BioHPP Bar-Retained Implant-Supported Overdenture Versus BioHPP Implant-Retained Fixed Bridge Using CAD/CAM Technology (Strain Gauge Analysis)

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Dedication

I would like to thank my mother for her sacrifice; endless support and providing me with prayers that blessed my work.

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Introduction

Edentulism is the terminal outcome of a multifactorial process including biological processes such as caries, periodontal diseases, pulpal pathology, trauma, oral cancer as well as non-biologic factors related to dental procedures.

It is conservatively assumed that ten percent of the world's population of 6 billion is between partially or totally edentulous. The choice between a fixed prosthesis and an overdenture when treating the edentulous mandible with implants shows wide variation both within and between countries.

A wide variety of treatment modalities exist for the edentulous patient. The preferred design for the edentulous patient was the fixed implant-supported prostheses. Many patients prefer this design as it provides them with a "natural feel" which they find comparable to their own teeth regarding both esthetics and function. In addition, fixed implant prostheses require less maintenance as there are no attachments to change or adjust. However, this type of treatment may be beyond the financial and anatomical scope of many edentulous patients. In addition, attempting to reduce the number of implants supporting a full arch fixed prosthesis may result in biomechanical disadvantages as increased stresses on the implants.

All these disadvantages make the patients asking for another treatment options like implant retained overdenture with different attachment systems.

The use of multiple types 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 resulting from greater surface area, load sharing between implants and improved biomechanical distribution. The bar's ability to decrease the potential for micromotion at the bone-implant interface may provide successful osseointegration of immediately loaded implants.

Nowadays Computer aided design/computer-aided manufacturing (CAD/CAM) technology has widened the scope and application of those treatment , allowing for prosthodontically-driven implant placement and optimum substructure design for optimal esthetics and biomechanics.

Hence this thesis was proposed to evaluate which treatment modalities are less destructive to the supporting structures using strain gauge analysis through comparing BioHPP bar retained implant supported overdenture versus BioHPP implant retained fixed bridge manufactured by CAD CAM technology.

Review of literature

I. Different treatment modalities to improve edentulism treatment:

Edentulism remains prevalent in among individuals older than 65 years of age. It results in a wide range of local anatomical, physiological, and psychosocial changes that include continued residual ridge resorption, reduced masticatory efficiency, altered facial esthetics associated with changes in vertical dimension and muscular function, and deterioration in social functions. It is a condition with broad psychosocial and physiological impact.[1-2]

A large variety of different treatment modalities exist for both the fixed and removable mandibular implant prosthesis. Clinical and technical aspects should be firstly considered at the treatment to select the optimal implant position, establishing an adequate number of functional units, selection the appropriate retainers, and apply the best technique for framework processing and veneering.[3]

Several factors play a role in the decision of the treatment option that best suits the patient, such as anatomy, esthetic, phonetics, interocclusal space, neuromuscular functions, cost and patient compliance. Moreover, the maxilla and mandible present different anatomical and functional challenges related to different arch morphology, resorptive pattern, quality and quantity of the bone, presence of anatomical structure, and biomechanics considerations.[4-5]

When contemporary treatment of the edentulous patients considered, dental implants for the treatment of edentulism offers an alternative treatment to complete denture. Inspite of the advantages of mandibular implants are the improvement in mandibular function, the prevention or reservation of alveolar bone loss, and the measurable improvement in self-reported satisfaction with treatment. Yet, complete treatment of the edentulous patient extends beyond considerations of improved prosthesis function.[6]

The CAD/CAM concept was applied in fabrication of maxillary and mandibular screw-retained implant-supported fixed prosthesis. Proper treatment plan and execution coupled with using advanced technologies contributes to highly esthetic results. However, long-term researches are required to guarantee a satisfactory long-term outcome of this modality of treatment.[7-8]

Fixed treatment options for implant-based rehabilitation of the edentulous patient have been documented for both maxillary and mandibular arches, with a large variety of opinions including the implant number, position, and distribution within each arch. These prosthesis can be implant-supported fixed prosthesis or hybrid prosthesis, multi-unit ceramo-metal restorations, CAD/CAM-based restorations with metal or zirconia frameworks, or monolithic zirconia implant-supported fixed prostheses.[9-10]

II. Complete denture:

For edentulous patients, successful complete denture is influenced by the biomechanical phenomena of support, stability, and retention.(11)

Successful complete denture therapy must involve both technical excellences during prosthesis fabrication and effective patient management and followed by complete denture placement. Satisfying the expectations of all patients for optimum denture retention and stability is often beyond the technical skills of even the most accomplished practitioners.(12)

Denture adhesives may also add psychological beneficial when the patient requires additional retention and stability, particularly during times of social interaction. Denture adhesives are not indicated to provide retention for loosely fitted prostheses, or excessive amounts of adhesive indicated under any circumstances.(13)

The current evidence available suggests that the restoration of the edentulous mandible with a conventional complete denture is no longer the most preferable first choice prosthodontics treatment. Now overwhelming evidence that a two-implant overdenture should become the first treatment option for the edentulous mandible.(14)

- Problems with conventional complete denture:

Complete dentures wearing may have adverse effects on the health of both oral and denture supporting tissues. These adverse effects may be divided into direct and indirect sequelae. Related to the first group belong

residual ridge resorption and gingival reaction, such as denture stomatitis, denture irritation hyperplasia, traumatic ulcers, and “flabby ridges.” It also has suggestions that there might be an association between oral carcinoma and chronic denture irritation, but no clear evidence appears to exist. (15)

Other conditions related to the wearing of complete dentures include altered taste perception, burning mouth syndrome and gagging. Indirect sequelae are related to the great changes in masticatory function in complete denture wearers in comparison with dentate subjects. Bite force is decreased with risk of the masticatory muscles atrophy. The decreased masticatory ability may lead to changes in dietary selection with risks for an impaired nutritional status mainly in the elderly complete denture wearer. (15)

Measurements of masticatory function, such as biting force and the ability to comminute a test food, are substantially decreased in complete denture wearers in comparison with people with natural teeth, Also with implant-supported prostheses.(16)

The most common complaint is the 'loosening' of the dentures which is often due to the continuous resorption of the alveolar ridge. Moreover, patients complain of intolerance to loading by the mucosa, pain, difficulties with speech and eating, loss of soft-tissue support, and altered facial appearance.(17)

Problems of retention and stability for the mandibular prosthesis often cause complaints of masticatory function in complete denture