# Osseo Densification - A Comprehensive Review on Novel Approach

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## Abstract

Success of a dental implant depends on osseointegration which is the direct structural and functional connection between the dental implant and the alveolar bone. Successful osseointegration requires both primary stability (mechanical stability) between the implant and the bone and secondary stability (biological stability) which occurs during bone remodelling during healing.

***Keywords-*** *osseodensification, osteotomy, bone density.*

## Introduction

Traditional osteotomy is a subtractive technique in which the drills have a positive rake angle of 25 to 35 degrees to drill away small amount of bone with each sequential drilling which might result in few drawbacks like compromised stability and heat generated bone necrosis whereas a unique method called osseodensification is a non excavating method in which bone is not removed but is densified with each drill thereby enhancing primary stability by establishing immediate contact between the implant and the alveolar bone .

Various factors that contribute to the stability are

i. Implant design (thread type, geometry and surface coating )[1]

ii. Instrumentation (sequence of surgery, speed and technique)

iii. Bone density[2]

However factors like drill protocol sequence, velocity and design may aid in accelerated osseointegration .

OD is carried out with unique burs with tapered flutes with a negative rake angle (non cutting edge) in counter clockwise direction at a speed of 800 to 1200 rpm / minute.Asthe osteotomy expands bone is densified[3,4,5] as a layer of dense and compact bone that surrounds the osteotomy wall is created which would increase the primary stability and bone mineral density.copious amount of irrigation is required to avoid overheating.

## Materials and Methods

A database search was carried out in PUBMED using keywords like osseodensification ,OD, implant stability and osteotomy for articles upto the year 2018 the search was scrutinized for full text articles . clinical trials, in vivo studies, review articles were selected for this review.

**OSSEODENSIFICATION AND BONE DENSITY**

Stability of any dental implant depends on the bone mineral density.

According to trisi et al there is a significant correlation between the bone density in the peri implant region, insertion torque and micromotion[6].

Bone evaluation around the dental implants can be performed and visualized either in ground sections of methylmethacrylate materials or light microscopic examination of peri implant tissue at the cellular level.

In an animal experimental study carried out by Burri and wolter in 1977 it has been proved that the new bone formation occurs in the peripheral osteotomy site and also the amount of new bone formed was shown to be proportional to the degree of compression.

D3 and D4 type of bone has poor bone density making it difficult to achieve implant stability. Using osseodensification procedure a layer of increased bone mineral density has been shown by imaging around the periphery of osteotomies which has shown a good effect on the implant stability.

**CONVENTIONAL DRILLING VS OSSEODENSIFICATION**

Conventional drilling with sequential drills facilitates implant placement by bone excavating thereby compromising the primary implant stability which inturn results in reduction of torque during insertion. some surgical techniques like undersizing the osteotomic implant site have been proposed to reduce bone sacrifice during implant placement procedure and to enhance primary implant stability and bone quality. An alternate to this procedure is the Osseodensification which has shown to increase required penetration force and torque.

Moreover during osteotomy a zone of osteocyte death is produced by conventional drilling[7,8,9] ; despite the use of copious irrigation a peak temperature of ~80 °C was generated at the cut edge whereas with OD even without copious amount of irrigation the peak temperature remained within normal range well below the temperature known to cause osteocyte death (45°C) [10].

OD retains osseous coagulum (trabecular bone chips, blood, and stroma) which have inherited osteogenic potential[11,12]. This coagulum serves as a nucleating surfaces to promote new bone formation around the implants and providing greater bone density and better stability.

## Disscusion

Preservation of cell viability is the most important factor [13,14,15]for the success of any treatment. conventional drilling might compromise the viability by creating mechanical and thermal trauma[16,17]. A viable osteotomy site is very critical for enhanced osteogenesis.

OD has shown to increase the % of bone at the implant surface by increasing the Bone mineral density in the peri implant region which inturn is directly linked with increased bone-implant contact ,improved bone healing and increase in primary stability .

OD is a slow incremental process carefully controlled by surgeon. The residual strain on the bone surface creates compressive forces that increases the implant stability.increased removal torque is a good indicator for primary implant stability.

## Conclusion

Osseodensification is a promising alternative to conventional drills as it helps in maintaining ridge integrity with preservation of bone. This osseous coagulum shows excellent osteogenic potential that brings about robust formation of new bone in the osteotomy site and allows for the placement of dental implants with superior stability. It also helps to improve bone density and also BV and increased bone-to-implant contact, thereby improving implant stability. However more clinical studies are recommended in future to derive any concreate conclusions.

**Ethical Clearance –** Not required since it is a review article

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**Conflict of Interest –** Nil

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