Short Communication

Comparison of Mechanical Strength of Palatal Denture Bases Made from Various Plastic Materials

Wieslaw Hedzelek, Prof Dr Med Dent[a]/Przemyslaw Gajdus DDS, PhD[b]

Purpose: The aim of the study was to compare the mechanical strength of palatal denture bases made from various plastic materials. ***Materials and Methods:*** A form and models of an edentulous jaw (Frasaco) were used in the study. The denture bases were made from Zhermacryl H Plus and SR Ivocap Plus (both acrylic resins) and the polyurethane Microbase. Five samples were fabricated for each of the studied polymers. The fracture tests were carried out on a universal testing machine (Hounsfield H5KS). ***Results:*** The highest fracture values were assessed on Ivocap specimens. The indicated differences between acrylic resin specimens made of Ivocap and Zhermacryl were not statistically significant. In turn, the differences shown between 2 acrylic resin palatal denture bases and the Microbase were statistically significant ($P < .05$). ***Conclusion:*** In this study, samples made from an alternative denture base polymer showed poorer mechanical strength as compared with those made of polymethylmethacrylate. *Int J Prosthodont 2006;19:193–194.*

Acrylic resins constitute about 90% of the polymeric materials used in prosthetic dentistry. However, they are not devoid of drawbacks. Their weaknesses include poor resistance to trauma and abrasion, as well as changes in volume and shape during fabrication and use. The search for more resistant materials and new technologies to produce removable dentures led to the development of acrylic resins, which have been crosslinked and modified with rubber graft copolymer, and also to materials without monomers, promoted as possessing greater mechanical strength.[1–3]

[a]*Professor and Head, Department of Prosthetic Dentistry, University of Medical Sciences of Poznan, Poland.*
[b]*Assistant Lecturer, Department of Prosthetic Dentistry, University of Medical Sciences of Poznan, Poland.*

Correspondence to: *Prof Wieslaw Hedzelek, Department of Prosthetic Dentistry, University of Medical Sciences of Poznan, Bukowska 70 str, 60-812 Poznan, Poland. E-mail: hedzelek@amu.edu.pl*

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The aim of the study was to compare the mechanical strength in fracture test of palatal denture bases made of 2 different types of acrylic resins and those made of a polyurethane.

Materials and Methods

For the manufacture of palatal denture bases made from various plastic materials, a silicon model of an edentulous jaw (Frasaco) was made after stone models were cast. On each working cast, a baseplate 1.5 mm thick was extruded from a thermoforming foil in an Erkopress apparatus. This element maintained a constant range between the working cast and a double in the polymeric flask. Palatal denture bases were then produced from each of the following materials: Zhermacryl H Plus (Zhermapol), SR Ivocap Plus (Ivoclar/Vivadent), and Microbase (Dentsply DeTrey), according to technologies of their polymerizations recommended by manufacturers. Five samples were produced for each of the studied groups.

The specimens were stored in water at room temperature for 4 weeks prior to testing. The fracture tests were carried out on a universal testing machine

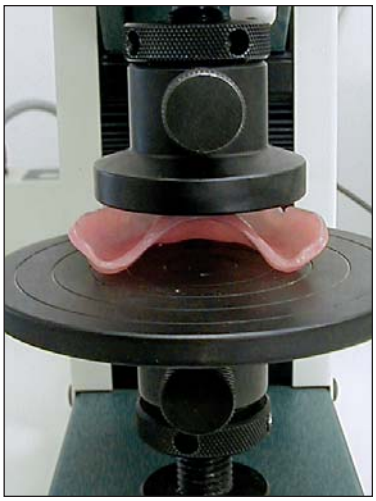

Fig 1 Palatal denture base on a testing machine (Hounsfield H5KS).

Table 1 Mechanical Strength of Palatal Denture Bases

Sample no.	Zhermacryl H Plus	SR Ivocap Plus	Microbase
1	409 N	441 N	190 N
2	441 N	701 N	201 N
3	538 N	458 N	179 N
4	719 N	713 N	211 N
5	512 N	596 N	185 N
Total	2,619 N	2,909 N	966 N
Average	523.8 N	581.8 N	193.2 N
Max average bend	29.73%	40.06%	19.61%

Table 2 Statistical Analysis (Student *t* Test) of the Results

Comparison	Average strength (N)	SD	Difference of average	Difference in SD	*t*	df	Significance*
SR Ivocap Plus	581.8	129.20	58	127.77	1.015	4	.3675
Zhermacryl H Plus	523.8	120.91					
Microbase	193.2	12.81	330.6	115.06	6.425	4	.0030
Zhermacryl H Plus	523.8	120.91					
SR Ivocap Plus	581.8	129.20	388.6	119.08	7.297	4	.0019
Microbase	193.2	12.81					

*Significant when $P < .05$.
SD = standard deviation; df = degrees of freedom.

(Hounsfield H5KS) at a crosshead speed of 10 mm/min. The palatal denture bases fractured at a force of 5,000 N (Fig 1). Results were submitted for statistical analysis (Tables 1 and 2).

Results

The highest mean fracture values of 581 N were obtained from Ivocap specimens. In turn, the lowest mean fracture values were found with Microbase denture bases (193.2 N). The mean fracture value of Zhermacryl specimens was 523.8 N. The differences in the strength of denture bases made of Ivocap and those made of Microbase were statistically significant ($P < .05$). The difference between palatal denture bases made of Microbase and those made of Zhermacryl was also statistically significant ($P < .05$). However, the differences in strength between specimens made of acrylic resin polymers (Ivocap and Zhermacryl) were not statistically significant.

Conclusions

Within the limits of this study, palatal denture bases made of an alternative polymer (Microbase) showed poorer mechanical strength than those made of polymethylmethacrylate (Zhermacryl H Plus and SR Ivocap Plus).

References

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