

ORIGINAL RESEARCH

Assessment of the flexural strength of heat-cure acrylic denture base resin by denture cleansing and plant extract immersion

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ABSTRACT:

Background: Different types of chemical solutions have been recommended for denture disinfection. An ideal denture cleanser should be biocompatible, bactericidal, fungicidal, harmless, and nontoxic to the structure of denture; should be effectively remove deposits; and should be easy to use. **Material and method:** 90 heat cure acrylic samples were incorporated in this study. All samples had uniform dimensions and shape (50mm×30mm×3mm). These samples were divided into 3 groups based on the material to be used for immersion. The first group of samples were immersed in distilled water. The second and third group of samples were immersed in denture cleaner and thyme essential oil respectively. A 3-point bending test till fracture was used to evaluate the fracture strength with the help of universal testing machine. **Results:** Control group recorded a mean value of 80.2 Mpa. The mean values of group 2 and group 3 were 87.6 and 92.4 Mpa respectively. The one way ANOVA analysis data showed statistically significant decrease with a P-value of .03. **Conclusion:** Thyme essential oil showed better flexural strength of acrylic resin than immersed in denture cleanser and control group.

Key words: Thyme essential oil, heat cure acrylic resin, denture cleaner.

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INTRODUCTION

In the majority of population, the loss of teeth is a matter of concern and their replacement is done by removable or fixed artificial substitutes. Removable prostheses are fabricated using polymethyl methacrylate (PMMA) resin and nylon-based plastic (polyamide)¹. Adequate mechanical properties, sufficient esthetics, hygiene, and easy handling are basic requirements for denture base polymers. In long-term use, denture base material can get colonized and infected by microorganisms².

Denture cleansing plays a pivotal role in maintaining the denture free from microflora. It is crucial both for esthetic concerns and in maintaining health of the patient by preventing denture-related stomatitis. It is a known fact that the dentures that are cared for daily, heighten patient's sense of well-being by keeping the tissues in the mouth healthy and free from unfavorable changes³.

Denture can be cleaned mechanically, chemically, or by combination of these methods. Different types of chemical solutions have been recommended for denture disinfection. An ideal denture cleanser should be biocompatible, bactericidal, fungicidal, harmless, and nontoxic to the structure of denture; should be effectively remove deposits; and should be easy to use⁴.

If routine use of denture cleansers affects the physical properties like flexural strength or surface roughness of denture base resin then it may be more detrimental to the prosthesis rather than improving its longevity. Thus, choosing an appropriate cleanser is of paramount importance⁵. Hence, this study was undertaken to evaluate and assess the flexural strength of heat-cure acrylic denture base resin by denture cleansing and plant extract immersion.

MATERIAL AND METHOD

The purpose of this study was to evaluate and assess the flexural strength of heat-cure acrylic denture base resin by denture cleansing and plant extract immersion. This study was undertaken in the department of prosthodontics after getting the ethical committee clearance. 90 heat cure acrylic samples were incorporated in this study. All samples had uniform dimensions and shape (50mm×30mm×3mm). Any deviation from the above size was considered as an excluded sample. These samples were divided into 3 groups based on the material to be used for

immersion. The first group of samples were immersed in distilled water. The second and third group of samples were immersed in denture cleanser and thyme essential oil respectively. A 3-point bending test till fracture was used to evaluate the fracture strength with the help of universal testing machine.

Entire data was recorded in the Microsoft excel sheets. SPSS software was used for statistical analysis. Chi square test, oneway ANOVA and student T test were use to compare the variables. P-value of less than 0.05 was considered significant.

RESULTS

In this study samples were divided into 3 groups based on the material to be used for immersion. The first group of samples were immersed in distilled water. The second and third group of samples were immersed in denture cleanser and thyme essential oil respectively (table 1).

Table I Distribution of patients

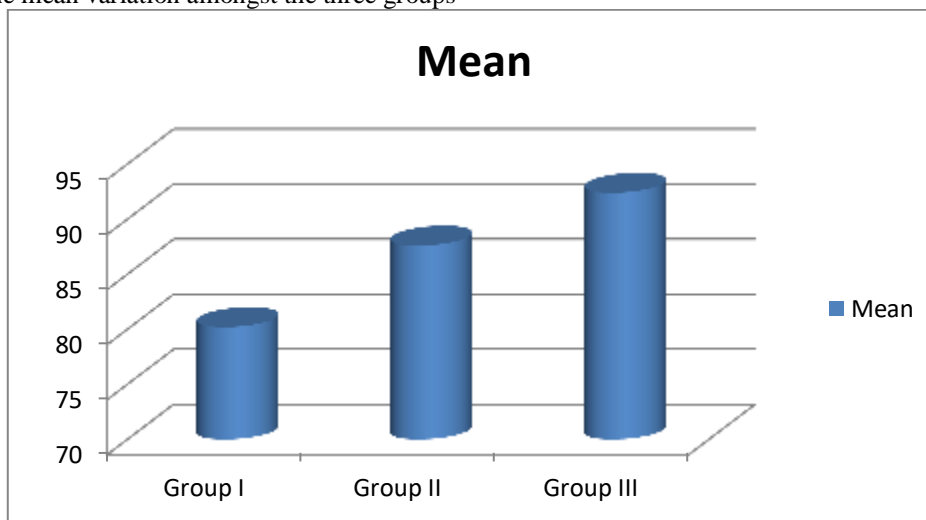
Groups	Group I	Group II	Group III
Method	Distilled water (Control)	Denture cleanser	Thyme essential oil
Number	30	30	30

The results in this study showed the mean flexural strength (S) and standard deviation for each denture cleanser. Control group recorded a mean value of 80.2 Mpa. The mean values of group 2 and group 3 were 87.6 and 92.4 Mpa respectively. The oneway ANOVA analysis data showed statistically significant decrease with a P-value of .03. (table 2) Graph 1 extrapolated the mean variation amongst the three groups.

Table II: Assessment of flexural strength

Groups	Mean	P value
Group I	80.2	0.03
Group II	87.6	
Group III	92.4	

Graph 1: The mean variation amongst the three groups



DISCUSSION

Denture cleaning being an important part in maintenance of prosthesis and reducing the oral problems, needs to be performed effectively as well as routinely. Chemical cleansing is found to be better and a recommended method especially in patients with poor dexterity and in old age people having

dementia⁶. Nevertheless, several studies indicate that denture cleanliness and oral hygiene of denture wearers are generally poor, thereby facilitating the formation and accumulation of an oral biofilm, resulting to risk of denture stomatitis⁷. Thyme essential oil was chosen as the plant extract denture cleanser to be used. Thyme essential oil is considered

to be the best antifungal and antimicrobial with least minimum inhibitory concentration (MIC) values⁸⁻⁹.

The results in this study showed the mean flexural strength (S) and standard deviation for each denture cleanser. Control group recorded a mean value of 80.2 Mpa. The mean values of group 2 and group 3 were 87.6 and 92.4 Mpa respectively. The oneway ANOVA analysis data showed statistically significant decrease with a P-value of .03.(table 2) Graph 1 extrapolated the mean variation amongst the three groups. Rizwana Anjum et al evaluated the flexural strength of heat-cure acrylic denture base resin by combination method of denture cleansing and plant extract immersion. In their study, ninety specimens of heat-cure acrylic denture base resin material were fabricated with dimensions of 65 mm × 10 mm × 3.3 mm. The specimens were divided into three groups, namely, Group I-III of thirty specimens each and were immersed in distilled water, denture cleanser, and thyme essential oil, respectively. The flexural strength of specimen was evaluated. Natural plant extract showed better flexural strength than immersed in denture cleanser and control group but statistically was not significant. The study concluded that plant extract, namely, thyme essential oil, showed better flexural strength than combination method and can be used as denture cleanser¹⁰.

The results in this study showed the mean flexural strength (S) and standard deviation for each denture cleanser. Control group recorded a mean value of 80.2 Mpa. The mean values of group 2 and group 3 were 87.6 and 92.4 Mpa respectively. Bose Babu Namala et al evaluated and compared the effect of plant extract (thyme essential oil solution) and commercially available denture cleanser on the flexural strength and surface roughness of denture base resin. A total of 90 heat polymerizing denture base material (Trevalon, Dentsply) samples were fabricated and divided into 3 groups with 30 samples each. Samples from each group were immersed in their respective denture cleanser solution (Group A- Distilled water(control); Group B- Fittydent denture cleanser; Group C- Thyme essential oil solution denture cleanser) for a simulated overnight 8hr immersion for 180 days. The samples were evaluated for increase in surface roughness and flexural strength using Tally-surf Surface Profiler and Instron Universal Testing Machine respectively. Results obtained were statistically analyzed using one-way ANOVA. hyme essential oil solution group showed minimal increase in surface roughness (ΔRa) with values comparable to that of the control group which had the least increase in surface roughness and Fittydent group showed significant increase ($P < 0.05$) in surface roughness. For flexural strength, statistically significant difference ($P < 0.05$) was observed among the three groups with Fittydent group showing the highest flexural strength followed by control group and Thyme essential oil solution group. However, the decrease in the flexural strength was not of clinical significance. Plant extract - thyme essential

oil denture cleanser was superior in preserving the surface roughness of denture base resins compared to commercially available denture cleanser. Clinically significant difference in flexural strength was not observed between the denture cleanser groups¹¹.

In the current study the oneway ANOVA analysis data showed statistically significant decrease with a P-value of .03 (table 2). Graph 1 extrapolated the mean variation amongst the three groups. Paranhos Hde et al concluded that overnight immersion in a denture cleansing solution simulating a year half of use did not alter the flexural strength which was 97.61 ± 11.09 MPa, since flexural strength depends on bulk of material, and insignificant change in flexural strength indicates that the bulk of the material remained intact from the influence of cleansers¹².

CONCLUSION

The author concluded that thyme essential oil showed better flexural strength than immersed in denture cleanser and control group. Further studies are recommended.

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