Research Article

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Study of Adaptation Accuracy of Different Injection Molded Resin

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ABSTRACT

Aim: The aim of this study is to compare the adaptation accuracy of a maxillary complete acrylic denture base processed using injection-molding technique by using two commercially available PMMA resins (Brecrystal and Ivoclar).

Materials & Methods: Exact fitting dentures of the same dimensions were fabricated from 14 master cast. These were made from the high-quality silicone molds. As per the manufacturer instructions Injection molded dentures of Brecrystal and Ivoclar were polymerized.

Results: The statistical correlation between both the sections for the two denture base materials. One-sample t-test was applied to correlate the values of both the sections of individual materials. It has been found that a highly significant correlation was observed for section A, whereas Section B showed a significant correlation for Ivoclar denture base material.

Conclusion: a relatively higher fit of the denture base may be helpful in reducing the initial adaptation period of the denture wearer.

Keywords: PPMA, brecrystal, ivoclar.

INTRODUCTION

Polymethyl methcrylate (PMMA) is the solitary recognized material for a effective denture base on account of its optimum physical properties and an outstanding esthetics with relatively low noxiousness compared to denture bases.[1,2] The traditional method of processing acrylic resin in a closed flask with heat activation resulted in shrinkage of the resin and this led to distortion of denture bases.[3] This supplementary effect results in movement of the prosthetic teeth and surges the gap among the denture base and the original mucosa which evidently compromise the retention and stability in complete dentures.[3] This distortion often leads to distortion of the periapical seal and, also leads to increase the volume of space below the denture. These factors lead to instability of denture.

Alternate to the conventional compression molding system several methods have been developed to increase the adaptation of the denture base. One such newer methods is injection molding technique. This method was presented to eradicate the flash of resin between the splits of the flask that compensated for polymerization shrinkage,[4] by

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compressing additional resin into the flask during polymerization. At the current situation, the accuracy, adaptation, and dimensional change have become an area of grave concern in removable prosthodontics. Some researches have suggested that an accurate fitting is a key factor for denture retention.

The aim of this study is to compare the adaptation accuracy of a maxillary complete acrylic denture base processed using injection-molding technique by using two commercially available PMMA resins (Brecrystal and Ivoclar).

MATERIALS AND METHODS

This study was carried out in department of prosthodontics of our institution. All the ethical clearance has been obtained from the review board committee. Exact fitting dentures of the same dimensions were fabricated from 14 master cast. These were made from the high-quality silicone molds. As per the manufacturer instructions Injection molded dentures of Brecrystal and Ivoclar were polymerized.

The Brecrystal dentures were cured by thermopress 400 injection molded unit at a high temperature of 260^{o} C. The pressure maintained while fabrication was 5 bar for 26 minutes. Once the polymerization was over, the flasks were cooled to room temperature and then polished with pumice on wheel.

On the other group (Ivoclar denture) the sprues were prepared with modeling wax and were attached to the trial denture is invested in dental stone. Once the dewaxing was done, the resin was introduced into the mold that contained resin with ratio of 20 gms to 30 ml. Manual pneumatic injection mold was used to press in traditional way followed by curing in boiling water for 30 mints. Once the denture curing was over then it was polished by pumice on rag wheel.

The accuracy of adaptation of the dentures were examined using scanning electron microscope. The accuracy was adjusted at 0.001mm and with a resolution of 0.001 mm and a magnification of 3x. The slit among the denture resin base and stone cast was measured at canine region and posterior palatal area at five points, corresponding to the right and left residual ridge crests, the midline, and the right and left marginal limits of the flanges (deepest vestibule gap). Three measurements were made at each location and the mean values were calculated.

RESULTS

The Mean values and standard deviations for the maximum posterior border gap (P), crest gap (C) and vestibule gap (V) for different materials are shown in table 2, represents the adaptation accuracy of the two examined dentures.

The statistical correlation between both the sections for the two denture base materials. One-sample t-test was applied to correlate the values of both the sections of individual materials. It has been found that a highly significant correlation was observed for section A, whereas Section B showed a significant correlation for Ivoclar denture base material. For Bredent, a statistically significant correlation was found for Section B, whereas Section A showed an insignificant correlation. Pearson correlation statistical analysis was done to found correlation between the two denture base materials. A positive linear relationship was observed for Bredent, whereas Ivoclar showed a statistically insignificant correlation.

Material Group	Section A (canine region)			Section B (PPS region)			Total section gap		Total gap score
	V	C	P	V'	C'	P'	A	B	
Ivoclar	47.56±1.12	47.76±1.23	48.39±4.10	35.73±1.67	31.50±3.09	21.41±3.28	47.68±0.59	29.55±7.36	38.62±12.82
Bredent	36.23±1.43	14.32±0.56	35.56±3.23	20.91±1.99	19.47±0.71	27.34±2.33	27.85±12.29	22.57±4.19	25.21±3.73

DISCUSSION

A perfect function of a complete denture depends on its accuracy of fit.[5] Inaccuracies of dimension caused due to polymerization shrinkage has been the cause of lose fit or misfitting dentures. This causes the denture base instability against soft tissues.[6] This intern leads to pain during the mastication with the denture. The adaptation depends on number of factors such as fabrication process and the material used for fabrication.[7] In order to facilitate accurate comparison of injection molded and conventional pressure packed acrylic denture bases, a single master mold was produced. Several studies have reported that dimensional changes do not occur evenly over the entire denture base.[7–10] Slit between the denture base and cast are usually credited to polymerization shrinkage of the resin material and an inclination of cooling shrinkage in the direction of the central area of the denture base, as well as to successive distortion caused by confinement of the surface topography of the alveolar ridge.[11] Hence, different slit creation was usually observed between the central portion of the posterior border, the crest of the ridge and buccal vestibule area.

The slit occurring through the complete denture technique has been documented by several authors[12] and still continues to be the major difficulty of the process. In this study, the slighter gap values for the Bre-Crystal system packing method associated with the conventional method, autonomously of the other factors, indicates that the dimensional change occurred in the denture base was influenced by the resin packing method.[13,14] It is arguable whether the variances observed between conventional pressure packed and injection molded PMMA samples would actually be clinically significant. As the denture bearing mucosa is compressible and the palatal seal is largely dependent on the prepared post dam, dimensional changes may be of little clinical relevance to the success or failure of the material as a denture base. However, a relatively higher fit of the denture base may be helpful in reducing the initial adaptation period of the denture wearer. `

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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