# IMPROVING BONE DENSITY BY USING VERSAH BURS IN ORAL IMPLANTOLOGY

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***ABSTRACT***

**The aim of the study** is to demonstrate the change in bone tissue density by using osteocondensation burs. An important factor that influences the long-term prognosis of the dental implant is the bone density; therefore, any method of optimizing the bone tissue is important for achieving the primary stability of the dental implant.The basis for osseointegration, leading to permanent, functional and interactive, coexistence between titanium and bone, is established when a topographically harmonious and precise recipient site – geometrically adjusted to the anatomy of the fixture – is gently prepared in bone.For these reasons, any way to optimize the density of the bone tissue is important from the point of view of achieving the primary stability of the dental implant.The working hypothesis of this study is that the use of osteocondensation burs can improve the quality of bone tissue in terms of density.
**Material and method.** The study was carried out on a group of 20 patients in whom Medical System Implants (MSI) dental implants were inserted as follows: 10 patients in whom MSI dental implants were inserted using the kit of this implant system and 10 patients in whom MSI dental implants were inserted using the osteocondensation kit. **Results.**. In 7 of the 10 patients in whom osteocondensation burs were used, the density of the bone tissue changed from D5-D4 (4 patients), D4-D3 (3 patients). **Conclusions**.Within the limits of the studied group, it can be seen that this method comes before the clinician in the conditions where the patient has a large amount of cancellous bone tissue. The use of these burs prevents peri-implant type complications by optimizing osseointegration.

**Keywords**:bone density, Versah burs, MSI dental implant

## INTRODUCTION

The elective method for the rehabilitation of patients with partial or total edentulism is the endosseous dental implant. The silver lining of this is the ossointegration of dental implants that consists in stability and so the direct result is the long-term survival.The primary stabilty of the dental implant is the most crucial aspect for clinical success.[1,2,3]

The term osseointegration is closely related to the name of Per Ingvar Branemark; the studies he carried out on this topic started with the doctoral research on bone microcirculation and continued with the study and finally the elucidation of the mechanisms of osseointegration.

The initial concept of osseointegration stemmed from vital microscopic studies of the bone marrow of the rabbit fibula, which was uncovered for visual inspection in a modified intravital microscope at high resolution in accordance with a very gentle surgical preparation technique. With special instrumentation, the marrow could be studied in transillumination in vivo, and in situ, after the covering bone was ground down to a thickness of only 10–20 μm. Circulation was maintained in this thin layer of bone and with very few signs of microvascular damage, which is the earliest and most sensitive indication of tissue injury. These intravascular studies of bone marrow circulation also revealed the intimate circulatory connection among marrow, bone, and joint tissue compartments. Subsequent studies of the regeneration of bone and marrow emphasized the close functional connection between marrow and bone in the repair of bone defects [4,5].

Later, he selected titanium as the material for making the dental implant, imagining at the same time the geometry of the dental implant, as it is still used today with variations specific to each implant system. The first experiment with this type of implant was performed by inserting it on the tibia of a rabbit and he noticed that the circulation in the bone tissue is restored around the implant. In 1969, the term osseointegration was used for the first time as the structural and functional connection of the bone tissue at the level of the dental implant. [4,5,6]

The basis for osseointegration, leading to permanent, functional and interactive, coexistence between titanium and bone, is established when a topographically harmonious and precise recipient site – geometrically adjusted to the anatomy of the fixture – is gently prepared in bone.

Branemark defined osseointegration as “A direct connection between living bone and a load-carrying endosseous implant at the light microscopic level.”

A current definition of osseointegration was formulated by Albrekson et all (2017) as a chemical interaction between the bone tissue and the dental implant with the involvement of immune mechanisms [7].

An important factor that influences the long-term prognosis of the dental implant is bone density. The first classification of bone density was made by Leonard Linkow as follows:1-cancellous bone with uniform spaces and cortical with small spaces; 2-bone cortical with spaces and uneven spongy; 3-bone with voluminous spaces in the sponge [8].

Carl Mish's bone density classification is currently used as follows: D1-dense compact bone; D2-dense compact bone surrounding dense trabecular bone; D3-thin porous compact bone covering fine trabecular bone; D4-fine trabecular bone; D5-non-mineralized immature bone [8,9,10]

Given the fact that most specialists in the field appreciate dental implant osseointegration as a multifactorial process, they agree that bone density is an essential parameter in the integration process. [10,11, 12,13,14]. For these reasons, any way to optimize the density of the bone tissue is important from the point of view of achieving the primary stability of the dental implant.

The working hypothesis of this study is that the use of osteocondensation burs can improve the quality of bone tissue in terms of density.

## MATERIAL AND METHODS

The study group was represented by 20 patients in whom MSI (Medical System Implant) dental implants were inserted and who were chosen according to the following selection criteria. The inclusion criteria were the following:

- patients of both sexes in an age range between 16-68 years;
- with a periodontal probing depth of at least 4 mm per quadrant;
- with clinically and radiologically evidenced bone resorption;
- with periodontal bleeding on probing;
- patients who agreed to be included in the study group.

The exclusion criteria were represented by:

- ❖ patients who are undergoing periodontal treatment at the time of evaluation;
- ❖ patients who have undergone periodontal treatment in the last 12 months;
- ❖ patients with systemic/local antibiotic therapy in the last 6 months;
- ❖ systemic diseases, neurological diseases;

- ❖ pregnant/breastfeeding;
- ❖ the impossibility of following the protocol imposed to carry out the study of the study. From the initial group, they were organized into two groups as follows: 10 patients in whom MSI dental implants (Figure 1) were inserted using the kit of this implant system and 10 patients in whom MSI dental implants were inserted using the Densah osteocondensation kit (Figure 2)

Figure.1 MSI dental implant

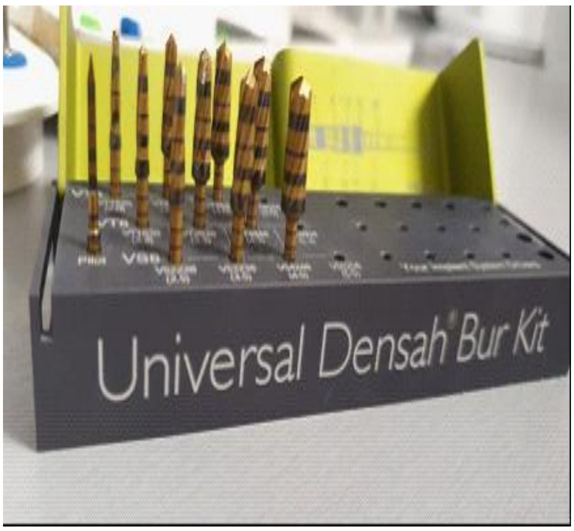


Figure.2 Presentation of the Densah osteocondensation kit,USA

Ethical permission. The study was conducted in accordance with the ethical principles of the Helsinki Declaration; the study was approved by the Bio-Ethics Committee of “Ovidius” University, Constantza, Romania. Written consent of each patients was obtained after the procedure was explained.

**RESULTS**

Since the early days of dental implantology, osteotomies have been prepared using standard drills designed for use in industrial applications. These drill designs have proven to be functional for dental applications; implant success rates have been satisfactory over time but osteotomy preparation techniques have still been lacking for various reasons. Standard drill designs used in dental implantology are made to excavate bone to create room for the implant to be placed. Standard drill designs, in twist or fluted shapes, cut bone effectively but typically do not produce a precise circumferential osteotomy.

Osteotomies may become elongated and elliptical due to chatter of the drills. In these circumstances, the implant insertion torque is reduced, leading to poor primary stability and potential lack of integration. Osteotomies drilled into narrow bone locations may produce dehiscence, buccally or lingually, which also reduces primary stability and will require an additional bone grafting procedure, which adds cost and healing time to treatment. The Densah® Bur technology is based on a novel biomechanical bone preparation technique called “osseodensification” as shown in Figure 3.

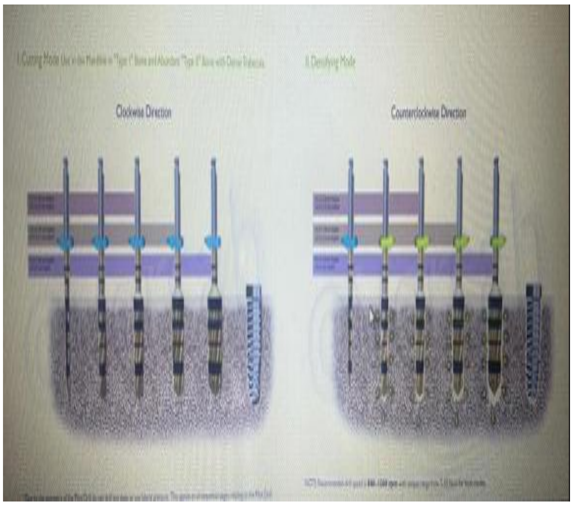

Figure 3. Sequences of Densah osteocondensing burs

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. 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. Dense compacted bone tissue produces stronger purchase for your favorite dental implant and may facilitate faster healing.

Densah® Burs progressively increase in diameter throughout the surgical procedure and are designed to be used with standard surgical engines, to preserve and compact bone
(800-1500 rpm) in a counterclockwise direction (Densifying Mode), and to precisely cut bone if needed (800-1500 rpm) in a clockwise direction (Cutting Mode).
Following the Densah protocol, we used with a lot of irigation in a Bouncing-Pumping motion(vertical pressure to advance the drill into the osteotomy, then a minor pull out for pressure relief, then advance with vertical pressure again and so on in an in/out fashion) and also we underprepared the neoalveolus so that for the insertion of an implant in this case with a diameter of 4 mm, we stopped at the Densah bur with a diameter of 3.5 mm as shown in Figure 4.

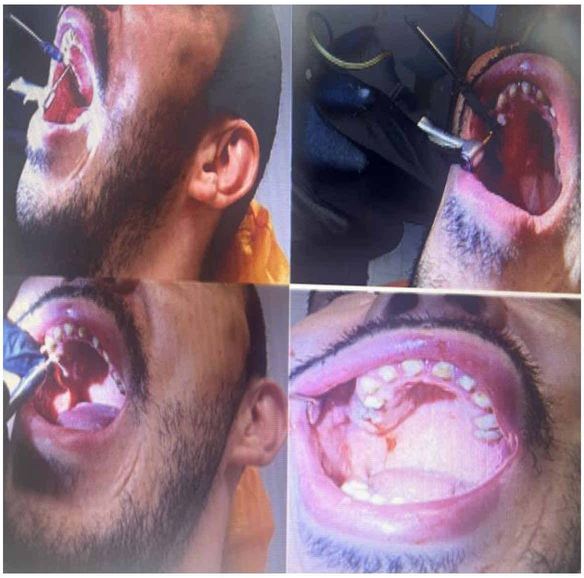

Figure 4.Sequences of MSI dental implant insertions using Densah osteocondensing burs

To demonstrate this process, we present comparative CT images before and after the insertion of dental implants with the conventional surgical kit provided by the MSI system as shown in Figure 4 and 5.

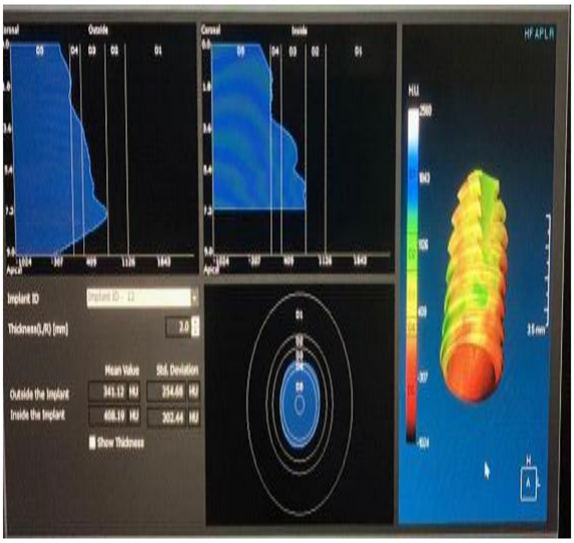

Figure 5. Bone density around an implant to be inserted in the classic way
In this image you can see the average bone density of type D4 around the neck of the dental implant.

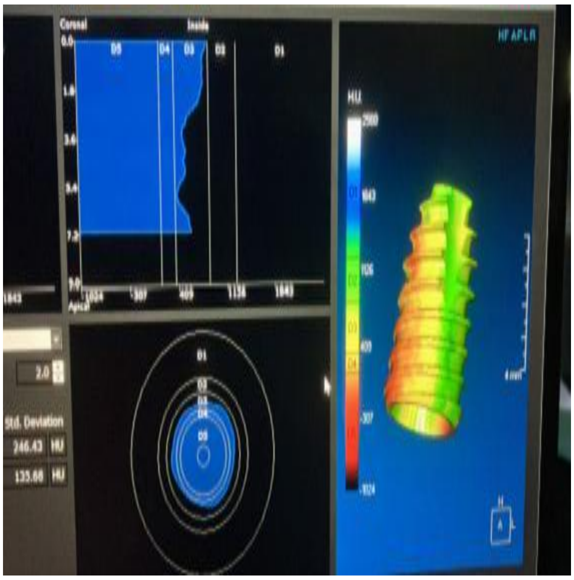

Figure 6. Bone density around an implant to be inserted in the classic way

In this image you can see another dental implant with the average bone density of type D4 around the neck of the dental implant.

In Figure 5 and 6 it can be seen that the bone density did not change significantly, even if we tried to under-prepare the neoalveolus to obtain a better primary stability.

We present comparative CT images before and after the insertion of dental implants with osteocondensation burs as shown in Figure 7 and 8.

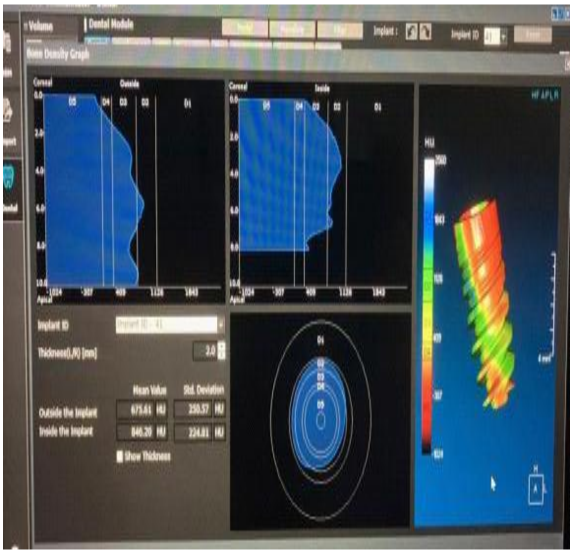

Figure 7. Bone density around an implant to be inserted using osteocondensation burs.

In Figure 7 you can see the average bone density type D3.

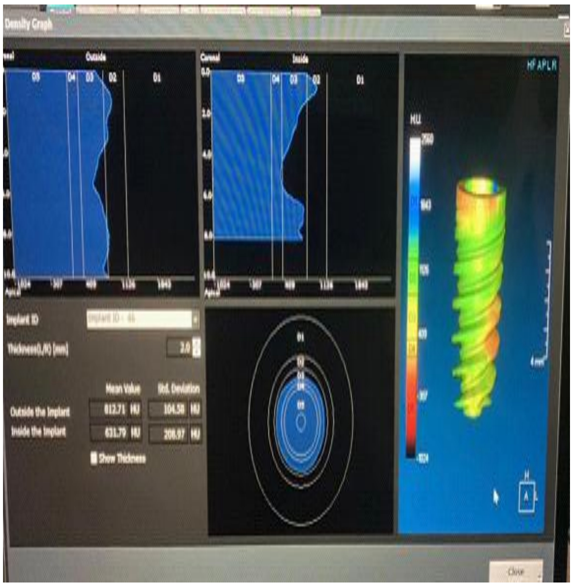

Figure 8. Bone density around an implant that was inserted using osteocondensation burs and a average of D3 bone denisty obtained

## DISCUSSION

Since the specialists in the field agree that primary stability is a decisive factor for the long-term success of the dental implant with all the benefits that this surgical procedure brings to the patient, the interest in accessing the subject is very high [9,13,15].

However, in the specialized literature there are few studies in which ways to optimize bone density as a primary factor of osseointegration are presented [2,3,14].

The present study brings conclusive evidence that supports the use of osteocondensation burs, there being clear differences regarding the density of the bone tissue obtained through them compared to the burs in the classic surgical kit.

Results similar to those of the present study were presented by Marzio Todisco et al. [9] and showed in his study that from 19 patients in which he inserted dental implants 10 patients had a good stability and this procedure mildly modified its bone density. The results of the present study show that these burs favor the process of bone remodeling from D5-D4; D4-D3, without the possibility of reaching the ideal bone density, respectively D2. In other similar studies, Fradeani M.,other advantages of these burs are studied, namely the preservation of the crestal bone at the level of the neoalveolus, which prevents complications such as peri-implantitis [11,16].

Also, these burs allow the immediate restoration of dental implants because they increase the primary stability of the dental implant. Althought this protocal has a lot of indications such as:Osseodensification in Medium and Soft Trabecular Bone Qualities,Osseodensification in Dense Trabecular Bone Quality Especially in the Mandible, Lateral Ridge Expansion it has the following contraindications: Osseodensification does not work in corticalbone. In (Type I/Dense Bone); use the Densah Burs in Cutting Mode (CW) and reverse-out (CCW) to re-autograft. (Densify-Preserve after Cut Protocol), avoid Densifying Xenograft.

## CONCLUSIONS

Within the limits of the studied group, it can be seen that this method comes before the clinician in the conditions where the patient has a large amount of cancellous bone tissue. The use of these burs prevents peri-implant type complications by optimizing osseointegration.

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