شبكة المعلومات الجامعية

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بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

The Effect of Two Different Bar Materials Constructed with CAD/CAM Technology on Implant Retained Mandibular Overdentures: Radiographic Evaluation

Thesis

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Dedication

I would like to dedicate this thesis to

my beloved Mother, Father, Brother, and Sisters

as well as my little young kids Karma and yahia

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Introduction

Oral rehabilitation with an overdenture on splinted or unsplinted implants is considered the standard care in cases of mandibular edentulism. Numerous studies have shown that the mandibular implant overdenture is a simple and effective solution and leads to significant improvement of patient-based outcomes as compared to conventional dentures.

The use of a wide variety of attachment systems, including stud, magnet and bar attachments have proven both clinically predictable and effective results. The design of attachments should provide equal implant-tissue support and optimum force distribution around the implants to allow bone loading within physiologic levels.

Implants splinted together with bars may decrease the risk of overload to each implant as a result of a greater surface area, load sharing between implants and improve biomechanical distribution [(1)]. Bar attachments are classified according to their biomechanical behavior into rigid and resilient attachment. In comparison to resilient bar attachment, rigid anchoring of removable prostheses creates stable occlusal plane, reduces loading of denture-bearing areas, and minimizes posterior mandibular ridge resorption. One of the major drawbacks of rigid bar attachment is overloading of the abutments, however resilient bar attachment encourages torsion-free load transmission to implants dentures. The main disadvantages of bar attachments are the need for a large prosthetic space and the risk of mucositis due to an inadequate oral hygiene under the bar.

With prefabricated bar designs, lack of accurate adaptation of the denture base to the bar superstructure, rotation and lateral movement of the denture are unavoidable. In order to improve the fit of the overdenture framework electrical discharge machining (EDM) and spark erosion can be used, but this procedure is costly and technique-sensitive [(2)]. Milled bars have been suggested as a less expensive alternative to EDM. Implant-supported milled bars are bars with precision attachments and rigid anchorage, made by casting, electroerosion or CAD-CAM (computer-aided design and computer- aided manufacturing). Traditional castings have a major limitation inherent in the process, which is distortion of the casting with increasing size of the pattern. CAD/CAM fabrication of bars and frameworks has resulted in elimination of distortion, better fit, and fewer fabrication steps [(2)].

Custom-fabricated bar could be accurately milled to develop guide planes that allow accurate adaptation of the denture base to the milled bar providing stability and resistance against rotational and lateral forces. Custom made bars are also more likely to follow the ridge shape when pronounced ridge curvature is encountered, without invading the tongue space.

Dental alloys for prosthodontic restorations have developed in type and number over the past few years. Generally, Cobalt-Chromium (Co-Cr) alloys have been widely used for several decades in the field of restorative dentistry. Their mechanical properties combined with good biocompatibility have been clearly demonstrated.

Recently, new materials based on polyetheretherketone (PEEK) were introduced to the market and have been marketed as a potential alternative material for surgical procedures such as interbody fusion cages or dental implants with a similar stress distribution as titanium implants. Being an inert material, PEEK has high biocompatibility and has shown a successful clinical history in spinal implants over more than a decade and a half. In addition, PEEK material has a modulus of elasticity nearly the same as that of bone so it can reduce stresses transferred to the abutment teeth. Additional advantages of this polymer material are elimination of allergic reactions and metallic taste, high polishing qualities, low plaque affinity, and good wear resistance [(3)].

In modern dentistry, advances in computer aided designing (CAD) and computer aided manufacturing (CAM) have resulted in the development of a considerable number of CAD/CAM systems for the fabrication of different types of dental restorations. Today, implant-supported restorations fabricated by CAD/CAM technology are routinely used in dentistry. A wide range of computer-aided subtractive and additive manufacturing technologies can be used with the associated restorative materials. Milled restorations from blocks of homogeneous materials such as metal, resin, or porcelain should eliminate some of the problems inherent in dental castings [(4)].

Review of literature

➢ Dental Implants

The provision of complete denture had been the traditional treatment modality used for rehabilitation of edentulous patients. The outcomes with complete denture usually do not meet the esthetic, psychological or social needs of the patients. This treatment modality is associated with its own set of complications and problems; additionally bone loss is further accelerated when the patient is wearing a poorly fitting denture [5].

Rehabilitation of tooth loss with dental implant was documented and shown to have more than 98% of success rate [6]. The stabilization of the lower denture with at least two endosseous implants is applied for more than 20 years and was recommended by Feine [7] and co- workers in the McGill consensus statement as standard therapy in 2002 and considered to be the first choice standard care for the edentulous mandible [8, 9].

Introduction of dental implant has improved the outcomes and quality of life for many edentulous patients [10]. The use of dental implants for restoring function and esthetics,[11] and for improving masticatory efficiency and individual satisfaction is a well-accepted treatment modality with long term success [12].

There are three basic types of implants; ***eposteal implants*** that receive their primary bone support by leaning on the residual bone of the mandible, ***transosteal (transosseous) implants*** which composed of a metal plate and transosteal pins or posts, and ***endosteal (endosseous) implant*** that is a dental implant placed into the alveolar and/or basal bone of the mandible or maxilla and transecting only one cortical plate. There are two basic types of endosseous implants, **blade,** and **root form** [13].

Endosseous root form implants are the most commonly used implant type. It is composed of an anchorage component, termed the endosseous dental implant body, which ideally is within the bone, and a retentive component, termed the endosseous dental implant abutment [13, 14].

Many materials have been used for manufacturing dental implants such as; carbons, polymers, ceramics and metals ranging from alloys of gold, titanium, and nickel-chrome-vanadium to commercially pure titanium [15]. Typically, dental

implants are made out of grade 4 commercially pure Ti because it is corrosion resistant and stronger than other grades. However, Ti alloys are also used since it is stronger and more fatigue resistant than pure Ti [16].

Dental implants can be further classified according to the implant body design into threaded (screw-shaped implants) and non-threaded (cylinder implants) [17]. Cylinder or Press-fit implant is an endosseous design consisting of a straight cylinder that is pushed or tapped into the surgical osteotomy. They gained widespread popularity in the late 1980s to early 1990s because of their simple surgical placement protocol [18]. Threaded type implants are the most popular type of root implant due to their proven success [19]. Threads are used to maximize initial contact with surrounding bone, improve initial stability, and enlarge the implant surface area, and favor dissipation of the interfacial stresses [17].

According to the implant surface topography, root form implants are classified into implants with smooth surface, rough surface, or porous surface. Implant surface quality influences the wound healing at the implantation site and subsequently affects the osseointegration [20]. As a result, several surface modifications have been developed in an effort to modify the surface roughness of the implant to promote the osseointegration process, particularly with poor bone quality [18].

➢ Surgical Protocols

There are different surgical protocols that can be used for placement of two-piece implant systems: one stage and two stage. Using the standard, two-stage protocol, the implant body with a cover screw is submerged below the soft tissue until the initial bone healing has occurred. During a second-stage surgery, the soft tissues are reflected to attach a component that passes from the implant connection, through the soft tissue, and enters the oral cavity[18].

With one-stage surgery, the surgeon places the implant body and a temporary healing abutment, which emerges through the soft tissue. During the restorative process, the healing abutment is removed and the prosthetic abutment or restoration can be connected [18].