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Original Research

Comparison of flexural strength in three types of denture base resins

Dr. Varun Gupta

Professor, Department of Prosthodontics and Crown & Bridge, Daswani Dental College & Research Center, Kota, Rajasthan, India

ABSTRACT:

Background: The present study was conducted for assessing and comparing flexural strength in three types of denture base resins. **Materials & methods:**The present study was conducted for assessing serum c reactive protein levels in peri-implantitis patients. 60 acrylic specimens were prepared. Based on the type of acrylic resin used, 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. Each group was subjected to flexural strength evaluation.Flexural strength of the samples was accessed using the universal testing machine. The results were recorded and compared using SPSS software. **Results:**Mean flexural strength of Conventional PMMA group, High impact PMMA and E-glass PMMA was 105.38 MPa, 135.9 MPa and 153.8 MPa respectively. While comparing the results, significant results were obtained.**Conclusion:** The flexural strength values of heat polymerized PMMA were considerably enhanced by reinforcements.

Key words: Implant, Peri-implantitis, C Reactive protein levels

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Corresponding Author: Dr. Varun Gupta, Professor, Department of Prosthodontics and Crown & Bridge, Daswani Dental College & Research Center, Kota, Rajasthan, India

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INTRODUCTION

Polymethyl methacrylate (PMMA) remains the denture base material of choice, although being introduced in 1936. Several types of PMMA denture base resin available today are similar in composition but small variations lead to different physical properties and processing methods. Dentures made by light-activated demonstrate lower mechanical properties over heat-activated resins. The polymerization shrinkage of PMMA by ordinary compression molding method prompts inaccurate adaptation of the base material to the dental replacement bearing tissues, bringing about a poor border seal. To minimize the dimensional inaccuracies of the compression molding technique, Pryor (1942) developed the injection molding technique as an alternative. In 1970, Ivoclar company introduced a special resin for injection molding.[1- 3]

PMMA gained popularity due to its good physicochemical properties as well as its low cost and acceptable aesthetics. Nevertheless, there have been increasing concerns about some characteristics of this material, such as the frequent fractures of dentures, polymerization shrinkage, and cytotoxicity. For instance, the addition of nanoparticles and nanotubes was tested to improve the material's mechanical properties.[4- 6]Hence; the present study was conducted for assessing and comparing flexural strength in three types of denture base resins.

MATERIALS & METHODS

The present study was conducted for assessing serum c reactive protein levels in peri-implantitis patients. 60 acrylic specimens were prepared. Based on the type of acrylic resin used, 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. Each group was subjected to flexural strength evaluation.Flexural strength of the samples was accessed using the universal testing machine. The results were recorded and compared using SPSS software.

RESULTS

Mean flexural strength of Conventional PMMA group, High impact PMMA and E-glass PMMA was 105.38 MPa, 135.9 MPa and 153.8 MPa respectively. While comparing the results, significant results were obtained.

Table 1: Comparison of C Reactive protein levels

Groups	Mean	SD
Peri-implantitis group	0.899	0.227
Control group	0.232	0.128
p-value	0.001 (Significant)	

DISCUSSION

The introduction of a more satisfactory plastic denture base material occurred in 1937 when Dr. Walter Wright described the results of his clinical evaluation of methyl methacrylate resin.[1] Poly (methyl methacrylate) (PMMA) has many advantages, particularly its appearance and ease of manipulation, but it has certain poor mechanical properties. Fractures may occur in use because of its unsatisfactory transverse strength, impact strength or fatigue resistance. Attempts have been made to improve the mechanical properties of acrylic resin by giving maximum bulk to the material in the regions most heavily stressed, by copolymerization and cross-linking, reinforcement with carbon fibers. The fracture of acrylic resin dentures is an unresolved problem in removable prosthodontics despite numerous attempts to determine its causes.[6- 9]

Mean flexural strength of Conventional PMMA group, High impact PMMA and E-glass PMMA was 105.38 MPa, 135.9 MPa and 153.8 MPa respectively. While comparing the results, significant results were obtained. Jaikuamr 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.[8]

Casucci et al compared the flexural strength of different resins fabricated using different technologies (conventional, CAD-CAM-milled, and 3D-printed) and polymerization techniques. A total of 11 different resins were tested: six PMMA conventional (Acrypol R, Acrypol LL, Acrypol HI, Acrypol Fast, Acryself and Acryslef P), two milled obtained from UDMA PMMA disks (Ivotion disk and Aadva disk, control groups), two 3D-printed PMMA resins (NextDent Denture 3D+, and SprintRayEU Denture Base), and one 3D-printed composite resin (GC Temp Print). Flexural strength was measured using a universal testing machine. One-way ANOVA and Bonferroni post hoc tests were performed; the p-value was set at 0.05 to consider statistically significant differences among the groups.: CAD-CAM-milled specimens showed the highest flexural strength (107.87 MPa for UDMA) followed by 3D-printed composite resins (102.96 MPa). Furthermore, 3D-printed resins polymerized for 40 min with the BB cure unit showed no statistically significant differences with conventional resin groups. Moreover, in all the 3D-printed specimens, a high correlation between polymerization technique and flexural strength was found. In terms of flexural strength, the polymerization technique is a determinant for both acrylic and composite resins.[9]

CONCLUSION

The flexural strength values of heat polymerized PMMA were considerably enhanced by reinforcements.

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