



RESEARCH ARTICLE

DETERMINATION OF DIMENSIONAL STABILITY OF HEAT CURE RESIN UNDER  
COMMON SOLUTIONS

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ABSTRACT

**Aim and Objective:** The aim of this study was to access the dimensional changes of heat cure acrylic resin when immersed in alcohol and chlorhexidine.

**Materials and Method:** This study included 12 specimens. Twelve heat cure acrylic resin cubes similar sizes were fabricated. The present study was undertaken to determine the dimensional change in heat cure acrylic resin cubes on immersing them in alcohol and chlorhexidine for 12 hours. Six cubes were immersed in 250 ml of each of the solutions. Before immersing, linear dimension of the cubes were measured using a digital vernier calliper. After removing the cubes from the respective solutions, cubes were again measured. The values were tabulated and compared.

**Result:** The heat cure acrylic cubes showed linear dimensional changes. The average change observed in those cubes immersed in alcohol was 0.004% expansion and those immersed in chlorhexidine was 0.021% Shrinkage.

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INTRODUCTION

The use of heat cure acrylic resin as a denture base material since 1937 has been observed as a revolution in dentistry. It can be easily manipulated and can be used with simple techniques for the construction of dentures. The resin has excellent aesthetic properties like colour and is chemically stable. (Saryu Arora *et al.*, 2011) The commonest dentures base material in dentistry is polymethyl-meth-acrylate. (Kimoto *et al.*, 2005; Machado *et al.*, 2007; Carr *et al.*, 2005) There are at least two recognized dimensional change which are unavoidably active in every acrylic denture namely shrinkage that occurs during processing and subsequent expansion that occurs on immersion in various solutions. (Skinner and Cooper, 1943) An accurate duplication from trial denture to final denture is ultimate aim of processing in the laboratory. However, certain properties like dimensional inaccuracies of the materials compromise the attainment of this goal optimally. Authors have been comparing the various mechanical properties of acrylic materials. (Becker *et al.*, 1977; Dixon *et al.*, 1992; Stafford *et al.*, 1980; Woelfel, 1977) Heat cure PPMA is commonly processed in a brass flask by a compression molding (dough) technique. The polymerization reaction is exothermic in nature. These resins are polymerized by placing the flasks in a time temperature controlled water bath. (Seo *et al.*, 2007) The

patients who use these two solutions often should be advised on the possible changes. Thus this study helps us understand the extent to which such liquids can cause distortion.

The present study was designed with the following sequence:

- To study the linear dimensional of the acrylic cubes before immersing in the solutions.
- To study the linear dimensional of the acrylic cubes after immersing in the solutions.
- Tabulate the values and compare the changes induced by the two solutions on the acrylic cubes.

MATERIALS AND METHODS

A dental plaster (type II) master cube was made with each side as 20mm. An impression of the master cube was taken using an irreversible hydrocolloid, Alginate. Wax was added in alginate impression. Once wax cooled down the wax cubes were recovered. The wax cubes were then packed in a flask using Type II Gypsum product along with counter pour. The flask is left undisturbed for 30 minutes. The flask was then placed in boiling water for dewaxing for 10 minutes. The softened wax is flushed out using hot water. After dewaxing the impressions in the dental plaster was recovered. Separating medium was then applied to the dewaxed mould space prior to packing the acrylic resin. The denture base resin was then mixed to dough stage. The material was then packed and bench

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pressed. After final closure the flask was cured in a water bath for 90 minutes. After curing the acrylic cubes were trimmed and polished.

- These blocks were marked from A- L. Blocks A,B,C,D,E,F were immersed in chlorhexidine and G,H,I,J,K,L were immersed in alcohol.
- The linear dimensions of the cubes were measured using a vernier calliper before immersing the blocks.
- Six cubes were immersed in 250ml of alcohol and six cubes in 250ml of chlorhexidine.
- The entire set up was left undisturbed for 12 hours.
- After 12 hours the cubes were taken out of the solutions and the linear dimensions were measured.
- The data was thus tabulated and compared.



Cubes immersed in alcohol

**RESULTS**

Name of the cube	Before immersing (in mm)	After immersing (in mm)
A	20.09	19.70
B	19.83	19.61
C	20.20	19.70
D	20.01	19.75
E	19.25	18.95
F	19.83	19.63
G	19.87	19.83
H	19.74	19.65
I	20.73	21.35
J	19.56	19.65
K	19.48	19.30
L	20.11	20.17

Average change observed in blocks a-f immersed in chlorhexidine= 0.021% shrinkage

Average change observed in blocks g-l immersed in alcohol= 0.004% expansion

**DISCUSSION**

The heat cure acrylic resin has been very successful as a denture base, as it has fine esthetic properties, excellent color stability, and can be used with a simple technique for the construction of dentures. In spite of having all these advantages, the lack of dimensional stability is widely accepted as one of the disadvantages of acrylic resin dentures. Mirza in his study on the clinical evaluation of dimensional stability of acrylic resin dentures found that the greatest dimensional change occurred during the first month of use in mouth and leveled off at the end of 3 month. The fit of the dentures was found to be good after 3 months indicating that the dentures changed dimensionally but were successful clinically. Thus changes in dimensional change don't seem completely disadvantageous. (Mirza, 1961) Craig stated that the change in dimension of acrylic dentures is for the most part, reversible and the plastic may go through numerous expansions and contractions when alternately soaked in water and dried. The solutions we have taken for performing the test also have a good quantity of water. (Craig, 1989) Initially there seems to be expansion followed by contraction on extended time limit of observation. The present study shows the linear shrinkage which is also in accordance with the study done by



Cubes immersed in chlorhexidine

Anusavice,(2004) Noort, (2005) and Shippee. (1961) The resins were all found to shrink during the curing process. (Kinner and Cooper, 1943) However, on immersion in water, the resins were found to expand. He reported greater shrinkage during processing than during storage in water up to 90 days.

### Conclusion

The heat cure acrylic cubes immersed in alcohol showed expansion phenomena and those heat cure acrylic cubes immersed in chlorhexidine showed shrinkage. Thus, patients having a pattern of frequent consumption of these types of liquids must be made aware of the dimensional changes which may occur to their fabricated prosthesis. This is the reason for my research on heat cure acrylic resin.

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