



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



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شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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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



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



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INTRODUCTION

An implant-retained overdenture is a removable dental prosthesis supported by the residual oral tissues and retained by dental implants. This concept has been successfully used for over 30 years. Implant-retained overdentures demonstrate improved retention and stability when compared to conventional dentures and may reduce residual ridge resorption and improve chewing efficiency, speech, and patient confidence.^[1]

Mandibular implant retained overdenture is considered as the treatment of choice in patients who are not satisfied with conventional complete dentures. Its relative simplicity, predictability, efficacy and affordability make it an attractive treatment option.^[2]

Diabetes mellitus is a metabolic disorder in which high blood sugar levels occurs over a prolonged period which when left untreated can cause many complications. The World Health Organization (WHO) defines diabetes as a ‘chronic, debilitating, and costly disease associated with severe complications, which poses severe risks for families, countries and the entire world.

Diabetes is classified as types I and II. Type I is an autoimmune disease that affects the beta cells of the pancreas and exogenous insulin is used to compensate for the deficiency and prevent or at least delay the chronic complications of this disease. Type II is a multifactorial disease caused by environmental effects on individuals with genetic predisposition and is related to obesity and age. Defect in insulin secretion and/or decrease in insulin sensitivity occurs in this type. The therapeutic goal aims to maintain blood glucose at normal levels. Glycated hemoglobin (HbA1c) is a test used to detect the glycemic control in the past 2-3 months in a single measure.^[3]

For so long, dental implants for diabetic patients have been avoided because of the increased susceptibility to infection, compromised wound healing, and microvascular changes, but most clinical investigations and studies found that good glycemic control gives successful results comparable to the results of non-diabetic patients.^[4,5]

Preservation of soft and hard tissues around the implant affects the long-term clinical success of implant supported prosthesis, so the amount of crestal bone loss is very important in determining the clinical success of the implant.

The crest module is the portion that retains the prosthetic component in a two-piece implant system. It also represents “the transition zone from the implant body design to the transosteal region of the implant at the crest of the ridge”. The crest module surface is either smooth/machined or roughened surface. The crest module is called a cervical collar when its smooth and polished. Controversy exists around the effectiveness of these configurations and their influence on the marginal bone loss.^[6]

So, this study was conducted to answer the question if different implant collar roughness can affect bone height changes around implants in implant retained mandibular overdenture especially in conjunction with type II diabetes mellitus patients or not?

REVIEW OF LITERATURE

Edentulism is defined as the loss of all permanent teeth ^[7], The edentulous state represents a loss of the integrity of the masticatory system, which is frequently accompanied by adverse functional and esthetic sequelae. These are varyingly perceived by the affected patient, ranging from feelings of inconvenience to severe handicap. Total tooth loss is equivalent to the loss of a body part. Consequently, the required treatment must address a range of biomechanical problems that involve a wide spectrum of individual tolerances and perceptions.^[8]

I. Impact of edentulism:

1) Oral health:

Bone loss is an ongoing process following tooth loss, affecting the mandible four times more than the maxilla. Edentulism was found to have a significant effect on residual ridge resorption, which leads to a reduction in the height of alveolar bone and the size of the denture bearing area. This reduction affects face height and facial appearance, which are altered following total tooth loss. The loss of alveolar bone height and width also leads to substantial changes in the soft-tissue profile, such as protrusion of the mandibular lip and chin. There exists an interpatient variation in these anatomic degenerative changes, and the etiology of these is still unclear. It is believed that a combination of local and systemic factors may be contributors; these include age, gender, duration of edentulism, parafunctional habits, general health, and several diseases.^[9]

The number of teeth has been chosen as a key determinant of oral function and oral health status. Several studies using different

methodologies have demonstrated that an important indicator for masticatory efficiency is the number of functional tooth units.^[10,11] According to a systematic review evaluating the relationship between oral function and dentition, tooth numbers below a minimum of 20 teeth, with nine to 10 pairs of contacting units, are associated with impaired masticatory efficiency, performance, and masticatory ability (an individual's perception of his/her ability to chew).^[12]

This disability could substantially influence the desire to bite, to chew, and to swallow and could lead to a modification of food choices. As a result, research has consistently demonstrated that tooth loss and dental status have a negative impact on diet and food selection.^[12,13]

Edentulism can be accompanied by functional and sensory deficiencies of the oral mucosa, oral musculature, and the salivary glands. Decreased tissue regeneration and decreased tissue resistance are expected in the edentulous population, which can impair the protective function of the oral mucosa. Associations have been reported between aging, denture use, and oral mucosal disorders, including denture stomatitis, an inflammatory condition of the palatal mucosa seen in complete denture wearers, angular cheilitis, oral candidiasis, and traumatic ulcers.^[9]

According to MacEntee et al.^[14] the odds of finding hyperplasia, stomatitis, and angular cheilitis increase approximately three-fold in denture wearers. Such disorders could expose the individual to internal and external pathogens, and their prevalence is an important parameter in evaluating the oral health of an elderly population. Although most of the oral mucosal conditions in the

elderly are benign, some may become malignant, especially if the protective functions of oral mucosa are decreased.^[15]

Edentulism may induce an oral dyskinesia, defined as abnormal, involuntary, patterned, or stereotyped, and purposeless orofacial movements. Several factors, such as ill-fitting and unstable prostheses, oral discomfort, and lack of sensory contacts, have been proposed to explain oral dyskinesia in edentulous individuals, but the exact mechanism is still unclear.^[16] Denture wearers may have additional prosthetic problems as a result of soft and hard tissue damage caused by oral dyskinesia. Edentulism is also associated with tardive dyskinesia, a type of dyskinesia occurring among patients chronically treated with antipsychotic drugs.^[9,17]

2) General health:

According to several studies, tooth loss can affect general health in several ways as indicated as follows.

- Lower intake of fruits and vegetables, fiber, and carotene and increased cholesterol and saturated fats, in addition to a higher prevalence of obesity, can increase the risk of cardiovascular diseases and gastrointestinal disorders.^[18]
- Increased rates of chronic inflammatory changes of the gastric mucosa, upper gastrointestinal and pancreatic cancer, and higher rates of peptic or duodenal ulcers.^[19]
- Increased risk of noninsulin-dependent diabetes mellitus.^[20]
- Increased risk of electrocardiographic abnormalities, hypertension, heart failure, ischemic heart disease, stroke, and aortic valve sclerosis.^[21,22]
- Decreased daily function, physical activity, and physical domains of health-related quality of life.^[23]

- Increased risk of chronic kidney disease.^[24]
- Association between edentulism and sleep-disordered breathing, including obstructive sleep apnea.^[9,25]

Edentulism negatively influences not only oral function, but also social life and day-to-day activities.^[26] Compromised oral function has been linked to decreased self-esteem and a decline in psychosocial well-being. Edentulous people may avoid participation in social activities because they are embarrassed to speak, smile, or eat in front of others, leading to isolation.^[27]

II. Treatment modalities for patients with completely edentulous mandible:

1) Conventional complete denture:

Complete denture rehabilitation remains one of the most popular and traditional prosthodontic treatment options for edentulous patients who have systemic, anatomic, and/or financial limitations. Successful outcomes of complete denture patients may depend on prognostic factors, such as age of patient, patient demographic, psychological factors and personal traits, previous denture experience, expectation and attitudes, residual ridge form and anatomy, method of construction, quality of dentures and changes over time, and esthetics.^[28]

Although there has been much debate on the influence or significance of these factors on the outcome of denture therapy, one thing that is certain is the sequelae of prolonged denture use. Residual ridge resorption is a phenomenon that describes the life-long remodeling of the alveolar ridge after dental extractions, where the size of the residual ridge is reduced most rapidly in the first 6 months and

continues throughout life at a slower rate. Residual ridge resorption has been described as chronic, progressive, irreversible, and catabolic.^[29]

2) Overdenture:

An overdenture is "removable partial or complete prosthesis that covers and rests on one or more remaining natural teeth, roots and/or dental implants". Another definition describes it as "A prosthesis that covers and is partially supported by natural teeth, teeth roots and/or dental implants".^[7] Overdentures are classified according to type of support into:

- **Tooth supported overdenture:**

Tooth supported overdentures rely on the remaining teeth to support the prosthesis. The location of these natural abutments is highly variable, and they are often compromised from past bone loss associated with periodontal disease. Tooth supported overdentures have the principal advantage of conservation of natural teeth and reduction of residual ridge atrophy. Stability, support, and retention of the overdenture also can be better in comparison with a conventional complete denture. In addition, sensory feedback of the periodontal receptors is maintained, and masticatory performance may be enhanced.^[30]

Disadvantages of the tooth supported overdenture treatment include the need for inevitable treatment, which requires additional time and increases costs. The overdenture not only prevents natural gingival stimulation and cleaning, but also promotes accumulation of plaque as well as being a source of irritation to the gingiva leading to periodontal breakdown. Bony undercuts also present a problem compromising the peripheral seal (either due to blocking

out of the undercut, or shortening the flange), as well as the esthetics due to over contoured or foreshortened flange.^[31]

- **Implant overdenture:**

An endosteal implant is an alloplastic material surgically inserted into a residual bony ridge, primarily as a prosthodontic foundation. The prefix endo means “within,” and osteal means “bone.”^[32]

Many endosteal implant designs have been used in the past, including tapered pegs, pin shapes, and plate forms. Today, an endosteal implant in the shape of a tooth root is the design most often used in the restoration of partial or complete edentulous patients.^[33]

The patient gains several advantages with an implant supported overdenture. The mandibular complete denture often moves during jaw movements during function and speech. The retention of an implant overdenture is dramatically improved compared with conventional denture. Retention of the prosthesis is enhanced using mechanical attachment with no need for maximum soft tissue coverage and prosthesis extension. This is very important for new denture wearers, patients with tori or exostoses or low gagging thresholds. Stability offered by implant overdenture will allow the patient to consistently reproduce a determined centric occlusion.^[2]

Soft tissue abrasions and accelerated loss are more symptomatic of horizontal movement of the prosthesis under lateral forces. An implant overdenture may limit lateral movement and direct more longitudinal forces.^[34]

The clicking sound elicited by teeth contact during denture movement is prevented by the enhanced stability and retention offered by the implant overdenture. ^[2,35]

After extraction of mandibular teeth, an average of 4mm vertical bone loss occurs during the first year and continues in smaller values over the next 25 years. The bone under an implant overdenture may resorb as little as 0.6 mm vertically over 5 years, and long term resorption may remain at less than 0.1 mm per year^[36]

III. Prosthetic options of implant overdenture:

There are two types of removable prostheses RPs (RP-4 and RP-5), based on support of the restoration. Patients are able to remove the prosthesis but not the implant-supported superstructure attached to the abutments. The difference in the two categories of removable restorations is not in appearance. Instead, the two removable categories are determined by the amount of implant and soft tissue support. One of the most significant benefits of a removable implant prosthesis (RP-4 and RP-5) is the ability to enhance the soft tissue profile. With a fixed prosthesis in an edentulous patient, it is often difficult to increase the fullness of the soft tissue without overcontouring the prosthesis and making hygiene difficult.^[37]

- **RP-4 design.**

RP-4 is a removable prosthesis completely supported by the implants, teeth, or both. The restoration is rigid when inserted: overdenture attachments usually connect the removable prosthesis to a low-profile tissue bar or superstructure that splints the implant abutments. Usually, five or six implants in the mandible and six to eight implants in the maxilla are required to fabricate completely

implant-supported RP-4 prostheses in patients with favorable dental criteria. The minimum interocclusal space needed to perform an RP-4 design is about 15mm to allow for sufficient space for acrylic and denture teeth. In addition, a superstructure and overdenture attachments must be added to the implant abutments. This requires a more lingual and apical implant placement to make room for the denture teeth.^[33]

- **RP-5 design.**

RP-5 is a removable prosthesis combining implant and soft tissue support. The amount of implant support is variable. The completely edentulous mandibular overdenture may have: (1) two anterior implants independent of each other; (2) splinted implants in the canine region to enhance retention; (3) three splinted implants in the premolar and central incisor areas to provide lateral stability; or (4) implants splinted with a cantilevered bar to reduce soft tissue abrasions and to limit the amount of soft tissue coverage needed for prosthesis support.^[33]

The primary advantage of an RP-5 restoration is the reduced cost. The prosthesis is very similar to traditional overdentures supported by natural teeth.^[38]

The patient can wear the prosthesis during the healing stage. After the implants are uncovered, the superstructure is fabricated within the guidelines of the existing treatment restoration. Once this is achieved, the pre-implant treatment prosthesis may be converted to the RP-4 or RP-5 restoration.^[33]

Food impaction under the denture and food debris trap against implants, bars or attachments because of the shortened flanges is considered by some patients as a very annoying problem that they always compare with their old complete dentures.^[39]

The implant supported or retained overdenture is difficult to fabricate in cases presented with insufficient inter-arch space to give room for attachment, denture teeth and adequate bulk of acrylic denture base to resist fracture. If a space less than 12 mm from soft tissue to occlusal plane is not available, an osteoplasty is needed to create the needed space; otherwise, a fixed prosthesis will be more preferable.^[40]

An implant supported or retained overdenture usually needs more maintenance than a fixed one due to the wear of the O-rings or clips and must be replaced regularly, and the need for relining to overcome soft tissue support changes should be considered. Overdenture wearers often pay greater long-term expenses than those with fixed restorations.^[41]

Two-implant-supported mandibular overdenture should be the “minimum offered to edentulous patients as a first choice of treatment.”^[42]

IV. Effect of surface roughness on osseointegration:

Osseointegration is defined as the direct structural and functional connection between the living bone and surface of a load-bearing implant. It is critical for implant stability and is considered a prerequisite for implant loading and long-term clinical success of endosseous dental implants. The implant–tissue interface is an extremely

dynamic region of interaction. This complex interaction involves not only biomaterial and biocompatibility issues but also alteration of mechanical environment. The processes of osseointegration involve an initial interlocking between alveolar bone and the implant body, and later, biological fixation through continuous bone apposition and remodeling toward the implant.^[43]

The original Branemark implant had a threaded machined surface. The threads enabled excellent implant stability in the prepared osteotomy and increased the surface area of the implant significantly. Currently, there is a significant shift away from the machined surfaces toward textured titanium surfaces. Most implant companies offer surface textured implants that claim osteoconductive properties with superior speed and quality of osseointegration or bone–implant contact (BIC) over traditional machined-surface implants.^[44]

Davies^[45] proposed that textured surfaces promote blood clot adhesion and bone formation directly on the implant surface (contact osteogenesis). In contrast, a clot shrinks away from a smooth machined surface creating a micro-gap. The osteogenic cells cannot reach the implant surface and new bone will start forming away from the implant (distance osteogenesis).

Dental implant surfaces have been modified from the machined relatively smooth surface to the dominating moderately rough surfaces of today. Further, surface roughness modifications have been performed at different resolution, variations at the μm and at the nanometre levels. The reason for this work has been a desire to speed up the bone healing process in order to provide a strong primary stability that can create possibilities for an early loading time. The μm