ABSTRACT

EVALUATION OF THE FLEXURAL STRENGTH OF HEAT POLYMERIZED POLY (METHYL METHACRYLATE) DENTURE RESIN REINFORCED WITH FIBERS – AN *IN VITRO* STUDY

Introduction: Synthetic resins are employed in a variety of dental and medical applications such as contact and intraocular lens, bone cements in orthopaedics, filler for bone cavities and skull defects, vertebrae stabilization in osteoporosis patients, dentures, cavity filling, sealants, maxillofacial reconstructive materials, impression materials, orthodontic appliances, equipment etc. Among the synthetic resins, poly methyl-methacrylate is considered as the most suitable biomaterial due to its favourable properties such as biocompatibility, chemical inertness, dimensional stability, ease in processing and other such advantages. However, PMMA based restorations cannot withstand higher rate of loading due to the inferior flexural strength. Therefore, the present study aimed to improve the flexural strength of conventional PMMA

Aim: The aim of this *in - vitro* study is to compare the flexural strength of conventional heat polymerized PMMA resin with that of glass fibres, carbon fibres, and polypropylene fibres reinforced heat cure acrylic resin.

Null Hypothesis: Reinforcement using glass fibres, carbon fibres, polypropylene fibres to improve the mechanical properties of PMMA.

Alternate Hypothesis: Reinforcement with glass fibres, carbon fibres, and polypropylene fibres did not affect the mechanical properties of PMMA.

Materials: Heat activated acrylic resin considered as the matrix material for the present study obtained from DPI (Dental products of India) was in powder – liquid from. Glass fibres, carbon fibres, polypropylene fibres are used for reinforcement. Other materials used for the preparation of the mould for the fabrication of the acrylic samples include polyvinylsiloxane impression material, Type II gypsum products, Modelling wax for the preparation of the wax pattern, cold mould seal as the separating medium.

Method:

Preparation of gypsum molds to obtain the acrylic specimen: Wax pattern (65 mm x 10 mm x 3 mm) is prepared using modelling wax and invested in the dental flask in the conventional manner using model plaster. After 1 hour, the invested flask kept for dewaxing, and then any wax residue removed by washing the mould by hot water and then cleaned using soap solution, allowed to dry. The mold is then ready to be used for the preparation of acrylic specimen.

Preparation of PMMA resin specimen: The test specimens are made with dimensions of 65 mm x 10 mm x 3mm as per the ISO 1567 standards. This enables the specimen to be tested for flexural strength on Instron Universal Testing Machine.

A total of 80 specimens are fabricated for the study, which are divided into four groups (Group 1, 2, 3 & 4) of 20 specimens each. Group 1 (control) comprised of unreinforced PMMA resin specimens; Group 2 comprised of glass fibre reinforced PMMA resin specimens, Group 3 comprised of Polypropylene fibres reinforced PMMA resin specimens, Group 4 comprised of carbon fibre reinforced PMMA resin specimens.

Measurement of Flexural strength: All the prepared samples are tested for flexural strength using universal testing machine. Specimens are placed in a position where its two edges supported from the lower side and the load was given in the middle of the specimen from an upper side. Specimen dimension was measured and recorded into the computer.

Results: After data collection, the mean and the standard deviation (SD) values of transverse strength of each group were analysed statistically with one- way ANOVA analysis. Then significant differences between the mean of the test groups were determined by Turkey's post hoc test using SPSS V22 software.

Conclusions: For the fabrication of denture base PMMA resin is the material of choice for usage. Because of poor transverse, impact, and flexural strength of PMMA fracture of the base may occur. So in this study I analysed increase in flexural strength after incorporation of fibres.