CLINICAL EVALUATION OF IMMEDIATE POST EXTRACTION IMPLANT PLACEMENT IN FRESH EXTRACTION SOCKET USING TWO DIFFERENT BONE AUGMENTATION MATERIALS WITH GBR BARRIERS

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Introduction and Review of literature

Replacement of lost dentition has always been a main goal of dental research work. Dental Implantology has evolved over the last 40 years to become one of the most predictable forms of treatment available to surgeons.Dental implants have offered other treatment modalities more satisfactory for patients than removable prosthesis,and also where fixed prosthesis was not possible due to insufficient number of abutments **(Branemark et al 1977).** In addition, it was found that teeth that may have a questionable prognosis such as teeth requiring root amputations, hemisections or advanced periodontal procedures should be considered for extraction, and the patient should be given the option of extraction and placement of a dental implant before these procedures are implemented **(Lovdahl1992)**.

Branemark was interested in studying bone healing and regeneration around chambers of titanium adopted for use in the rabbit femur, he later tried to retrive these titanium chambers and was unable to remove them, he observed that bone had grown in close proximity with the titanium that is effectively adherent to the metal, Branemark conducted many further studies on both animal and human subjects, which all confirmed this unique property of titanium. In the early1960s, Branemark discovered osseointegration, that bone can integrate with titanium components, a titanium screw shaped implant fixture is carefully placed in bone and amazingly enough the genetic code that commonly makes bone reject a foreign material is not activated, instead nature allows bone cells to attach to the titanium surface and the result is a firm and permanent anchorage for prosthetic reconstruction **(Branemark 1977).**

Osseointegration:

The Glossary of implant terms 2007 defined osseointegration as, contact established without interposition of non-bony tissue between normal remodeled bone and an implant at the light microscopic level entailing a sustained transfer and distribution of load from the implant to and within the bone tissue. This implies an anchoring mechanism whereby non-vital components can be reliably and predictably incorporated into living bone, which persists under physiologic loading conditions. However, this definition does not explain how the durable connection between bone and implant originates **(Slates et al 2006).**

Osseointegration is now regarded as a biological reaction cascade divided into three distinct phases, where the first is osteoconduction, relying on recruitment and migration of osteogenic cells to the implant surface, the second is new bone formation, where a mineralized interfacial matrix equivalent to that seen in the cement line in natural bone tissue. These two phases result in contact osteogenesis. The third phase is long-term remodeling of the tissue which is influenced by different stimuli, the most important being the biomechanics of the developed healing site **(Davies et al 2003 and Terheyden et al 2012).**

Types of dental implants:

Several types of dental implant systems are available which are classified according to their shape and relation to the bony housing including:

-Subperiosteal

-Transosteal

-Endosseous

The most frequently used are the endosseous implants, which include a range of sizes, shapes, coatings and prosthetic components. Implant length and width can be chosen to fit the available bone while the prosthetic component can be selected in size and angle to accommodate the final restoration **(Binon2000).**

Studies have shown that the placement of endosseous implants is a predictable procedure. Criteria for success include:

1) Absence of persistent signs/symptoms such as pain, infection, neuropathies, parathesias, and violation of vital structures

2) Implant immobility

3) No continuous peri-implant radiolucency

4) Negligible progressive bone loss (less than 0.2 mm annually) after physiologic remodeling during the first year of function

5) Patient/dentist satisfaction with the implant supported restoration. Many implant systems have shown multiyear success rates of greater than 90% for fully edentulous patients. Similarly, multi-year studies of implants in partially

edentulous patients have generally reported greater than 90% success rates for both maxillary and mandibular implants **(Albrektsson et al 1988).**

Endosseous implants were classified into blade form and root form implants.

-**Blade form**:

They are buccolingually narrow, wedge shaped implants. Which incorporate vents in their design to allow tissue ingrowth **(The glossary of prosthodontics terms 1994).**

-**Root form**:

Root form implants are the most used in dentistry today as they are the easiest to be placed since they simulate the general size of anormal tooth root, they can be placed in locations previously occupied by natural roots making them very versatile for replacing one or more teeth **(Buser et al 1999).**

Recently the evolution of the science of dental implantology yielded technological breakthroughs in the macro and micro design of dental implants, including implant shape, thread patterns and surface treatments, which have demonstrably fostered greater primary stability and faster osseointegration**(O'Sullivan et al 2000, Stanford 2002, Sakoh et al 2006, Jones and Cochran 2006).**

Dental implants function is to transfer load to the surrounding tissues. Thus the primary function design objective is to dissipate biomechanical loads in order to maintain osseointegration is dependent on two factors; the character of the applied force and the functional surface area of the implant over which the load is dissipated. The functional surface area of the implant is more important than its total surface area, as it is the area that actively serves to dissipate compressive and tensile loads through the implant-bone interface and provide initial stability of the implant following surgical placement. Various designs in functional surface area include implant macro-geometry, threads geometry, implant width, length, crest module and apical design **(Misch 1999).**

The basic macro-design types of root form implants include:

- **Non-threaded implants:** cylindrical press-fit which can be; parallel-wall, tapered or conical.

- **Threaded implants:** screw implants which are the most common design used in dentistry as they provide additional immediate fixation compared tocylindrical implants, due to their increased surface area for bonding **(Misch 1999 and Vallecillo-Capilla et al 2007).**

Thread patterns in dental implants currently range from micro-threads near the neck of the implant to broad macro-threads on the mid-body and a variety of altered pitch threads to induce self-tapping and bone compression **(Brunski et al. 2000).** Implant body design with threaded features has the ability to convert occlusal loads into more favorable compressive loads at the surrounding bone interface. Therefore thread shape is particularly important when considering long-term load transfer to the surrounding bone interface **(Binon 2000 and Millan et al 2000).**

Original endosseous implants were parallel in design which was not suitable for all applications, therefore tapered implants were initially designed especially to serve for immediate implant placement after tooth extraction, as they have a tapered apical end which simulates the form of a natural root, which resulted in improved esthetics and easier placement between adjacent natural teeth especially with those with convergent roots **(Garber et al 2001, Glauser et al 2004 and Shapoff 2002).**

Tapered implants distribute forces into the surrounding bone, creating a more uniform compaction of bone in the adjacent osteotomy walls compared with parallel walled implants, thus when inserted it creates lateral compression of bone **(O'Sullivan et al 2004).**

Other design modification was the introduction of self-tapping dental implants. They are usually designed with vertical cutting blades in the apical one third of the implant which increase their cutting efficiency. This feature helps to eliminate the pre-tapping procedure which in turn contributes to the gain of higher initial stability **(Olsson et al 1995).**

Recently, conical implants were introduced to the field of oral implantology. They have a self-tapping conical body design with cutting tips. These tapered conical implants can be inserted through undersized osteotomy preparations, which allow more bone compression than normal tapered implants giving higher initial stability, also the conical design fits better in situations where there is labial concavity or thin ridge due to the increased apical tapering of the implant **(Zahran 2007 and Zahran 2008).**

On studying implant surface treatment, **Buser et al 1991** compared between implants having blasted and acid-etched surfaces with others having plasma sprayed surfaces. More bone-to-implant contact was found in the blasted and acid-etched implants.It has been suggested that micro-roughness produced by blasting and/or acid etching increases the implant surface area and enhances biomechanical bonding by optimizing the biological response of the bone and micromechanical interlocking.

Studies showed that the surface roughness of titanium implants affects the rate of osseointegration and biomechanical fixation due to their effect on increasing the osteoconductivity. It is beneficial to improve the fixation of implants by the ingrowths of bone into the coating at early post implantation period. The surface roughness could be created either by the addition of the material on the bulk of the implant (surface addition), or by removing particles from the surface creating pits or pores on the surface (subtraction treatment). Rougher implant surfaces have been reported to have higher bone-to-implant contact percentages than machined surfaces **(Gedrange et al 2009 and Wennerberg and Albrektsson 2009).**

Dental implants are available in two main designs:

-**The one-piece implant**

-The two-piece implant

- The one-piece implant: where the intraosseous part, the transmucosal neck portion and the abutment were all integrated in one implant body that is inserted during one stage implant surgical procedure **(Long and Wilson 1992).**In this system no healing collars, no microgap between the abutment and the implant capable of harboring bacteria , no need for manipulation of the soft tissue portion after initial healing, there is less surgical time and improvement in esthetics **(Hahn 2007 and Finne et al 2007).**