Effect of Silver Nano Particles-Reinforced Resin on Candidal Growth and Fracture Resistance of Complete Dentures (In Vitro Evaluation)

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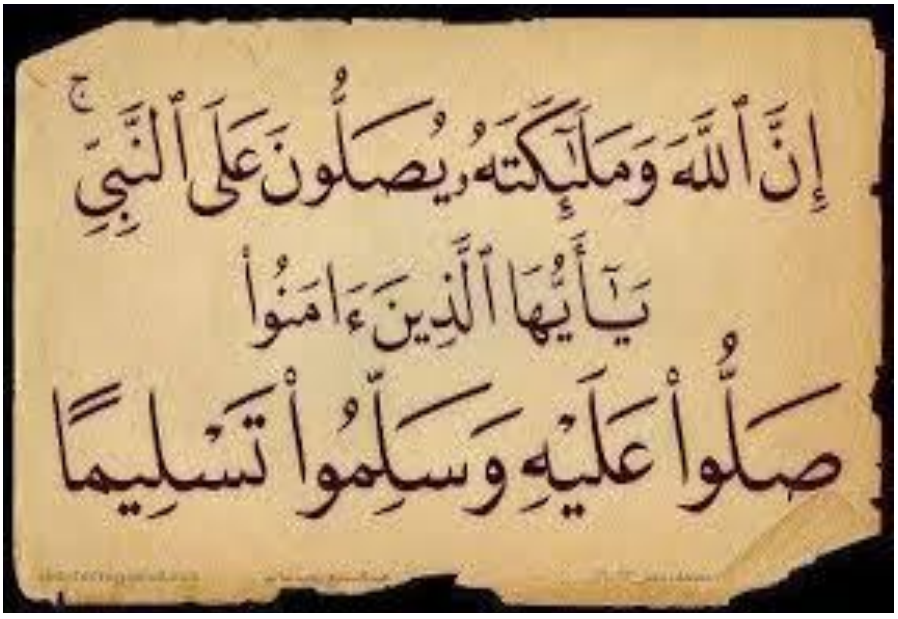

الأية ٥٦ .. سورة الأحزاب

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Dedication

Deepest thanks to

My beloved Family

Daughter

True Friends

Special thanks to

My beloved Husband

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INTRODUCTION

Complete edentulism is a global problem that is highly prevalent among elderly patients. Edentulism affects oral and general health as well as the quality of life. [(1)] Providing edentulous patients with complete dentures is a common, well established mode of treatment. [(2)]

Documented arch discrepancy in tooth survival showed that maxillary arch exhibits earlier tooth loss compared to mandibular arch. Thus, prosthetic need for maxillary dentures is a common finding. [(3)]

Poly methyl methacrylate (PMMA) resin is commonly used for the fabrication of denture bases, owing to their good esthetics, simple handling and processing, relative ease of repair and moderate cost. However, their mechanical properties render them non-ideal as a denture base material. [(4)]

One of the complications of maxillary dentures especially single dentures is frequent fracture of the denture base. This may result due to heavy occlusal contact, impacts and micro porosities. [(3)]

About 50-70% of patients rehabilitated with maxillary dentures present with a pathogenic state known as denture

stomatitis. Denture stomatitis is a recurrent inflammatory process characterized by homogenous erythema and red focal areas, especially in the palatal mucosa. It is usually associated with Candida species, particularly Candida albicans. [5]

Placement of removable prosthesis in the oral cavity produces profound changes in the oral environment that may have an adverse effect on the integrity of the oral tissues. Mucosal reactions could result from mechanical irritation by the dentures, accumulation of microbial plaque, or occasionally a toxic or allergic reaction to the constituents of the denture base material.[3]

Recent advances in dental technology evolved several materials and techniques to overcome problems encountered with acrylic resin. Hence, attempts were carried out to enhance acrylic resin properties. These included materials that re-enforce denture bases and others that may reduce the tendency to post insertion microbial or fungal infection. [3]

Many approaches have been reported to reinforce polymethyl methacrylate denture bases through inclusion of several re-enforcing materials. These included carbon fibers, metal strengtheners, and polyethylene and glass fibers. Recently, the introduction of nanotechnology has encouraged the use of

nanoparticles to enhance the mechanical properties of acrylic resin denture bases. [6, 7]

Different types of nano materials have been developed. Silver nanoparticles are recently used in the medical field as they exhibit an antimicrobial action against Gram-positive and Gram-negative bacteria and fungi. They can also enhance mechanical properties of denture bases and increase their fracture resistance. [7]

Reviewing the dental literature revealed few studies on the use of nano silver particles as a reinforcing material for denture bases. Hence, this in vitro study was attempted to assess the effect of nano-silver reinforced acrylic bases on the fracture resistance of denture bases and on reducing the Candida growth on reinforced acrylic samples.

EDENTULISM

Edentulism is a debilitating and irreversible condition and is described as the final marker of disease burden affecting oral health. Although the prevalence of complete tooth loss has declined over the last decade, edentulism remains a major disease worldwide, especially among older adults.[8, 9]

Disease factors as caries or periodontal disease are not the sole cause for patient's edentulism; research has demonstrated that attitude, dental attendance and characteristics of health care system play an important role in edentulism. In addition, a significant relationship exists between the edentulous state and financial concerns. It is therefore reasonable to conclude that edentulism is due to a combination of cultural, financial and dental disease as well as to post dental treatment. [3]

Edentulism can directly lead to impairments including physical, psychological and social disabilities. [10]

Impact of edentulism on oral health

Impact of edentulism on bony structure

The close relationship between teeth and the alveolar process continues throughout life. [9] It was stated that bone remodels in relationship to the applied forces, where loss of mechanical stimulation due to disuse is followed by reduction of bone mass. Thus, bone needs stimulation to maintain its form and density. Teeth transmit compressive and tensile forces to the

surrounding bone. When a tooth is lost, lack of stimulation causes decrease in bone density resulting in loss in external width then height of bone volume. [11]

Bone loss is an ongoing process following tooth loss. It affects the mandible four times more than the maxilla. Edentulism was found to have a significant effect on residual ridge resorption (RRR) lead to reduction in the size of the denture bearing area. This reduction affects face height and thus facial appearance. [12]

Continuous reduction in the alveolar ridge is regarded as a major oral disease arising due to anatomical, metabolic, prosthetic and functional factors. [13] The potential causative factors include hereditary, systemic factors including oral and general health conditions and local factors including chewing habits, para-functional habits, previous denture experience and denture loading. However, it is difficult to specify the most important factor affecting individual variations in RRR. [14]

It was reported that ridge resorption associated with edentulism is usually attributed to lack of mechanical stress, absence or presence of dentures and the number of years of denture use. Trauma to the denture-bearing tissues that may be caused by defective occlusion, poor denture fit and unfavorable loading may also enhance the rate of RRR in edentulous patients. [15]