

To Quantify the Amount of Material Required for Acrylization of Trial Dentures – An in vitro study

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Abstract

Aim: To estimate the amount of material required for acrylization of trial dentures.

Materials and Methods: To estimate the amount of material required for acrylization of trial dentures, the weight and volume of waxed up dentures was measured using digital weighing machine and Archimedes' principle respectively. The weight of polymer and flash generated was also measured. Once the acrylized dentures were retrieved, the weight and volume of the same was measured and compared again. Results were analysed using student "unpaired t" test.

Results: There was a no significant difference between the weight and volume of waxed up dentures to weight and volume of acrylized dentures.

Conclusion: Polymethyl methacrylate acrylic resin is categorised under non- biodegradable materials. Its increased wastage can cause problems in manner of its disposal. Measuring the weight and volume of waxed up dentures helped in quantifying the amount of material required for acrylization of trial dentures. Hence if the wastage of material can be minimized; it will be a great contribution to the field of dentistry and environment.

Keywords: Ratio of polymer to monomer, Weight of trial denture, Volume of trial denture

Introduction

Edentulism is a matter of great concern to the majority of people and their replacement by artificial substitute, such as denture is vital to the perpetuation of normal life. One of the requirements of the denture is its ability to function for a minimum required period. The material most commonly employed in the construction of denture base is polymethylmethacrylate (PMMA).^[1]

They may be classified as metallic and non-metallic. The ideal denture base material must satisfy a list of physical, chemical, mechanical and biological requirements.

However to date, no known denture base material adequately fulfils all these requirements. Acrylic resin meets most of the requirements of an ideal non-metallic denture base material. It has a number of advantages such as good esthetics, ease of fabrication, low capital cost and good surface finish while its disadvantages are low impact strength, flexural strength low enough to penalize poor denture design and short fatigue life.^[2]

Acrylic resins were introduced to dentistry in 1937, and to date are regarded as one of the best materials to be used as denture bases for removable prosthesis.^[3] In spite of its good handling characteristics concern regarding the wastage and recycling of the material is of paramount importance.

Acrylic plastic is not recycled easily. Among recycled plastics, it is considered as a Group 7 plastic and mostly not collected for recycling. It is possible to form large pieces into useful objects in case they have not suffered crazing,

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stress or cracking. These are not readily biodegradable. Some of them are highly flammable and must be protected from combustion sources.

PMMA, the key type of acrylic, can be recycled in several ways. This normally involves subjecting the resin to pyrolysis. It is possible to recover the monomer from PMMA scrap by depolymerisation. PMMA has been successfully depolymerized by contacting with molten lead resulting in Methyl methacrylate (MMA) with purity more than 98%. From an environmental perspective, the use of lead is undesirable. Since it is very difficult to remove and then cannot be used afterwards. Hence new methods of recycling are being devised. [4]

Till date in literature no methods were employed to measure the required quantity of acrylic for acrylization of trial denture which causes lot of wastage of material which is bio hazardous. This study was an attempt to reduce the wastage of material during acrylization of trial dentures by studying the method of quantifying the material required for acrylization.

Materials and Method

An in vitro study was conducted in the Department of Prosthodontics, Rural Dental College, Loni to estimate the amount of material required for acrylization of trial dentures. 30 Pairs of trial complete dentures were fabricated according to the standard procedure. After try-in the trial dentures were weighed, using a digital weighing machine (Wensar™, Model: HPB220) and the scores recorded (Fig 1). To measure the volume, each waxed up denture was immersed in a beaker containing 200ml of water (Fig.2,3). The increased level of water from the beaker was removed by pipette; until the water level in the beaker reaches 200 ml^[5] (Fig.4).



Fig. No.1:

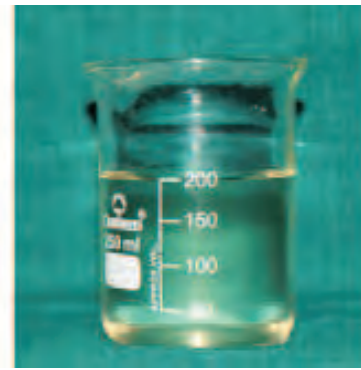


Fig. No.1:



Fig. No.1:



Fig. No.1:

The water in the pipette indicates the volume of waxed-up denture. Same procedure was repeated for mandibular trial denture. The measurements were tabulated. Then the regular process of flasking was carried out.^[6] At trial packing stage the excess flash was removed. The weight of the flash was measured using the method previously mentioned.

After dewaxing and application of tin foil substitute the weighed amount of polymer was mixed with the required amount of monomer. When the mixture reached dough like state it was placed in to the portion of the flask that houses the prosthetic teeth. A polyethylene sheet was

placed over the resin and flask is reassembled. The flask assembly was then kept under the bench press so that excess resin (flash) will flow out.^[7] 2-3 times trial packing was repeated until no flash was generated.

The amount of flash collected was measured and tabulated. Further acrylization procedure was carried out according to manufacturer’s instructions. After retrieving the acrylized dentures, the weight and volume of the same was measured and compared again. This procedure was followed for 30 pairs of waxed up dentures to tabulate the results and compare the weight and volume of the acrylic resin used in this study. ANOVA test was used for comparison of volume of trial denture with study variables, Pearson Correlation test was used to find the correlation between study variables. Comparison of flash (gms) among weight and volume was done using unpaired t test.

Results

The descriptive data of the study (Table.1) were compared statistically. Comparison of weight and volume of trial denture among polymer used and flash showed statistically non-significant results (Table 2 and Fig 5, 6).

Table 1: Descriptive data of the study

	N	Minimum	Maximum	Mean	Std. Deviation
Weight	60	9.00	23.00	16.23	3.42
Volume	60	9.00	24.00	16.61	3.503
Polymer	60	20.00	34.00	27.36	3.43
Flash	60	2.00	13.00	6.31	2.78

Table 2: Correlation between study variables

		Polymer	Flash
Weight	Pearson Correlation	0.241	0.045
	Sig. (2-tailed)	0.063	0.734
Volume	Pearson Correlation	0.226	-0.069
	Sig. (2-tailed)	0.083	0.599

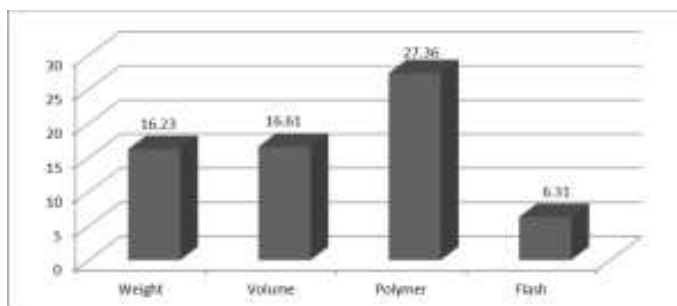


Fig. 5 Comparison among study variables

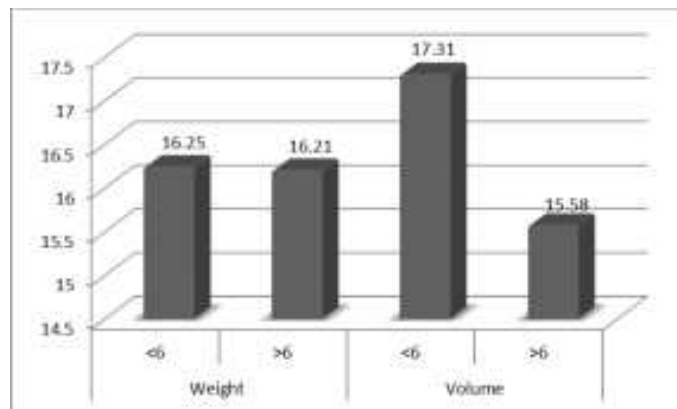


Fig. 6- Comparison of flash (gms) among weight and volume

Discussion

There will be great opportunity to provide complete dentures for many years to come. Usually PMMA is the material of choice for fabricating the dentures. In the fear of processing errors due to insufficient material, operator, invariably uses extra material to fabricate the denture. As the disposal of PMMA is difficult, the wastage has to be reduced. Keeping this in mind the study was formulated. Neither there should be any processing error due to insufficient material nor should it be wasted.

All the dentures were weighed and volume was calculated. The amount of polymer used was exactly of same weight of waxed up denture in initial few samples. The flash generated was more. Gradually the amount of polymer was reduced than the weight of waxed up dentures for next few samples. Here the flash generated was little less than initial samples. While experimenting, the minimum amount of flash generated was almost negligible approximately 2 gm. All the dentures were free from processing errors. Though the results showed no correlation between the weight and volume of trial dentures

to the polymer used, we found it easy to predict the amount of polymer required for that particular denture if the weight of trial denture is already measured.

Limitations

The weight of acrylic teeth was not considered.

Amount of monomer used was not quantified or correlated.

Conclusion

The current study gave a productive result in minimising the wastage of Polymethyle methacrylate. Hence reducing the problems associated with its disposal and its bio-hazards.

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