The Effect of Acrylic Resin Reinforcement on Stresses Induced on Implant Supported Mandibular Over Denture

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تأثير الاكريل المقوى على الاجهاد الناتج على الانسجة المحيطة بالغرسات السنية الداعمة للاطقم الكاملة المحمولة

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الملخص العربى

استهدفت هذه الدراسة تقييم تأثير الاكريل المقوى على الاجهاد الناتج على الانسجة المحيطة بالغرسات السنية الداعمة للاطقم الكاملة المحمولة .

تم عمل نموذج من مادة الاكريل وتم وضع غرستان سنيتان فى منطقة النابين لهذا النموذج.

تم تصميم طقمين محمولين كاملين على هذا النموذج حيث كانت قاعدة الطقم المحمول الاول مصنوعة من الاكريل المقوى اما قاعدة الطقم الثانى مصنوعة من الاكريل الحرارى.

استخدمت تكنولوجيا مقاييس الإجهاد لتسجيل الاجهاد الناتج عن اسقاط الاحمال باستخدام جهاز الحمل حيث تم وضعها حول الغرسات السنية وفي الحافة الدردريه جانبيا في مكان الضرس الأول.

ثم أنزل ضغط معياري مقداره 60 نيوتن في جهة واحده ثم في الجهتين في التصميمين المختلفين في منطقة الضاحك الثاني و الضرس الأول للفك السفلي.

قراءة وتحليل النتائج إحصائيا أوضحت الأتي:.

١ - الإجهادات على الغرسات السنية كانت أكثر من الإجهادات المنقولة على الحافة الدردريه في قاعدتى الاطقم المستخدمة.

٢ - الإجهادات فوق الغرسات السنية على الاطقم المصنوعة من الاكريل الحرارى كانت أقل من الاجهادات فوق الغرسات السنية على الطقم المصنوعة من الاكريل المقوى .

٣ - إسقاط القوى على جهة واحده من الفك له تأثير سلبي على الإجهادات المنقولة إلى كل من الغرستين والحافه الدردريه الجانبية مقارنة بإسقاط القوى على جانبي الفك.

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Introduction

Edentulism has a negative impact not only on mastication, but also on speech, esthetics and self-image. The loss of teeth is usually accompanied by resorption of the surrounding alveolar bone which compromises the expected results of conventional prosthetic therapy. Besides that complete dentures are always difficult to accept requiring a considerable level of tolerance and adaptation by the patient.

The reduced stability, retention and the maladaptive response to complete dentures inspired prosthodontists to seek an alternative for conventional complete dentures. Once established that osseointegration is a predictable successful treatment, it was a natural progression to use osseointegrated implants to provide proper support and retention to complete dentures.

Implant-supported prosthesis has become a popular treatment for edentulous patients who are maladaptive to complete dentures. Recent studies have demonstrated a higher tendency for

success when overdentures were supported by implants than by natural roots[1].

The overdenture helps patients develop better skills by wearing a stable denture rather than starting denture skills with an unstable complete denture. However, overdentures are contraindicated in cases exhibiting insufficient inter-arch distance, patients with systemic complications and patients with bad oral hygiene.

Acrylic resin is the most common material used as denture base. It has a lot of desirable properties although it is still far from ideal in fulfilling all the mechanical requirements of a prosthesis.

Acrylic polymers were introduced as denture base materials in 1937. Previously materials such as vulcanite, nitrocellulose phenol formaldehyde, vinyl plastics and porcelain were used for denture bases. The main advantages of heat cured acrylic resin include their ease of processing, low cost and light weight. Moreover, the material has the ability to simulate the translucence of the oral tissues and retains its appearance over along period of time [2].

Denture base fracture is one the most disadvantages of denture base polymer material. The incidence of denture base fracture is most commonly encountered in overdentures due to the high masticatory load, thin thickness of the denture base over the abutments and bone resorption causing the abutment to act as a fulcrum causing denture base fracture. Several approaches were

attempted to strengthen the acrylic base using different methods and materials. The aim was to improve the impact strength, fatigue resistance and transverse strength of the acrylic resin[3].

Modification of the conventional heat cured denture base to produce a co-polymerized high impact strength resin, or reinforcing the denture base with carbon fibers, glass fibers, ultra-high molecular and metal powders have been suggested.

In-vitro stress analysis studies have been widely used to provide good understanding of the nature of stresses and strains acting on dental structures, even more than in-vivo studies. This can be explained by the fact that any valid in-vivo test has to be repeated under the same conditions every time standardizing all the variables except the one under investigation which is clinically impossible. Thus, comparative studies would be more accurate and practical if they were laboratory performed.

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

Long term researches have been published evaluating the generalized effect of overdenture attachment on the lower denture and abutment supporting structures. However, little attention was directed to the effect of denture base material on the overdenture supporting structures.