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Comparison of flexural strength in two types of denture base resins

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***Abstract*---**Background: The present study was conducted for assessing and comparing flexural strength in two types of denture base resins. Materials & methods: A total of 20 acrylic specimens were made. Stainless steel dies were made. Twenty acrylic specimens were fabricated using these stainless steel dies. The metal dies were flasked using dental plaster to complete the flasking procedure. The stainless steel dies were retrieved to create the mold space for the acrylic specimen. All the specimens were randomly divided into to study groups as follows: Group A: Conventional denture base resins and Group B: Glass reinforced denture base resins. Flexural strength of the samples was accessed using the universal testing machine. Results: Mean flexural strength of group A specimens was 109.5 MPa. Mean flexural strength of group B specimens was 139.7 MPa. While comparing the mean flexural strength between group A and group B, significant results were obtained. Conclusion: Glass reinforced denture base resins demonstrated higher flexural strength in comparison to conventional denture base resin.

***Keywords*---**Denture, Base, Resin.

Introduction

Acrylic resin polymers have been introduced as denture base materials and the majority of denture bases are fabricated using polymethylmethacrylate (PMMA). These materials have optimal physical properties and excellent esthetics with relatively low toxicity compared to other plastic denture bases. Compression molding with heat activation in a water bath for resin polymerization is the conventional method to process dentures.[1, 2] However, shrinkage and dimensional

change of denture bases during resin polymerization is unavoidable and has been well documented. Mechanical behavior of the denture base, including flexural strength, depends on the type of the material and even on processing techniques. Therefore, acrylic resins and processing methods have been modified to improve physical and chemical properties of denture bases.[3, 4] The denture base resin is subjected to various stresses during the function, these includes, compressive, tensile, shear, and impact stresses. Fractures of denture base resins are still a reported clinical problem. Flexural strength of denture base resin is considered the primary mode of clinical failure.[5, 6] Hence; under the light of above mentioned data, the present study was conducted for assessing and comparing flexural strength in two types of denture base resins.

Materials & Methods

The present study was conducted for assessing and comparing flexural strength in two types of denture base resins. A total of 20 acrylic specimens were made. Stainless steel dies were made. Twenty acrylic specimens were fabricated using these stainless steel dies. The metal dies were flasked using dental plaster to complete the flasking procedure. The stainless steel dies were retrieved to create the mold space for the acrylic specimen. All the specimens were randomly divided into to study groups as follows: Group A: Conventional denture base resins and Group B: Glass reinforced denture base resins. All the twenty specimens were immersed in distilled water for 28 days at room temperature to simulate the oral conditions. Flexural strength of the samples was accessed using the universal testing machine. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software.

Results

Mean flexural strength of group A specimens was 109.5 MPa. Mean flexural strength of group B specimens was 139.7 MPa. While comparing the mean flexural strength between group A and group B, significant results were obtained.

Table 1: Comparison of flexural strength (MPa)

Group	Mean	SD	p- value
Group A	109.5	12.5	0.000 (Significant)
Group B	139.7	15.7	

Discussion

Edentulism has been a constant companion of human race since time immemorial. Many individuals experience either complete or partial loss of dentition in their life span and in order to rehabilitate their oral condition, dentures have been the most sought after solution. The need for complete dentures is set to rise from 53.8 million in 1991 to 61.0 million in 2020. The American College of Prosthodontists, has provided facts and figures which validate the need of dentures even today and for days to come.[6- 8]

Acrylic resin/Polymethyl methacrylate (PMMA) is the most widely used denture base material till date and has undergone various modifications in order to enhance its physical and mechanical properties. Even after the modifications

acrylic resin is far from an ideal material for dentures and requires more research and breakthroughs to provide a better material.[7- 10] Hence; under the light of above mentioned data, the present study was conducted for assessing and comparing flexural strength in two types of denture base resins.

Mean flexural strength of group A specimens was 109.5 MPa. Mean flexural strength of group B specimens was 139.7 MPa. Jaikumar RA et al evaluated whether the flexural strength of a commercially available, heat polymerized acrylic denture base material could be improved using reinforcements. A total of 30 specimens (65 mm × 10 mm × 3 mm) were fabricated; the specimens were divided into three groups with 10 specimens each. They were Group 1 - conventional denture base resins, Group 2 - high impact denture base resins, and Group 3 - glass reinforced denture base resins. The specimens were loaded until failure on a three-point bending test machine. The flexural strength values showed statistically significant differences among experimental groups ($P < 0.005$). Polymethyl methacrylate (PMMA) reinforced with glass fibers showed the highest flexural strength values this was followed by PMMA reinforced with butadiene styrene, and the least strength was observed in the conventional denture base resins.[11]

In the present study, while comparing the mean flexural strength between group A and group B, significant results were obtained. Choksi RH et al assessed the effect of the addition of glass flakes on physical properties of conventional heat cure denture base resins and to compare it with a high impact strength denture base resin. Test specimens were divided into Group 1 - poly (methyl methacrylate) (PMMA) (Trevalon), Group 2 - Trevalon HI, Group 3 -5% glass flake +95% PMMA (Trevalon), Group 4 -10% glass flake +90% PMMA (Trevalon), and Group 5 -20% glass flake +80% PMMA (Trevalon). For glass flake modified groups, part of PMMA (powder) was substituted with the same weight of glass flake (GF003 m) as required, to bring it to 100% powder. Plain PMMA (Trevalon), showed the highest value of flexural strength followed by Trevalon HI. Trevalon HI (highly cross-linked PMMA) group showed the highest value of impact strength. Flexural strength of unmodified PMMA denture base resin decreases with increase in the concentration of glass flakes.[12]

Conclusion

Glass reinforced denture base resins demonstrated higher flexural strength in comparison to conventional denture base resin.

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