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EVALUATION OF RETENTION OF A RECENTLY SUGGESTED FLEXIBLE DENTURE BASE MATERIAL

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EVALUATION OF RETENTION OF A RECENTLY SUGGESTED FLEXIBLE DENTURE BASE MATERIAL

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ABSTRACT

Purpose was to evaluate the retention of thermo-elastic acrylic resin versus conventional heat cured acrylic resin. **Material and Methods:** Ten completely edentulous patients were divided into two groups, patients in this first group received one maxillary and mandibular complete denture made of conventional heat cured acrylic resin, and wearing it for one month, and then the mandibular denture was replaced by another one whose denture base was made of thermoelastic acrylic resin. Patients were instructed to wear the dentures for one month before evaluation of retention. While in the second group, the other patients received one maxillary conventional heat cured acrylic complete denture and one mandibular thermo-elastic denture, and wearing it for one month, and then the mandibular denture was replaced by another one whose denture base was made of conventional acrylic resin. Patients were instructed to wear the dentures for one month before evaluation of retention. **Results:** The results of this study showed thermo-elastic mandibular denture base had recorded statistically significant higher retention mean value than conventional cured mandibular denture base $p \leq 0.001$. **Conclusion:** Thermo-elastic heat cured acrylic resin (versacryl) denture exhibit more retention than that of the conventional heat cured acrylic denture.

INTRODUCTION

Wearing complete dentures for some patients is disturbing and problematic. The most frequent complains concerning the complete denture are retention and stability. Such problems become worse with the mandibular complete dentures because of their limiting bearing area and the unfavorable distribution of occlusal forces leading to increase in rate of bone resorption ⁽¹⁾.

KEYWORDS

Complete denture,
flexible acrylic, retention.

- Paper extracted from Master thesis entitled " Evaluation of Retention of a Recently Suggested Flexible Denture Base Material"

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Poly methyl methacrylate became the most commonly used denture base material, since it was introduced in 1937. However, during using this material some problems had been encountered, such as presence of unilateral or bilateral undercuts that complicate the fabrication of denture prosthesis ^(2,3).

Researches have been done to improve the quality of complete dentures retention through using flexible dentures. Patients wearing flexible dentures have more comfort and improved masticatory efficiency compared to those wearing conventional hard acrylic dentures ⁽⁴⁾.

They also have the ability to act as a cushion during functional movements to distribute forces and to enhance denture retention by close adaptation to the supporting tissues and engagement of undercuts ^(1,5).

A multipurpose thermo-elastic acrylic resin material called "Versacryl" was introduced in the last decade that allows the prosthodontists to improve retention, esthetics and comfort for the patients ^(6,7). Thermo-elastic acrylic not only improve adaptation to tissue but also it can utilize existing undercuts without altering the position of the artificial teeth, hence the occlusion of the prosthesis ⁽⁸⁾.

MATERIAL AND METHODS

Ten completely edentulous patients were selected from the outpatient Clinic of the Removable Prosthodontic Department; Faculty of Dental Medicine, Al Azhar University for Girls. Patients' ages ranged from 55-60 years, free from any systemic diseases which may affect denture retention, the residual alveolar ridges had moderate height and width, without any signs of inflammation or flabby tissues, all patients had mild to moderate lingual undercuts. All patients accepted this dental treatment and informed about the steps of this study and signed a written informed consent.

The patients were divided into two groups.

First group

Complete denture construction

Five patients in this group received one maxillary and mandibular complete denture made of conventional heat cured acrylic resin (Heat cured acrylic resin, Vertex-B. V, Netherlands). Patients were asked to wear the conventional denture for one month, after that they were called for measuring the retention of the mandibular conventional denture.

A digital force meter (Untied States) was used to measure denture resistance to vertical displacement (i.e., retention) by applying a pulling force on a metal hook located in the geometric center of each mandibular conventional denture that was identified on the lower cast at the intersection of three lines bisecting the angles of the triangle, formed by both retromolar pads and the midline (Fig.1).



Fig. (1) Geometric center of lower denture.

Measurement of mandibular denture retention:

The patient was instructed to place his head on chin rest and occlusal plane was set parallel to the floor (Fig.2).

Tongue freedom was then checked and 3 minutes seating time was allowed before taking the measurements.

The metallic probe of the digital force-meter was attached to the hook present at the geometric center of mandibular denture and a vertical pulling force was used to pull the denture. Average value of six readings was recorded.



Fig. (2) Measuring retention of mandibular denture

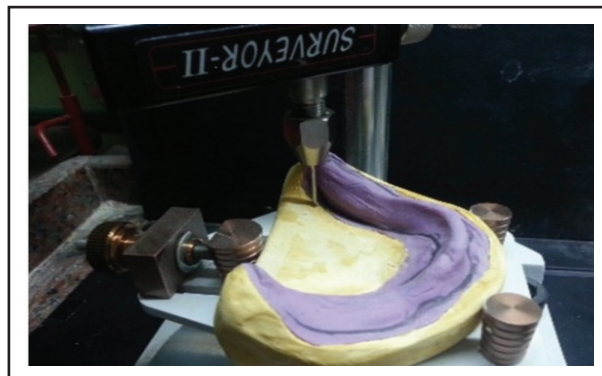


Fig. (3) Surveying and underlining lingual undercut.

Duplication Procedures

Putty polycondensation silicone (Labosil shore 90, silicone putty, Italy) was added to the entire fitting surface of the denture, a scalpel knife blade was used to make grooves in putty while it is soft for stone retention, a mix of dental stone (Zesus Dental stone hard type, Italy) was placed onto the soft material and the remainder of the dental stone was vibrated into the lower half of the flask. After the stone has set, separating medium was applied to the exposed surface of the stone.

A uniform layer of silicone rubber was applied to the polished surface of the denture and to the teeth, the scalpel knife was used to make grooves in unset silicone material for stone retention. The upper half of the flask was placed in position on the lower half, and the flask was completely filled with stone before the silicone rubber has set. After the stone has set, the two halves of the mold were separated and the denture was removed.

Construction of Thermo-elastic resin denture

The mandibular denture constructed from versacryl (Heat cured resin, Keystone industries. NJ. USA) material was divided into two main areas. Area A: all denture bearing area except lingual pouch, Area B: lingual pouch area which represent undercut area. Each area constructed with a different hardener - softener (liquid A: liquid B) ratio. The duplicate mandibular cast was surveyed to underline the lingual undercut (Fig 3).

Patients were asked to wear the thermo-elastic resin denture for one month, after that they were called for measuring the retention of the thermo-elastic resin denture as was mentioned before.

Second group

Same steps for construction of maxillary conventional denture and mandibular thermo-elastic resin denture were followed as first group, except before processing, the mandibular master cast was surveyed first.

Patients were asked to wear the maxillary conventional denture and mandibular thermo-elastic resin denture for one month, after that they were called for measuring the retention of the mandibular thermo-elastic resin denture as was mentioned before.

Mandibular thermo-elastic resin denture was taken from the patient and a duplicate conventional one was made. Two weeks interval as a washing period between the mandibular thermo-elastic denture and its duplicate which constructed from conventional heat cured resin material.

Construction and duplication of conventional denture:

Same steps for processing and duplication of conventional denture were followed as first group.

Patients were asked to wear the maxillary and mandibular conventional denture for one month, after that they were called for measuring the retention of the mandibular conventional denture as was mentioned before.

RESULTS

This study was performed to compare the retention of conventional heat cured and thermo-elastic heat cured acrylic resin in ten completely edentulous patients. The results of this study were collected, tabulated and statistically analyzed.

Mean and standard deviation of the retention force for the two study groups at the follow up appointments are summarized in Table 1 and Figure 4.

Table (1): Comparison of retention results (mean \pm SD) between conventional and thermo-elastic mandibular dentures after one month

Time interval	First group (Conventional)		Second Group (Thermo-elastic)		P value
	Mean	\pm SD	Mean	\pm SD	
After 1 month	6.5	0.3	12.7	0.3	<0.001*

*: Significant at $P \leq 0.05$

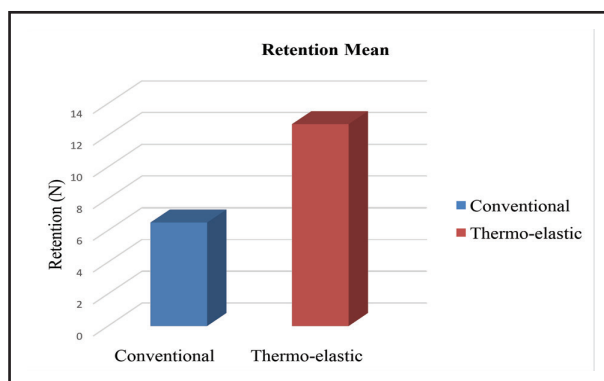


Fig. (4) 3D Bar chart representing mean for retention values between conventional and thermo-elastic mandibular dentures.

The statistical analysis using Paired t-test showed significant difference between both denture bases at ($P = 0.001 < 0.005$). where thermo-elastic mandibular denture base had recorded statistically significant higher retention mean value than conventional cured mandibular denture base.

DISCUSSION

This study was designed as a prospective comparative clinical and laboratory trials. The success or failure of an oral prosthesis depends upon several factors including the technical and planning skills of the prosthodontics, the physical and mechanical properties of the material used and the health and tolerance of oral tissues⁽⁸⁾.

Retention and stability in mandibular complete denture are important in newly delivered dentures to gain patient satisfaction^(1,9).

The results of this study showed apparently a clear superiority of the retention of the thermo-elastic acrylic resin "Versacryl" mandibular complete denture than that of the conventional heat cured acrylic resin. Thermo-elastic acrylic resin "Versacryl" showed statistically significant higher mean retention value than conventional acrylic resin, this may be attributed to the intimate adaptation and settling of the thermo-elastic denture to the underlying resilient mucosa. "Resiliency and like effect" "Realeff"⁽¹⁰⁾.

Mechanical factors in addition to the physical ones related include atmospheric pressure, peripheral seal and intimate contact between thermo-elastic denture base and supporting structures⁽¹⁾.

Similar results were attained by previous study that used a mandibular complete denture whose lingual flange was made of thermos-elastic acrylic resin. Effective engagement of the lingual flange with the undercut and the intimate contact with the underlying tissue explained such results^(1,3,11).

Another study proved that conventional acrylic resin assumed significantly higher water sorption

than the thermo-elastic resin. Water sorption was definitely associated with some dimensional changes. When these changes happen in the lingual flange area, they most probably cause distortion, thereby “negatively” affecting the denture adaptation, border seal and retention. This explains the increase in retention of “Versacryl” a higher rate than the conventional acrylic resin ⁽¹²⁾.

CONCLUSION

Within the limitations of the present study, the following conclusion was obtained.

The use of thermo-elastic acrylic resin denture base material in the construction of mandibular complete dentures resulted in improved denture retention.

Further investigations will need to be carried out for a long follow up period.

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