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Comparitive Evaluation of the Dimensional Accuracy of Multiple Casts Poured From Two Different Elastomeric Impression Materials

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Abstract: Aim*: The aim of the present study is to compare accuracy and dimensional stability of two different elastomeric impression materials, with respect to obtaining multiple casts at various times of pours.*
Materials and methods*: A master die was prepared with specific dimension and impression was made using two different elastomeric impression materials and the impression was poured at various time periods. Casts thus obtained were evaluated under a CMM (Coordinate Measuring Machine) to evaluate various dimensional changes.*
Results*: Addition silicones provided dies which were shorter in height and bigger in diameter in 2nd and 3rd pour. Condensation silicones showed insignificant changes from the master die at the*
Immediate pour but deteriorated rapidly after that in subsequent pours.
Conclusion*: None of the two impression material showed a consistent behavior up to the third pour They occasionally showed deviation from the pattern, but all these values were almost statistically insignificant.*

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I. Introduction

In the field of dentistry, accurate and dimensionally stable impressions are the first step toward fabrication of a successful prosthesis5. An impression is an impression is a negative likeness or copy in reverse of the surface of an object; an imprint of the teeth and adjacent structures for use in dentistry10. The elastomeric impression material is the most widely used impression material in dental practice. Selection of material is generally left at the discretion of the dentist, who makes choices based on personal preference and experience

Making an impression represents a critical step in processing and fitting of a dental prosthesis. The definite impression should be accurate to fabricate restoration with ideal marginal fit, internal fit, interproximal contacts and occlusal contacts. Accuracy of an impression depends on properties of impression materials like thermal contraction, polymerization shrinkage, presence of volatile by products, elastic recovery, bulk of material and impression technique used4

The dimensional stability and accuracy of impression with repeat pours is of paramount importance as duplicate casts are usually required for various laboratory procedures, as wax the individual retainers, develop the connectors of fixed partial denture and complete the wax pattern etc. These duplicate casts are used as working or refractory casts so that the master cast remains unaltered. It also reduces the professional clinical time, patient inconvenience, and extra material cost. The dimensional accuracy of the cast from repeated pour is influenced by the extent of elastic recoil from distortion during cast retrieval and continued polymerization shrinkage3.

The objective of this study was to compare the dimensional accuracy of the cast obtained from multiple pours of a single impression at various time intervals. The aim of the study was to evaluate if repeated pouring of elastomeric impression materials would influence the dimensional accuracy of resultant casts.

II. Material And Methods

This in vitro study was conducted in the Department of Prosthodontics, for comparative evaluation of dimensional accuracy of casts made by repeated pouring at various time intervals including immediate, 24hr and 7 days.

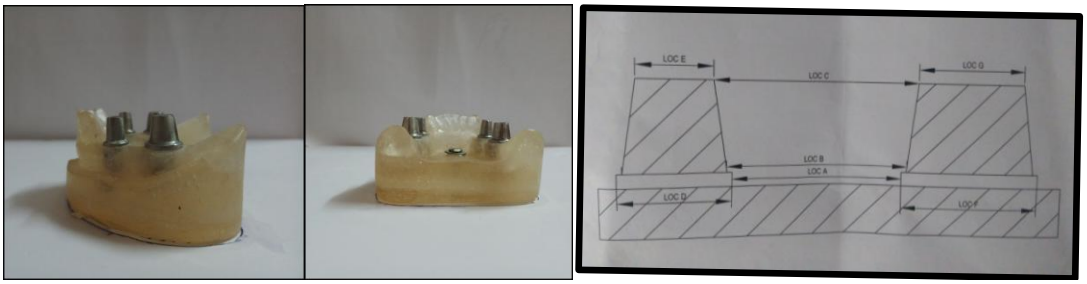
The materials used were

- Master Model
- Metal Perforated Rim Lock Trays
- Flexeed Putty Material And Light Body(Addition silicone)

- Zhermark Zeta Plus Putty And Light Body(Condensation silicone)
- Type 4 Dental Stone
- Vibrator

Master model

A lower arch master model was made of self-curing Orthodontic Resin (Dentsply) with resin teeth from canine to canine and four machined stainless steel dies. The four stainless steel simulating prepared abutment teeth were embedded in region 37 and 34 & 44 and 47 region. The stainless steel dies were designed to simulate circular full crown preparations with shoulders. The molar die preparations had 6° total occlusal convergence (TOC), were 7.0 mm high, and had a cervical outer diameter of 9.0 mm and a shoulder width of 1.0 mm. The premolar dies had the same TOC, height and shoulder width, but an outer diameter of 7 mm. The root portion of the stainless steel dies were 15 mm in length and had a design that well locked them inside the resin to prevent rotation and vertical displacement. Approximately 1 mm of the dies root portion was exposed on all four dies. Diamond bur was used to make marks on the occlusal surfaces and the shoulders of the dies. Reference points were marked on the cast, at 3 locations, on either side of the cast, giving a total of 6 points (fig 1,2). The two adjacent intra abutment points were joined to obtain 3 locations. The model is then fixed in a wooden frame.



III. Methodology

The first set of six impression trays were used for putty wash impression technique WITH uniform spacer width. The impression procedures were conducted at controlled room temperature and handled according to the manufacturer's instruction. Here we are using two stage putty wash impression technique. The putty was then mixed according to the manufactures instruction. The mixed putty was then loaded into the tray and polythene spacer is placed over the tray. The impression tray was placed over the model. It is then allowed to set over the cast for four minutes. The second stage involved the removal of the spacer and relining the preliminary putty impression base with light body elastomers. After impression procedure, impressions were rinsed in water and disinfected with sodium hypochlorite immersion for 3 minutes.

Then casts was poured with type 4 dental stone immediately for condensation silicon. PVS impressions after the disinfection were stored at room temperature

(25 ± 10∘C) for one hour for elastic recovery and hydrogen release. After that cast is poured and the set gypsum cast was removed from the impression after one hour with due care, to avoid the impression damage. The second and third cast were obtained following the same procedure after 24-hour, and -day interval from the same impression.

Then the distance between the reference points were measured with CMM (Coordinate Measuring Machine) and analysis done by ANOVA

IV. Result

The present study evaluated the accurate reproducibility of dental die from repeated pour of an impression at the different time intervals

Table 1 lists the mean values, standard deviation, and percent of deviation of the stone die of both samples. Table 2 lists the minimum and maximum values.

Table 1

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
locA1	1.00	6	4.5133	.26636	.10874	4.2338	4.7929
	2.00	6	4.8167	.63213	.25807	4.1533	5.4800
	Total	12	4.6650	.48885	.14112	4.3544	4.9756
locB1	1.00	6	6.9283	.02229	.00910	6.9049	6.9517
	2.00	6	7.1667	.65972	.26933	6.4743	7.8590
	Total	12	7.0475	.46211	.13340	6.7539	7.3411
locC1	1.00	6	8.3317	.14986	.06118	8.1744	8.4889
	2.00	6	8.6367	.71301	.29109	7.8884	9.3849
	Total	12	8.4842	.51639	.14907	8.1561	8.8123
locD1	1.00	6	8.9700	.05441	.02221	8.9129	9.0271
	2.00	6	8.8500	.10315	.04211	8.7418	8.9582
	Total	12	8.9100	.10054	.02902	8.8461	8.9739

LOCATIONS	GROUPS	N	MEAN AND SD	ANOVA (P VALUE)
LOCATION A1	GROUP 1	6	4.5133±0.26636	0.304
	GROUP 2	6	4.8167±0.63213	
LOCATION B1	GROUP 1	6	6.9283±0.02229	0.397
	GROUP 2	6	7.1667±0.65972	
LOCATION C1	GROUP 1	6	8.3317±0.14986	0.329
	GROUP 2	6	8.6367±0.71301	
LOCATION D1	GROUP 1	6	8.9700±0.05441	0.030
	GROUP 2	6	8.8500±0.10315	

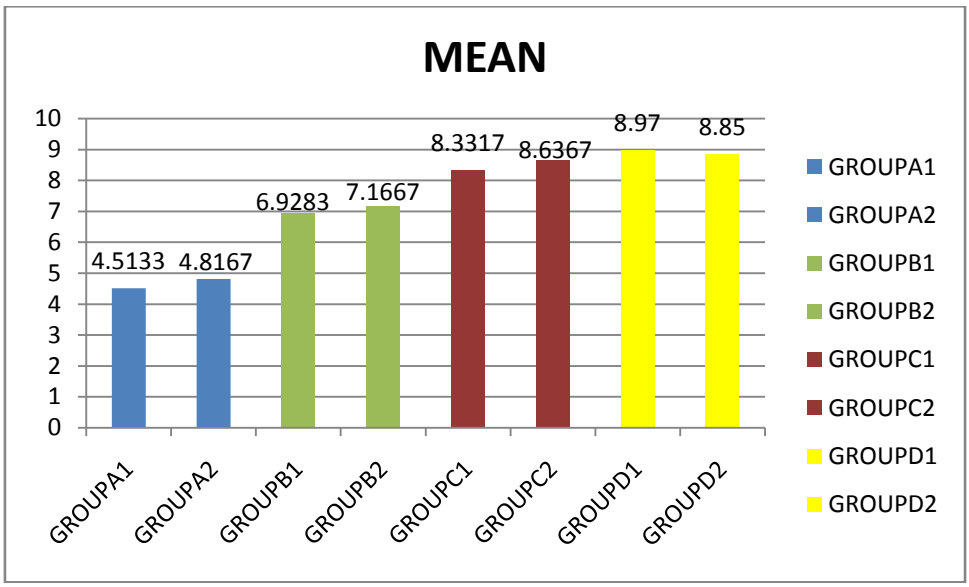
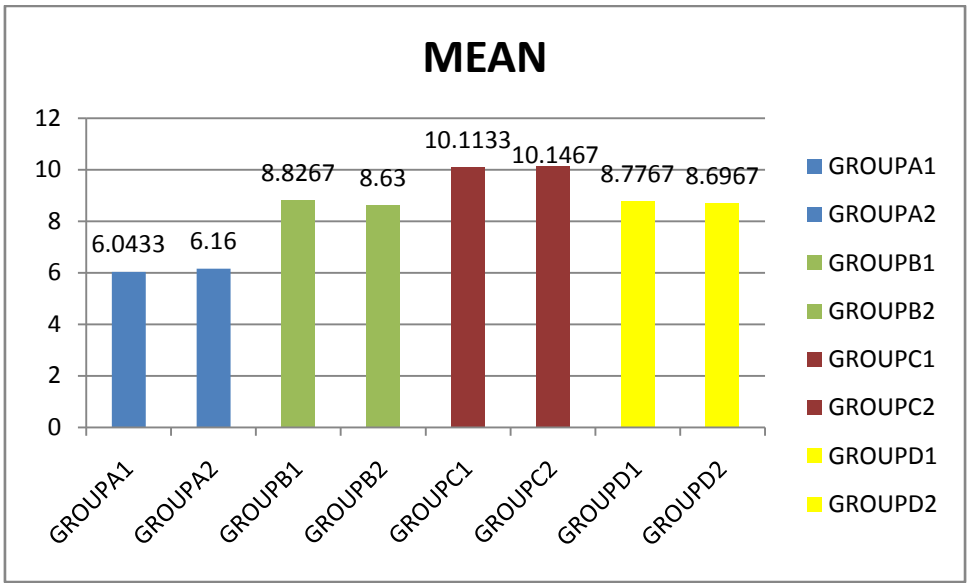


Table 3 lists the anova and The one-way ANOVA showed the significant (<.05)variation among all the measurements in loc D

LOCATIONS	GROUPS	N	MEAN AND SD	ANOVA (P VALUE)
LOCATION A2	GROUP 1	6	6.0433±0.01366	0.021
	GROUP 2	6	6.1600±0.10315	
LOCATION B2	GROUP 1	6	8.8267±0.07230	0.003
	GROUP 2	6	8.6300±0.09675	
LOCATION C2	GROUP 1	6	10.1133±0.06346	0.516
	GROUP 2	6	10.1467±0.10328	

LOCATION D2	GROUP 1	6	8.7767±0.04502	0.183
	GROUP 2	6	8.6967±0.12941	



After evaluating the results on the basis of statistical analysis, following observations were made
For Addition Silicon the resultant dies are almost duplicating the master die. But changes in dimensions were present at loc D. Most of the dimensional changes in casts were statistically insignificant.
Condensation silicon showed insignificant changes from the standard dimensions at different pour and does least resemble the master die at various locations.

V. Discussion

To compare the two different elastomeric impression materials in their accuracy and dimensional stability, with respect to obtaining multiple casts from a single elastomeric impression at various times interval includes immediate, 24hr and 7 days. A lower arch master model was made of self-curing Resin with resin teeth from canine to canine and four machined stainless steel dies is used.

To make the impression lower metal rim lock trays were used. The impression material of chosen was PVS and condensation .After completing the setting the impressions were made according to the manufactures instruction. After impressions were made, it is rinsed in water and disinfected .Then casts was poured immediately and then after 24-hour, and 7 day interval from the same impression.

Accuracy of impressions with repeated pours is of interest clinically, because duplicate models are sometimes desired. Most of the studies carried out on addition silicones including the monophase polyvinyl siloxanes showed that they were dimensionally accurate even up to one week. This is advantageous because multiple casts can be poured in the same impression up to one week without concern for dimensional inaccuracy. These materials exhibit the least amount of distortion from loads imposed on the set materials. Thus pouring the impression, removing the casts several times will not alter the dimensional stability of the impression, even though a fairly substantial force is needed each time the cast is removed from the impression. In case of condensation silicone the stone die or cast should be constructed within the first 30 minutes after removal of the impression from the mouth, even when putty wash technique is used.

This is due to loss of polymerization byproducts like water and alcohol and thereby producing poor results.

All the results gave the conclusion that all of them were quite accurate in reproducing the details and preserving the details for quite some time. It should be understood that this study was different from just evaluating the dimensional stability of any given elastomeric impression material at any given period of time, because here two factors are in consideration—one was the elapsed period of time, and another was repeated induced distortion while withdrawing

of multiple casts from the same impression. The impression materials which were quite good in resisting the induction of undue stresses over it while removing the casts gave better results like addition silicone.

VI. Conclusion

None of the impression material always showed a consistent behavior. They occasionally showed deviation from the pattern, but all these values were statistically insignificant. Overalladdition silicones showed better results than others in most of the situations

References

[1]. Ciesco JN, Malone WF, Sandrik JL, Mazur B. Comparison of elastomeric impression materials used in fixed prosthodontics. J Prosthet Dent 1981;45:89-94. 2. Johnson GH, Craig RG.
[2]. Accuracy of four types of rubber impression materials compared with time of pour and repeat pour of models. J Prosthet Dent 1985;53:484-90.
[3]. American Dental Association: ANSI/ADA standard No:19 – Dental elastomeric impression materials (2004)
[4]. Satheesh B. Haralur, MajedSaadToman,Abdullah Ali Al-Shahrani, Abdullah Ali Al-Qarni; Accuracy of Multiple Pour Cast from Various Elastomer Impression Methods; International Journal of Dentistry, Volume 2016, Article ID 7414737, 6 pages
[5]. Kumar D, Madihalli AU, Reddy KRK, Rastogi N, Pradeep NT. Elastomeric Impression Materials: A Comparison of Accuracy of Multiple Pours. J Contemp Dent Pract 2011;12(4):272-278
[6]. F.S. Gonçalves, D.A.V. Popoff, C.D.L Castro, G.C. Silva, C.S. Magalhães, A.N. Moreira. Dimensional Stability of Elastomeric Impression Materials: A Critical Review of the Literature, Eur. J. Prosthodont. Rest. Dent., Vol.19, No. , pp 1-4
[7]. Dr Neethu.L, DrGilsa K Vasunni. Comparative Evaluation of Dimensional Stability of Three Different Elastomeric Impression Materials – An Invitro Study. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 14, Issue 9 Ver. VI (Sep. 2015), PP 89-93 www.iosrjournals.org
[8]. Eduardo Batista Franco, Leonardo Fernandes Da Cunha, Ana Raquel Benetti; Effect of storage period on the accuracy of Elastomeric impressions. J Appl Oral Sci. 2007;15(3):195-8
[9]. Anusavice KJ. Phillips science of dental materials.
[10]. Devan M. Basic principles in impression making. J Prosthet Dent 2005;93:503-08.
[11]. Glossary of Prosthodontic Terms , 9th Edition

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