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Effect of Flexible Denture Base on Retention of Complete Denture

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ABSTRACT

Aim of the study: to evaluate the effect of flexible denture base materials on retention of complete denture.

Material & methods: Seven completely edentulous patients with age ranged between 45 and 55 years were selected for this study. Complete conventional heat cured acrylic resin dentures were constructed for all patients .The retention was evaluated after one and three months from dentures delivery. Another set of flexible denture base was constructed for all patients then the retention were evaluated after one and three months from denture delivery.

Results: The result of the study revealed that there were statistically significant differences in the retention between heat and flexible cured acrylic resin denture bases (p value <0.001).

Conclusion: from This study it is concluded that the flexible heat acrylic resin denture base improve retention of complete dentures.

KEYWORDS

Flexible dentures,
Heat cured, and
Retention

INTRODUCTION

Different types and designs of complete dentures are currently available as low-cost solutions. Acrylic resins were introduced in 1937 and have been used to construct the bases of complete and partial removable dentures. Among their characteristics are easy handling, good thermal conductivity, low permeability to oral fluids and color stability.

However, polymerization shrinkage is the greatest disadvantage of this material. Dimensional alteration is a critical factor for the retention

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and stability of prostheses, although some factors may compensate this effect, including water absorption by the acrylic resin, resilience of the gingival mucosa and the action of saliva [1].

Thermoplastic resins (bre-crystal) are flexible biocompatible materials,with no residual monomer and reduced water absorption with unique physical and mechanical properties to overcome too much of the limitations found in conventional acrylic resin, since they offered better denture adaptation as well as denture retention because of their light weight and because of engaging more desirable undercuts. These materials offer excellent esthetics combined with favorable physical properties and easy processing characteristics[2].

Flexible dentures are generally used when traditional dentures cause discomfort to the patient that cannot be solved through relining. Flexible dentures are not the same as a soft reline for traditional dentures. Soft relines use a soft putty-like substance to separate gums from the hard acrylic in dentures. Flexible dentures use a special flexible resin that prevents them from injuring the gums, allows the wearer to chew properly. It also provides a soft base that prevents the gums from being rubbed raw [3].

The retention of a complete denture is directly related to the adaptation of the base to the supporting oral tissues. The physical forces that determine the retention of a complete denture are surface tension, adhesion, cohesion, saliva film thickness and atmospheric pressure. Retention is optimized when the interfacial film thickness is reduced and a thin film of saliva exists between the mucosa and the tissue surface of the denture. The more dimensionally stable and accurate the base, the more intimate the adaptation will be to the oral tissues and retention will be maximized [4] .The aim of this study was to evaluate the effect of flexible denture base on masticatory efficiency and retention of complete denture.

MATERIALS AND METHODS

Seven completely edentulous patients with age ranged between 45 and 55 year were selected for this study. Patients were free from any systemic diseases, oral pathologies, TMJ disorders or bone diseases. All patients had Angle's class I jaw relationship and enough inter-arch space. Their ridges had adequate contour, which covered with firm and healthy mucosa.

Dentures were constructed following the conventional clinical and laboratory techniques. All patients were received heat cured acrylic resin complete maxillary and mandibular dentures. All patients were instructed to use their dentures for one month as minimal adaptation period after delivery. The retention was evaluated after one month and three months from heat cured acrylic resin denture delivery.

Another set of complete denture was constructed from flexible denture base material for each patient .The same steps as heat cure acrylic resin denture base but thermoplastic acrylic resin material (bre-crystal) was used for constructing of flexible denture bases .The artificial cross-linked acrylic resin teeth are mechanically attached to this type of denture base material. The mechanical means of retention were prepared in the artificial teeth before setting. Special types of flasks were used with the thermopresscomplete denture base materials, during flasking the injection channels were attached as close as possible to injection opening of the flask and the model.

Complete dentures were prepared with the set-up teeth prior to being finally invested in the flask. Plaster was invested into the flask. The flask was placed in boiling water for wax elimination .The flask was opened. The remaining residues of wax were removed. The thermopress acrylic resin was supplied in the form of crystals this supplied materials is called "thermopress 400 system" .The thermopress complete denture were processed with the injection molding technique. Laboratory remounting

was carried out. The dentures were then removed from the casts and finished according to the conventional procedures.

All the patients received upper and lower flexible acrylic resin dentures, the dentures were examined for proper extension; retention, stability and fine adjustment of occlusion was carried out. Retention was evaluated after one and three months from delivery of flexible acrylic resin dentures.

Retention test

The retention device, that allows applying an increasing vertical upward force on the denture, is composed of: Attachment part , Chin rest ,and Universal testing machine (this machine provides accurate reading for the force needing to dislodge the denture vertically) .The patient was instructed to sit in an upright position and keep his chin firmly seated on a chin support . The bar was rigidly connected to the denture and the attachment part of the universal machine was adjusted. The device was subjected to a slowly increasing vertical load (10mm/min) until the denture was totally out of place. The load at dislodgment manifested by an audible sound tuck and confirmed by a sharp drop at load-deflection curve recorded using computer software (nexygen-MT-4.6; Lloyd instruments) and this value was recorded in Newton. The test was repeated five times to obtain 5 records, the mean of which was calculated. This test was performed for each denture after one month and three months from delivery.

Statistical analysis

Statistical analysis was performed with IBM SPSS Statistics Version 20 for Windows. P-values ≤ 0.05 was considered statistically significant in all test, and student t-test was used to detect significance between both types of dentures at all follow up time, while percentage analysis was performed to express patients' satisfaction level. The significance level was set at P ≤ 0.05.

RESULTS

Comparison between types of denture base materials

After 1 month as well as 3 months, flexible denture base material showed statistically significantly higher mean retention value than conventional denture base material (Table 1, Fig. 1).

Table 1. *Mean, standard deviation (SD) values and results of paired t-test for comparison between retention values of the two types of denture base materials*

Time	Conventional		Flexible		*P*-value
	Mean	SD	Mean	SD	
1 month	5.23	1.61	11.25	2.83	**<0.001***
3 months	5.44	1.57	11.44	2.88	**<0.001***

**: Significant at P ≤ 0.05*
ns: non-significant (P ≤ 0.05)

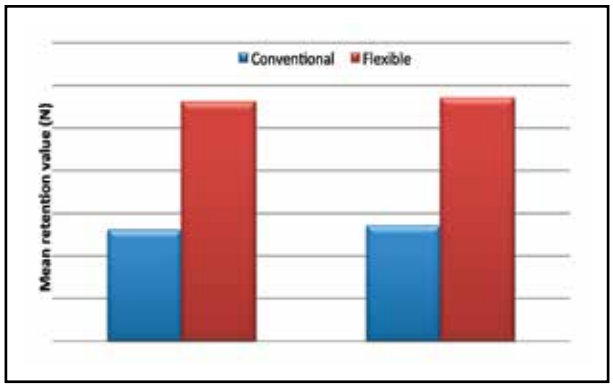

Fig. (1) Bar chart representing comparison between mean retention values of the two denture base materials

DISCUSSION

Complete denture should be retentive to achieve its goals as speech, mastication, esthetics and patient comfort. To achieve such needed retention, the denture base should be an exact replica of the patient's mouth to allow for close adaptation of the denture to the tissues. This study dealt with two different denture base materials (Conventional heat cured acrylic

resin and Flexible acrylic resin) and their effect on the retention of complete denture.

Seven male patients were selected for this study, due to more cooperation in following good oral hygiene instruction [5]. The age of the selected patient ranged between 45-55 years. Very old patients were excluded to avoid muscle atrophy due to senility that may affect muscle activity. Besides, this age range reduced the effect of age variability on the muscle activity and chewing ability and to create a relative homogeneity of the patient population [5].

The edentulous ridge had normal morphology and cover with firm healthy mucosa to ensure favorable conditions for prosthetic procedures. These patients had no prosthetic experience in denture wearing to eliminate the expected adaptation of the muscles to the denture that mask the results [6].

Retention test was performed using NEXYGEN from Lioyd Instrument, which is a universal testing machine with a standardized accurate device for measuring retention. A new attachment was made to help measurement of retention of complete denture in the patient mouth [7].

The patient head position was perpendicular to the long axis of the body, this allowed even distribution of the forces exerted on the denture base. Patients were asked to fix their heads during the steps of examination, because any changes in head position may alter the direction and length of traction. Patient's muscles were relaxed to avoid unwanted tension when the test was set up to guarantee more accurate result [8].

The retention device is very sensitive as when device's sensitivity increases, this increases the device ability to read the smaller values of forces thus giving accurate records. The device has a very sensitive load cell (grade 0.5%) that can start measuring from the zero Newton of force (as the manufacturer claimed) [7].

It's important that patient perceive their denture as retentive during function and as esthetically agreeable in order to meet the psychodynamics required by the patient [9].In this study denture retention obtained by using two different denture base materials, conventional heat cured acrylic resin and heat cured thermoplastic resin, was compared.

It was obvious that the retention of the flexible acrylic resin of complete denture was higher than that of the conventional heat cured acrylic resin, this may be attributed to maximum adhesion of flexible acrylic resin to underlying mucosa.

It's important that patient perceive their denture as retentive during function and as esthetically agreeable in order to meet the psychodynamics required by the patient [9]. After one month, both type of dentures showed statistically significant increase in retention values, because each material seemed to behave in a negative way differently, where the conventional resin has been assumed significantly higher water sorption than the flexible resin [10]. After three months, the two type of denture showed statistically non-significant increase in retention values over retention values at one month, this might be due to the neuromascular control and patients adaptability to their dentures. But still when we compared the retention values at three months of the flexible acrylic resin and the conventional heat cured acrylic resin, flexible acrylic resin showed statistically significant higher retention values over the conventiona lheat cured acrylic resin [9].

CONCLUSION

The study concluded that the retention was improved after delivery of flexible acrylic resin denture rather than conventional heat cured acrylic resin denture.

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