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COMPARATIVE STUDY OF FLEXURAL STRENGTH IN THERMOFORMABLE DENTURE BASE RESINS

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ABSTRACT

This paper compares the flexural strength of resins used as denture base with a three-point bending flexural test. Three different formulations of denture base materials were analysed: heat-curing resin in total volume (Ivoclar Probase Hot™), self-curing and thermoformable resin compound (Ivoclar Probase Cold™ and Good Fit™) and thermoformable resin in total volume (Good Fit™). The result of these mechanical tests showed that the thermoformable resin has similar or even higher resistance to fracture compared to the heat-curing resin.

Keywords: denture, resin, thermoformable, flexural.

INTRODUCTION

Polymethylmethacrylate (PMMA) is currently the most widely used material of denture base, whether are they removable or fixed. The easy handling, precise adjustment, low cost, oral cavity stability and superior aesthetics contribute to the selection of this material (Jaikumar, 2015). Despite these excellent qualities, its mechanical properties still fall short regarding the flexural strength (Ali, 2008). Denture base fracture occurs mainly during oral function due to the fatigue of the acrylic resin, which often leads to a midline fracture (Gurbuz, 2010).

The main objective of this study was to analyse the mechanical properties of the thermoformable resin in order to compare them with the conventional resins.

A total of 30 samples divided in three groups were manufactured according to the specified ISO 1567 dimensions, 65mm, 10mm and 3mm in length, width and height, respectively. The samples were submersed in distilled water at 37ºC for 72h. The three-point bending flexural test was performed on a universal test machine. The support span used was 45mm, displacement rate was 5mm/min and load cell was set at 500kgf.

The flexural strength, in MPa, was calculated using the formula $S = 3FL/2BD^2$

(F = maximum load, L = span distance, B = width, D = height)

One-way ANOVA was used to determine statistical differences among the three groups.

RESULTS AND CONCLUSIONS

The results from the three-point bending test regarding the flexural strength are shown in Table 1.

Table 1 - Flexural strength (in MPa)

	Group 1	Group 2	Group 3
	112,41	86,80	74,63
	99,78	109,64	104,38
	107,67	58,79	103,13
	104,08	112,07	113,59
	104,53	140,88	100,70
	93,17	96,14	92,09
	97,29	81,68	94,73
	108,38	90,41	113,45
	78,12	92,74	144,28
	108,80	92,09	127,30
Mean ± Std. Deviation	**101,42 ± 9,54**	**96,12 ± 20,47**	**106,83 ± 18,36**

The mean value and standard deviation of the flexural strength are presented in Figure1.

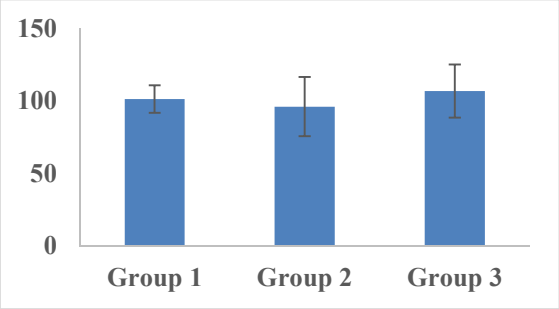

Fig. 1 - Average value of flexural strength (in MPa)

One-Way ANOVA showed there were no significant statistical differences ($p > 0,05$).

This study shows that the thermoformable resin may have slight higher flexural strength comparatively to the conventional heat-curing resin. Further studies and clinical applicability are required to confirm this denture base resin as a viable and possible superior option.

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