EVALUATION OF THE EFFECT OF CONVENTIONAL AND FLEXIBLE ACRYLIC DENTURE BASES ON THE SUPPORTING TISSUES IN MAXILLARY SINGLE DENTURE CASES

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TO MY PARENTS

MY BELOVED HUSBAND

AND OUR LOVELY

SONS

ABDELRAHMAN & OMAR

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INTRODUCTION

Single denture is one of the subjects which attracts the attention and be in mind of most of the dentists in an attempt to prolong the life of the remaining natural teeth and relating structures. The restoration of masticatory efficiency and preservation of the remaining structures were the main objectives in the construction of complete upper dentures and lower partial dentures.

The success in fabrication of single dentures is highly dependent on it's effect on the supporting tissues beneath maxillary single complete denture. The acrylic bases in maxillary single denture cases is recommended, on the other hand the use of metallic bases is not recommended if alveolar ridge preservation was the prime concern.

Resin can be defined as a broad term used to describe natural or organic substances that form plastic materials after polymerization. They are named according to their chemical composition, physical structure and means of activation of polymerization , for example, autopolymerizing and heat polymerizing.

Acrylic resin is the most employed material in complete denture bases. This material began to be used in the 1930s. Polymethyl methacrylate is the most used acrylic resin and is characterized as being strong, having satisfactory optical properties, copying oral tissue appearances, showing low water sorption and solubility to oral tissue and having good dimensional stability. The reason for this continued popularity of the acrylic resin denture base material is the simple processing equipment required and relatively low cost of the fabrication process.

The well adapted complete dentures on good alveolar ridge move as much as 2.3mm from their original positions during mastication here there is a tendency for the borders to be broken on the other hand with the flexible denture, the forces of the

tongue and of buccal musculature act to mold the denture borders toward the alveolar ridge which maintains integrity of border seal.

Versacryl is a biocompatible intra oral thermoelastic material which adapt to tissues and teeth, and after polymerization it always remains thermoelastisc which means it may be adapted to soft tissues and teeth over and over again ,that’s why the flexible denture is preferred to the conventional acrylic resin denture because of better stability, retention and comfort .

SINGLE DENTURE

Definition

According to the academy of prosthodontics, 2005 the single denture construction was defined as the making of a maxillary or mandibular denture as distinguished from a set of complete denture.

Problems

Koper (1987) reported that the problems involved in providing comfort, function, proper esthetics and retention for the maxillary complete denture in patients with natural opposing dentition can be challenging.

Ghadiali et al., 2007 said that the clinical factors related to single denture failure include mandibular occlusal plane, high frenal attachment, occlusal scheme, occlusal forces, denture foundation, denture base thickness.

I. The forces delivered to the single denture

1-Opposing occlusion

Bergman et al (1985) compared the bone resorption of the anterior maxilla in patients wearing complete maxillary dentures opposing three different mandibular status (l) complete dentures, (2) complete set of natural teeth, (3)anterior teeth only. A significantly greater bone resorption was found in the third group.

Kaddah et al., (1998) clarified that the single denture that occludes against natural teeth must often be the loser because of the firmness and rigidity by which the natural teeth are retained in the bone, even in the presence of severe periodontal disease.

Gupta et all, (1999) noticed increased pressure in the anterior maxillary region during occlusion and loss of posterior occlusal contact in one or both sides in edentulous subjects rehabilitated with mandibular implant supported

prosthesis**.** However the magnitude often exerted, when natural teeth in one arch are opposed by a complete denture is variable and not always tolerated without deterioration of bone ***(Miyaura et al 2000, Rahn and heartwell et al 2002)***

2-Position of artificial teeth and load levels

Complete maxillary dentures are subjected to significant variations of force. The influence of tooth position on the stress patterns of a complete maxillary denture during gradual load increase hasn't been determined.

Prombonas et al., (2002) measured the effects of the position of artificial teeth and load level on stress patterns in the complete maxillary denture in which 2 groups of complete maxillary denture were fabricated with different tooth positions (group 1 with teeth on the crest of the ridge, group 2 with buccal position of the teeth). They found that the high anterior tensile stress with stable orientation and the lower posterior stresses with variable orientations during loading may be responsible for denture base fractures that initiate from the anterior palatal area. The pattern of these stresses might also be responsible for the clinically observed characteristics of crack propagation.

3-Type of food

Kossioni et al., (1998) reported that the harder the food required the higher the chewing rates and forces delivered, also higher electromyographic activity and higher relative contraction times which is accomplished by shorter cycle duration.

4-occlusal table width

Phoenix et al., (2003) reported that the pressure for the average chewing strokes was decreased when decreasing the occlusal table width.

5-cusp height and occlusal anatomy

The selection of cusp height of artificial teeth was said to be greatly dependant on the cuspal form of the opposing natural ones-However, ***Khamis et al., (1998)*** explained the most important aspects in single denture construction would be to avoid contact between opposing inclined

planes in centric occlusion and to ensure that the final occluded position of the teeth only transmitted vertical and no horizontal forces.

6-Area of denture base coverage

Thiel et al., (1996) Dirscoll and Masri (2004), clarified that the maxillary complete denture should incorporate border seal and tissue detail to ensure retention and enhance stability, which decrease trauma to the underlying supporting structures.

7-Tooth material

Cibirka et al., (1992)and Kaddah et al (1998), reported that acrylic resin teeth wore easily, so that their occlusal surface altered and became inefficient in five to seven years with loss of comminuting ability on the contrary , porcelain teeth maintained the comminuting efficiency and their occlusal anatomy for years. The maintenance of adequate sluice ways or escapes for food avoided the need for excessive pressure or vertical forces.

8-age and sex

Fontijn-Tekamp et al., (2001), studied the bite force in three groups of patients with (a) complete denture, (b) implant –mucosa borne overdentures and (c) implant borne overdentures retained by transmandibular implants and found that the mean maximum bite force differed significantly between men and women and implant groups versus the complete denture ones.

9-occlusal plane and occlusal balance

The most common cause of difficulty with the occlusion is the occlusal plane of natural teeth .Tipped and extruded teeth are often the result of premature loss of teeth together with delay in obtaining replacements. Therefore, it is important to study and correct these occlusal interferences by grinding, placing restorations or even by surgery of the maxillary arch. ***Zarb et al (1990), Kaddah et al (1998), Rahn and Heartwell*** (***2002).***

10-Maxillomandibular Relationships

Changes as a result of tooth extraction generally could end with a smaller maxilla, when compared with the dentulous state. The discrepancy in size between the maxillary and mandibular arches complicated the

prognosis of the denture, because of the dislodging influence of the unfavorably directed masticatory forces. ***(Denissen et al., 1993, Kawano et al 1996)***

11-Muscle Activity

Studies on the electromyographic activity of upper single denture patients showed that there was a parallel increase in the muscle activity and the chewing forces indicating the strong relation between them .(***Tallgren and tyrde 1991, Bakke et al., 2002)***

II. Fracture of maxillary denture base

Zhi (1992) reported that the material fatigue caused by the repeated alternate force is increased and the strength of base material is reduced by unsuitable processing.

Scand (1993) evaluated the damage of removable dentures and found that damaged lower skeletal dentures and acrylic partial dentures had a complete denture as the antagonist. He added that the type of dentures most commonly needing repair was the complete upper denture, where the most frequent type of damage was breakdown of the acrylic base and loosening of artificial tooth

Dogan et al., (1995) reported that midline fracture appear to be the most common problem in maxillary complete dentures, However the risk of maxillary denture base fracture was great in some patients only, because of the adverse occlusal stresses acting on the single denture, especially due to anterior hyper contact. Specific conditions that encouraged this fracture included deep labial frenal notches, midline diastema and inadequate base thickness. (***Zarb et al 1997, and El Motaiem 2001***)

Ates et al., (2000) investigated the effect of occlusal contact localization on the stress distribution in complete maxillary denture bases utilizing two dimensional finite element analysis. They found that the maximum