



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: In this study, two distinct denture base resin types were compared and evaluated for their flexural strength. A total of 50 acrylic samples were produced. They created dies made of stainless steel. Twenty acrylic samples were produced using these stainless steel dies. Dental plaster was added to the metal dies to complete the flasking procedure. The stainless steel dies were taken out of the mould to make way for the acrylic specimen. All of the specimens were chosen at random to form the following research teams: Denture base resins with glass reinforcement belong to Group B, while conventional denture base resins belong to Group A.

Results: Mean flexural strength of group A specimens was 180.63 MPa. Mean flexural strength of group B specimens was 213.75 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.

Key words: Denture, Base, Resin

INTRODUCTION

Polymethyl methacrylate (PMMA) resin became one of the most commonly used dental materials since it was introduced in the 1930s.^{1,2} Denture resins should have sufficient

strength and toughness to ensure dimensional stability under various temperature conditions of intraoral environment for decades.³ Nonetheless, denture fracture has been reported continuously as the main cause of denture treatment failures.⁴ According to Zarb et al.¹ 68 percent of acrylic dentures were broken within a couple of years after their delivery. This result implies that denture fracture is one of the most common failures of denture treatment.⁵ Therefore many attempts have been made to enhance mechanical properties of denture base resins by mixing additives to change microstructure and by increasing the ratio of fluid/powder.⁶⁻⁹ Additionally, various producing methods have been introduced to simplify the polymerization process and to strengthen the physical properties of dentures.^{10,11} Hence; under the light of abovementioned data, the present study was conducted for assessing and comparing flexural strength in two types of denture base resins.

MATERIALS & METHODS

In this study, two distinct denture base resin types were compared and evaluated for their flexural strength. A total of 50 acrylic samples were produced. They created dies made of stainless steel. Twenty acrylic samples were produced using these stainless steel dies. Dental plaster was added to the metal dies to complete the flasking procedure. The stainless steel dies were taken out of the mould to make way for the acrylic specimen. All of the specimens were chosen at random to form the following research teams: Denture base resins with glass reinforcement belong to Group B, while conventional denture base resins belong to Group A. All 20 samples were immersed in distilled water for 28 days at ambient temperature to simulate the oral environment. The flexural strength of the samples was evaluated using the universal testing equipment. All of the outcomes were evaluated using the SPSS programme and were kept on a Microsoft Excel spreadsheet.

RESULTS

Mean flexural strength of group A specimens was 180.63 MPa. Mean flexural strength of group B specimens was 213.75 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	p- value
Group A	180.63	0.003 (Significant)
Group B	213.75	

DISCUSSION

The commonly used resin for denture base is PMMA. It has advantage of low cost, ease of processing, easy repair and light weight. This material has also disadvantages of low strength, brittle and also exhibits large shrinkage during polymerization which leads to inaccuracy in the dimensions of hardened material. Several materials and methods have been used to improve the strength of the acrylic resin. Many studies have been done such as modifying the denture base itself to produce a co-polymerized high impact strength resin or reinforcing it with materials. Recent advances in the processing of dentures had reinforced acrylic resin with Al₂O₃ ceramic filler.¹²

The advantages of the filler is the lower density, thus the light weight of acrylic resin is retained. As the Al₂O₃ are white, therefore are less likely to alter the finished appearance of the denture base material

Hence; the present study was conducted for assessing and comparing flexural strength in two types of denture base resins.

In this study, the mean flexural strength of group A specimens was 180.63 MPa. Mean flexural strength of group B specimens was 213.75 MPa.

In a research conducted by Sharma P et al.¹³, authors assessed the impact of various chemical cleaners on the flexural strength and surface hardness of heat cure denture base resin. They fabricated 40 rectangular specimens and thirty-two disc-shaped specimens, from the heat cure denture base resin (DPI heat cure), and assessed the flexural strength and surface roughness respectively. Controls were taken from those specimens which not subjected to cleansing. All the other specimens were exposed to daily cleansing with either 1% Sodium Hypochlorite, Fittydent tablets or 100% vinegar, daily and kept in distilled water for 30 months. For assessing the change in surface roughness of the specimen's prior to and after cleansing, as designated, the surface analyzer was used. They observed that after immersion in one percent sodium hypochlorite solution for 3 months, there was significant elevation and significant decline in the surface roughness and flexural strength of the specimens respectively. However; they didn't observe any significant difference in the mechanical parameters among the specimens cleansed with fittydent and 100% vinegar for three months. From their results, the authors concluded that surface hardness and flexural strength of heat cure denture base resin is influenced by 1% sodium hypochlorite solution.

CONCLUSION

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

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