

Osseodensification – A Novel Technique of Osteotomy Preparation

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Abstract

Osseodensification, a novel osteotomy concept, is at the top of advancements in operative preparation of the implant site. To aid in improved implant surgical site, bone mass, and indirect sinus lift as well as achieving bone expansion at various sites with variable bone densities, this novel concept with globally compatible drills has been developed. In comparison to traditional implant drills, this approach has shown improvement in attaining superior osteotomy and implant primary stability. Ultimately, the prosthesis that has been installed in the patient is stable and physiologically reliable; perform a key contribution to the implant's longevity. As a result, numerous adjustments, reinforcements, and approaches have been proposed over time to improve the original. The non-subtracting osteotomy performed with a custom Densah burs is the most recent in the series.

Keywords: Density, Osseodensification, Osteotomy, Primary stability.

INTRODUCTION

Osteointegration refers to the literal structural and physiological interaction among well-structured native bone and the surface of implants. It is important for implant sustainability, which impacts dental implants long-term success.^[1]

By mechanically engaging the exterior implant layer with the wall of the osteotomy, primary stability is obtained. It is challenging to attain good basic stability in minimal volume bone. This was done either by inaccurately prepping the area or using an osteotome to crush and condense the bone. However, each of these approaches has drawbacks of its own. Removing bone is a part of conventional subtractive implant site preparation techniques and preparing the implant bed with drills of progressively bigger diameters revolving anticlockwise while being heavily irrigated.^[2]

A cutting-edge method for getting biomechanical bone ready for dental implants is called osseodensification (OD). When compared to standard osteotomies, by compacting the bone, OD protects the living bone tissue and building the working site by autografting small pieces of bone in an outside motion.^[3]

REVIEW ARTICLE

The theory of OD

Osseodensification is a renowned, distinctive and non-excavation method of osteotomy preparation. He also produced

the Densah burs, which are OD tools (produced by Versah LLC). In contrast to traditional drills, this form of drill reinforces the primary stability through non-subtractive drilling.^[4] Controlling drill speed and sensations during osteotomy are a benefit of non-subtractive drilling densifying burs. A layer of autograft that covers an osteotomy surface is created around the implant by the OD procedure. OD is based on the theory that endogenous bone interacts with endosteal implants to strengthen primary stability by contacting the implant surface and bone.

Osteoblasts form on examined bone adjacent to the implant, which promotes osseointegration.^[5]

Characteristics of densifying burs

1. The conical tapering body of this pattern regulates the expansion procedure while the bur descends into the osteotomy region
2. When operated in the non-cutting/burnishing/counter clockwise path, the apex end should have at least one lip that grabs bone; on the other hand, it should drill bone when turned inversely

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3. Each helical flute has a cutting edge as well as a burnishing face. It slices bone when pointed in the course of cutting and burnishes bone when pointed in the direction of burnishing
4. The lands and at least one lip are made to produce an opposing axial response when spun continuously in a burnishing direction to create a push-back phenomena, that results in enlargement of the site.^[6]

When the implant is entirely lodged and there are not minor movements, primary stability has been attained. This is made feasible by the implant, which mechanically interlocks with bone tissue to achieve stability. Fibrous connective tissue formation surrounding the implant is a very essential consideration for implant stabilization. Among the contributing aspects are surgical methods, insertion torque (IT), implant architecture, and bone mass. Osseodensification is a renowned, distinctive and non-excitation method of osteotomy preparation. One millimeter of bone gets eliminated, reabsorbed, and reconstructed around the implant surface as a result of an operation trauma, which lowers the initial stability. Later, the BIC rises when the bone starts to grow around the implant surface. As a result of this organic product's secondary stability, the implant becomes osseointegrated.^[7]

Primary implant stability is essential for future therapeutic success, which has been viewed as a predictor of osseointegration in the future. The prevalence of any implant movement at the moment of implantation is frequently used to examine primary implant stability. A mirror handle or other blunt object can be used to evaluate the primary stability during implant placement. During subsequent visits, instruments such as the periotest, periometer, RFA, and IT can be employed to estimate the stability.^[8,9]

Bur design and technology

- I. During the surgical operation, the bone has been removed in a clockwise by Densah drills
- II. Direction and densified by counterclockwise direction without cutting
- III. The design uses helical flutes with opposing cutting faces and burnishing faces that are separated by lands and have a tapered shape.^[10]
- IV. This guarantees a faster feed rate and reduced heat production. Bone condensation is produced by the negative rake angle lands acting without cutting, and cutting is produced through the chisel edge
- V. A tapered shank is used to achieve the qualities that allow the user to immediately raise away from touch and enable irrigation.^[11]
- VI. When irrigation is used at the point of contact, the drills create an outward pressure that results in a hydrodynamic compression wave. Instead of eliminating the bone fragments and debris, this forces them into the implant bed.^[12-14]

OD and bone density

For the implantation of dental implants to be successful, secondary stability of the two bones and implant must

be achieved through the osseointegration process. Low bone density in the maxillary posterior region impacts histomorphometric metrics such as the proportion among the bone implant interface and the bone mass although, OD improvement in the negative effect has had a impactful effect on secondary stability.

OD and stability

The main stability of an implant is crucial for achieving implant bone marrow integration.^[4] Immediate-loading procedures require strong basic implant stability, while it has been discovered implant micromovement beyond 50–100 µm which can hasten implant disintegration or surrounding bone loss.^[15] It was found that there was not any discernible variation in the rate of failure for implants with low IT and crestal bone resorption. The capacity of OD bits to raise bone volume and bone implant contact for dental implants implanted in bone of poor volume was also established, as opposed to conventional osteotomies, which can aid in improving osseointegration.^[16,17]

Conventional OD and osteotomy

The dynamic properties of implants have been affected by osteotomies and nanosurface modifications, macro- and microgeometry of implant.^[18,19] Basic drills used at implant site to make it easier to insert an implant, hollow out the bone. They cut bones well, but their design is poor. In the early stages of osseointegration, one millimeter of bone gets eliminated, resorbed and reconstructed around the implant surface as a trauma which lowers the initial stability of implant. Because the holes were incorrectly made, the osteotomies are extended and elliptical as a result. This results in less torque being applied during implant insertion, which lowers primary stability and increases the risk of implant non-integration.

Under sizing the implant size creation bone condensation and osteotomes are two approved surgical approaches for improving low density bone implant contact and initial stability of implant.^[10,20]

In addition, remarks regarding various frameworks of peri-implant bone regeneration and repair were made.^[21,22]

The osteotome technique,^[23] a novel implant inserting process at the rear portion of the maxillary area, concentrating bone with the rotary motion of cylinder-shaped devices along the OD osteotomies was diminutive than traditional implant sites due to the elastic characteristics of bone created with the same impact. This increased the volume of readily accessible bone at the implant site by 3 times.

Indication

- I. It makes ridges with a width of >3 mm expand laterally
- II. It makes the maxillary sinus' vertical ridge's expansion easier.

Contraindication

- I. It is best to exclude patients who have a variety of systemic conditions, such as a weakened immune system, bleeding issues, or a titanium allergy.

Advantage

- I. Bone mineral density has risen
- II. It compacts and preserves bone by autograft compaction during osteotomy preparation
- III. Bony fragments are autografted, resulting in a smoother OD hole
- IV. Contact of bone and implant, basic stability, and bone volume are all increased.

Limitations

- I. OD is ineffective because cortical bone is not pliable
- II. Prevent xenograft densification.

CONCLUSION

Since the majority of these investigations are not clinical, it may be concluded that OD is a successful strategy for improving the main stability of implants in a model of low-density bone. However, estimation over time of clinical outcomes may not be decided until more information is known.

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