-density bone. Comments were also made of different models of healing and Peri-implant bone remodeling models.[23,24] The alternative implant drilling procedure in the posterior region of the upper jaw the osteotome technique[25] aimed at densifying the bone with the mechanical action of cylindrical instruments along the OD osteotomy diameters were less than conventional osteotomies prepared with the same drills due to the elastic nature and elastic tension of bone increases the proportion of available bone at the implant site about three times.

2.6. Indications

1. It facilitates lateral ridge expansion- Ridge with < 3 mm of width.
2. In maxillary sinus, it enhances expansion of vertical ridge.

2.7. Contraindications

1. Patients with various systemic disorders such as compromised immune system, bleeding disorders and titanium allergy should be excluded.

2.8. Advantages

1. Increase in bone mineral density.
2. During osteotomy preparation it condense and preserve bone through autografting compaction.
3. Autografting of bony particles, creating a smoother OD hole.
4. Primary stability, bone density and BIC are increases.

3. Limitations

1. OD doesn't work as cortical bone lacks plasticity.
2. Prevent the densification of xenografts.

4. Conclusion

Patients demand for a shorter and a faster final treatment. With the introduction of specially designed burs, making OD possible, not only reduces treatment time but, also gives a successful implant outcome. Modern dentistry focuses on techniques that ensure maximum durability and aesthetics as well as preserves as much viable tissue as possible. In the osseodensification the Densah burs guarantees an advantage over traditional osteotomy in no uncertain terms atleast in theory. But, it is a relatively new concept and the biological implications on a long term basis are yet to be evaluated by longitudinal studies.

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6. Conflict of Interest

None declared.

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