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# Osseo integration in Implants: A Review

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**Abstract**

Osseo integration of dental implants refers to direct structural and functional link between living bone and the surface of a non-natural implant. It follows bonding up of an implant into the jaw bone when bone cells fasten themselves directly onto the titanium surface. It is the most investigated area in implant logy in recent times. Evidence based data reveals that osseointegrated implants are predictable and highly successful.

**Keywords:** Osseo integration, Implants, Bone.

## Introduction

It is the direct structural and functional link between living bone and the surface of a non-natural implant. It is a direct bone anchorage to an implant body, which can provide a foundation to support prosthesis; it has the ability to transmit occlusal forces directly to bone.1

## Definition

Osseo integration was first defined as a direct contact between living bone and the surface of a load-carrying implant at the histological level.2

"It is a process whereby clinically asymptomatic rigid fixation of all plastic material is achieved and maintained in bone during functional loading" – "Functional ankylosis**".**3

"It is the direct anchorage of an implant by the formation of bone directly on the surface of an implant without any intervening layer of fibrous tissue."4

## History

An investigational work was carried out in Sweden by Professor Per-Ingvar Bran mark and his colleagues from 1950to 1960. It was in 1952Dr. Per-Ingvar Bran mark discovered that titanium glued well with bone; a spectacle which was later termed as osseointegration.5In

1965, Dr.Branemark and his associates started clinical trials with titanium dental implants with great success.

**Bone**

Osseo integration is a constant procedure representing process of formation and adaptation to function and repair, which is due to Osteo plastic and orthoclastic activity of bone, also known as coupling.7-9

**Bone density classification**

In 1988 Misch10classified bone density groups independent of regions of jaw based on macroscopic cortical and trabecular bone. Dense or porous cortical bone is found on the external surface of the bone and comprises of the crest of edentulous ridge. Granular and fine trabecular bones are found surrounded by the outer shell of cortical bone.

1. Fibro-osseous integration supported by Linkow (1970), James (1975), and Weiss (1986.)12
2. Osseo integration supported by Bran mark (1985.)**10**

1. Implant design refers to the 3Dorganization of the implant i.e., form, configuration, geometry, contour, surface macro irregularities and macro structure. Exactitude fit in the vital bone leads to osseointegration. At present, satisfactory long-term documentation solitary on threaded types of oral implants that have been established to function for decades devoid of clinical problems.
2. Various implant designs are cylindrical, screw shaped implants, Threaded and Non threaded
3. Cylindrical implants / press fit implants:
4. They lead to stark bone resorption due to micro movement of the implant in the bone. Alberktsson in 1993 reported that enduring bone saucerization of 1mm – first year, 0.5 mm annually and there after cumulative rate of resorption up to 5 year follow up. The various forms of threads are: Standard V – thread, Square thread, Buttress thread.
5. The threaded portion of a screw-shaped implant has three typical regions: the top, the flank and the valley region. Of the three different sites, the top region frequently has the roughest surface.15
6. If we assume that all parts of an implant are equally important with respect to osseointegration, a proper characterization of the implant surface must include measurements made in all 3areas.Alignment of irregularities may give isotopic surface & anisotropic surface.

Wennerberg 2000 reported that improved bone fixation (osseointegration) will be attained with implants with an enlarged isotropic surface as matched to implant with turned anisotropic surface structure.16

Different machining process results in different surface topographies:

With respect to the deceptive topography there is strong documentation that most plane surfaces don't result in intolerable bone cell adhesion. Such implants do consequently get anchored in soft tissue even with the best material used.

Carlson et al published evidence of dominance of the threaded design in osseointegration compared with plates and several irregular implant shapes.

**Osteo promotion**

It is the procedure to enhance the formation of bone approximating the implant surface using bone regeneration techniques (using Polytetrafluoroethylene membrane).Bone growth factors like Platelet-derived growth factor (PDGF),Insulin-like growth factor (IGF), Platelet-rich plasma, transforming growth factor (TGF – B1)stimulates osteoprogenitor cells, enhance the bone growth.

**Osseointegration from the perspective of inter molecular forces:**

According to Albrektsson et al. Calcified tissue extents within 50 A0 of the implant surface. The metal surface is a tremendously polarizable titanium oxide coating altered by auxiliary filths from the majority metal phase.21,22

With time the titanium oxide surface blends with material from contiguous tissue, and a thin layer of ground substance of cellular origin is engaged on the implant so as to reinforce bone tissue and titanium. The interactions are electrostatic rather than hydrophobic or Van Der Waals interactions. To a charged body the highly polar oxide coating delivers a sturdily attractive substitute to water.

Conversely, certain histologic differences between the proper ligament and the soft tissue were observed in nearby metallic devices, this led to the formulation of new nomenclature named osseointegration. Even though implantologyis the prime areas of the present research, a comprehensive and thorough understanding of bone–implant interface interactions is important for the dental surgeon to give the patient finest promising clinical care after understanding patients bone characteristics', thus enabling a treatment plan which follows the principles and gives better clinical expectedness.

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