The Effect of Cantilever Bar Length on Stresses Induced in Tooth-Supported Mandibular Overdenture Supporting Structure

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تأثير طول القضبان الممتدة على توزيع القوى في حالات الأطقم الكاملة المحمولة بدعامات سنية

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وَعَلَّمَكَ مَا لَمْ تَكُنْ تَعْلَمُ وَكَانَ فَضْلُ اللَّهِ عَلَيْكَ عَظِيمًا

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INTRODUCTION

Tooth supported overdenture is one of the most effective preventive prosthetic measures for the treatment of the pre-edentulous patients with severely mutilated dentition. Numerous articles have addressed the functional benefits of complete dentures supported by few remaining natural roots[1-3]

These natural physiologic abutments offer more support and stability for dentures, reducing stresses transmitted to the alveolar bone and thereby preserve the alveolar bone height. The role of proprioceptors present in their retained roots is not only feedback mechanism, but also direction and tactile force sensitivity, dimensional discrimination and motor responses. The discriminatory tooth proprioceptors are also important for mandibular positional sensitivity and centric relation record. In addition, tactile sensitivity, vertical and horizontal stabilization, contributes to better masticatory performance encountered in overlaid denture wearers. The improvement in function together with the preservation of the mandibular ridge point out the importance of this treatment modality[1-3].

Various treatment modalities are used in conjunction with overdenture for the remaining mandibular canines. The root may have only a denture supporting function or they may serve to provide both support and retention . The use of a wide variety of attachment system, including stud, magnet and bar attachments have proven both clinically predictable and effective results.

Bar attachments have been used, because they provide a splinting mechanism between the overdenture

abutment teeth and increase the stability and retention of prosthesis . Bar attachment consists of a sleeve, incorporated in the overdenture which clips over a bar attached to the abutment teeth. The overdenture bar attachments are classified by their biomechanical behavior into rigid, and resilient attachment[2]

In an attempt to minimize the undesirable forces transmitted to the overdenture supporting structures , a short (5-7 mm) and long (13-15 mm) distal cantilever extension bar have been suggested [4-6].

Cases that require increased retention such as compromised ridge and cases exhibiting high muscle attachments , prominent mylohyoid ridges, or extreme gaggers have been indicated for cantilever bars. The cantilever design may satisfy the increased demand for retention and tissue protection providing a more economic treatment approach[4].

Inspite of the functional advantages offered by cantilever supported prosthesis , the distal cantilever bar may cause bending moments which may lead to mechanical failure and subject the abutments and their supporting structures to excessive bone resorption .

Many experimental stress analysis methods have been employed to evaluate biomechanical loads. These techniques compromise photo- elastic stress analysis, strain gauge analysis, holographic iterferromtry and finite element stress analysis.

Although, Long term studies have been published evaluating the generalized effect of overdenture attachment on denture supporting structures , however