

Types of Implants

Madhuri Kotha¹, Krishna Kripal^{2*}, Sushma Reddy Bhavanam¹ and Kavita Chandrasekaran¹

¹Post Graduate Student, Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India

²Professor, Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India

***Corresponding Author:** Krishna Kripal, Professor, Department of Periodontology, Rajarajeswari Dental College and Hospital, Bangalore, Karnataka, India.

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Abstract

The goal of modern implant dentistry is no longer represented solely by successful Osseo integration. Today clinicians can prescribe the use of implants with the knowledge and confidence that they will predictably integrate into the jaw bone. In order to claim success, the definitive restorations must restore the patient to normal contour, function, aesthetics, speech and health. The clinical success of implant therapy in edentulous and partially edentulous patients is well documented and many clinicians realize the benefits of adopting implant therapy in their practices. Implant therapy offers many advantages over conventional fixed or removable treatment options and in many cases, is the treatment of choice. However, many clinicians still do not use implant therapy and choose instead to prepare teeth for fixed partial dentures. To obtain optimal aesthetic results with fixed partial dentures, a significant reduction in the amount of tooth structure is necessary, occasionally predisposing to endodontic, periodontal and structural sequelae.

Keywords: Oral; Implant Therapy; Esthetic

Introduction

Ideal Requisites of implant restorative material [1].

- It should be stable in the oral environment and should not undergo corrosion.
- It should fit passively over the implant abutment.
- It should be esthetic.
- It should not induce undue stresses in the implant or the bone.
- It should be biocompatible and should not induce any allergenic reaction.
- It should be easy to imaging compatibility.

It should be stable in the oral environment and should not undergo corrosion

Materials that are compatible with the living tissues. The physical properties of the materials, their potential to corrode in the tissue environment, their surface configuration, tissue induction and their potential for eliciting inflammation or rejection response are all important factors under this area [2].

It should fit passively over the implant abutment

Surface morphology plays an important role in biological interactions of the implant material to promote growth. If a particle size is smaller than 10 micron the surface will be more toxic to fibroblastic cells and have an adverse influence on cells due to their physical

presence independent of any chemical toxic effects. If the pore is larger than 500 micron the surface zone does not maintain sufficient structural integrity because it is too coarse. Of all the cellular response, cellular adhesion is the most important response necessary for developing structural and functional integrity at the bone and implant interface. It alters the entire response to biomaterials. Surface roughness in the range 10nm to 10 micron influences the interfacial biology. As it is the same order as the size of the cells and large biomolecules. Micro roughness at this level includes material defects, such as grain boundaries, dislocation steps and kinks and vacancies that are active sites for adsorption and therefore influence the bonding of biomolecules to the implant surface. Micro rough surfaces promote significantly better bone apposition than smooth surfaces, resulting in a higher percentage of bone in contact with the implant. It may influence the mechanical properties of interface, stress distribution and bone remodeling [3].

It should be esthetic

With modernization of dentistry, today's market is not only looking for functional and spatial replacement for teeth, but also for substitutes that are visually as natural as possible. Though, dental implants are inside the bone, their optical properties have significance, owing to the translucent cortical plates and thin gingiva that cannot camouflage the color of the implant material. Also, under ideal circumstances implanted part should not be visible, any exposure of the implant should not be drastically unpleasing to cause discomfort to the patient. Hence, the implant biomaterial should be esthetically pleasing if it is visible and should be esthetically compatible with the adjacent tooth and tissue [4].

It should not induce undue stresses in the implant or the bone

Important mechanical properties of biomaterials that must be considered in dental implant.

Fabrication are:

1. Modulus of elasticity
2. Tensile strength
3. Compressive strength
4. Elongation
5. Metallurgy

Modulus of elasticity

An important property of any biocompatible material is its modulus of elasticity (E), which represents elastic response to mechanical stress. The forces (F) and stresses within bone that result from loading an implant, balance the effect of the externally applied forces of occlusion or muscle action. These forces may establish a condition of static equilibrium. When these forces are not in equilibrium, the implant and bone deform or undergo mechanical strain. In elastic deformation, the implant and bone regain their original dimensions after the removal of force. In plastic deformation, the original dimension is altered permanently after the removal of the applied force. In this case, the properties of the material are such that a desired extent of permanent change of original dimension can be achieved while maintaining metallurgic and clinical integrity.

Tensile or Compressive forces (stresses)

This force when applied to a biomaterial or bone because a change of dimension (strain) that is Proportional to the elastic modulus.

Elongation

The magnitude of the moduli of elasticity can provide a direct measure of the degree and relative movement at the interface that can be expected. Both the bone and the implant deform (strain) as a result of forces applied to either one. Physiologically, this relative movement

in part determines the health or pathologic state of interface components and influences the surrounding tissue integration.

Metallurgy

The metals used in implant fabrication are an important consideration. Grains often called crystals can be of various geometric shapes. They exhibit crystallographic orientations that are a result of their formation, geometric shape and location within the bulk structure. Metals can be coined or squeezed into desired shapes when sufficient ductility exists, such that relative grain rearrangement occurs without disrupting integrity.

Coining

It is the process of shaping a metal in a mold or die especially by stamping. In the early 1970s, research by Matarese and Weiss solved this problem leading to fabrication of first coined endosteal dental implants. The coining process permits geometrically precise and planned modifications of grain size and orientation. This reduces metal fatigue over longer-term cyclic loading and promotes ease and increased safety during insertion adjustments to follow bone anatomy and to establish intraoral parallelism for prosthodontic restorations [5].

It should be biocompatible and should not induce any allergenic reaction

The most critical aspect of biocompatibility is dependent on the basic bulk and surface properties and biomaterials. Materials used for fabrication of dental implants can be categorized in two different ways:

1. Chemical point-metals, ceramics
2. Biological point-biodynamic materials: biotolerant, bioinert, bioactive Biomaterials, regardless of use, fall into four general categories:

Metals and metallic alloys, ceramics, synthetic polymers and natural materials. Metals and metal alloys that utilize oral implants include titanium, tantalum and alloy of Ti-Al-Va, Co-Cr-Mb, Fe-Cr-Ni. These materials are generally selected on basis of their overall strength properties. Bioinert materials allow close approximation of bone on their surface leading to contact osteogenesis.

These materials allow the formation of new bone on their surface and ion exchange with the tissues leads to the formation of a chemical bonding along the interface bonding osteogenesis.

Biotolerant are those that are not necessarily rejected when implanted into living tissue. They are human bone morphogenetic protein-2 (rh BMP-2), which induces bone formation *de novo*.

Biomimetics are tissue integrated engineered materials designed to mimic specific biologic processes and help optimize the healing/regenerative response of the host microenvironment.

Bioinert and Bioactive materials are also called osteoconductive, meaning that they can act as Scaffolds allowing bone growth on their surfaces [5].

Types of implants

Endosteal/endosseous implant [6]

They are locked into the bone. They engage the endocortex for fixation. They can be used in all areas of the mouth. Endosteal implant is a dental implant consisting of a blade, screw, pin, or vent Inserted into the jaw bone through the alveolar or basal bone.

Since the accidental rediscovery of the endosteal implant by Formaggini in the late 1940's, the field has witnessed a tremendous evolution in theory and clinical application. Chercheve, in his efforts to improve on earlier spiral designs, proposed several theories on

the relationship of the metallic endosteal implant to its osseous environment. Some of the problems he experienced still have not been overcome in our present designs.

The development of the blade implant marked a true advancement in endosteal design.

This implant proved to be much more functional and reliable than the spiral concept. However, it too had certain disadvantages which became obvious after a relatively short period of clinical trial.

The anchor endosteal implant was developed as a result of efforts to correct the various problems associated with the blade. Preliminary animal research using both anchor and blade implants was begun. Four dogs had each type of implant inserted in edentulous areas. The animals were sacrificed four months post insertion for histologic examination.

More sophisticated animal implant studies are being performed at the Brookdale Hospital Medical Center. Clinical evaluation of the anchor implant over a 3-year period has been very encouraging. Results have indicated a higher level of clinical success than previously achieved with blade.

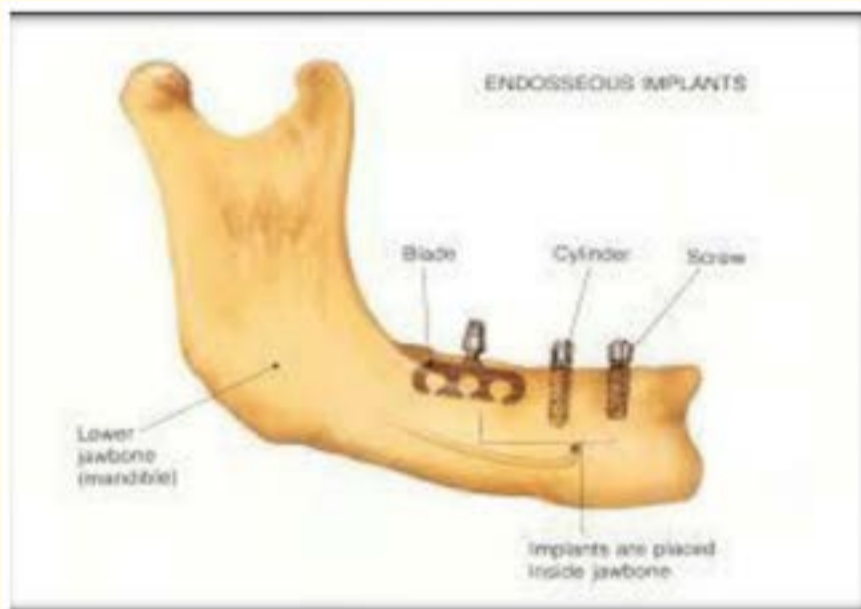


Figure 1

Subperiosteal implants [6]

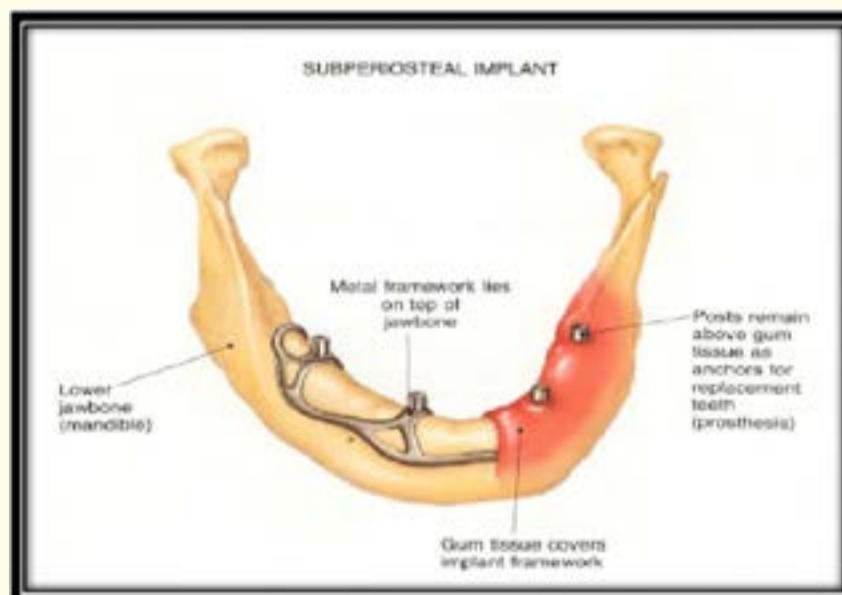


Figure 2

They are custom made frames that rest on the bone. Posts protrude from this framework through the tissues and provide the anchoring foundation for the final bridge work or denture. They are used if there is inadequate bone to place endosseous implant.

Sometimes the bone structure is badly atrophied. Not only it is atrophied but; the bone structure is limited to the extent that bone grafting cannot be done. In that case subperiosteal bone graft is given which is individually made and is very light weight. It is a metal frame work which has multiple posts which come out of the gum tissues and is put on the remaining bone. The dentist has to decide where it can be put depending upon the site and the condition of the bone. It can be used to replace the multiple teeth or even complete denture can be given above this. After it is put the natural bone and the tissue covers it and give it extra stability.

Intramucosal implant [7]

Inserted into the oral mucosa and mucosa is used as attachment site for the metal inserts. The attempts to solve the problems associated with the wearing of removable prostheses with intramucosal inserts date back to the 1940s. Dahl' reported on intramucosal inserts for the maxillary complete denture in 1943, and in 1973 Muratori' reported on a 25-year study. Many authors have reported on the technique to create a mechanical lock in a soft tissue receptor site to retain a biocompatible insert affixed to a removable prosthesis. The histologic studies of Weiss and Judy show that the tissue receptor sites heal into a keratinind cul-de-sac that maintains the protective integrity of the oral mucosal membrane and provides a positive mechanical lock to retain the prosthesis.

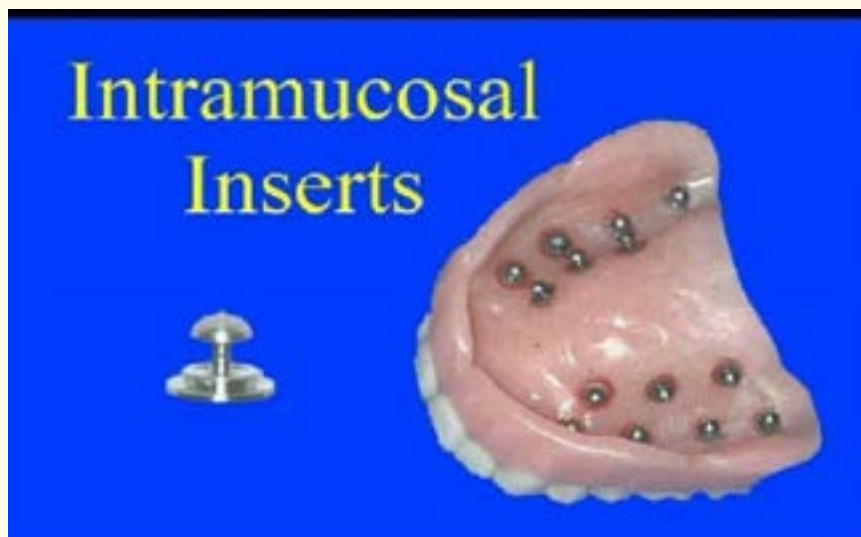


Figure 3

Conclusion

The ultimate success of implants is not only based on diagnosis, evaluation, treatment planning but also on having a knowledge regarding the complications of implants and their fruitful management. In short it is always better to remember: 'Prevention is better than cure' and 'a stitch in time saves nine'.

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