*IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*
*e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 1 Ver. 6 (January. 2019), PP 54-56*
*www.iosrjournals.org*

# A Comparative Evaluation of Diamensional stability of irreversiblehydrocolloid impression materials –An invitro study.

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***Abstract***
***Background***
*The study conducted to determine diamentional stability of irreversible hydrocolloid impression materials stored at different time interval.Diamensional stability of irreverssible hydrocolloids is an important and thoroughly discussed topic. Many studies says that to prevent distortion, it is generally recommended that irreversible hydrocolloid impressions to be poured immediately or within a few minutes from removal from the mouthwithout wrapping in a wet paper towel.*
***Aim***
*The aim of this study was to determine dimensional stability of irreversible hydrocolloid impression materials.*
***Methods***
*In this studyIvorine teeth are modified on a model to allow measurements of tooth and arch width. And impressions were made and generated casts immediately and at additional times of 1/2hr dry,1/2hr wet,1hr wet,4hr wet.recorded tooth and arch widths on the casts and compared the measurements with those for the standard model.*
***Results***
*Traditional irreversible hydrocolloids were generally stable when poured immediately. However, stability decreased as time elapsed. New irreversible hydrocolloid substitutes appear to allow delay in pouring time and repouring of impressions without significant side effects.*
***Conclusions:-***
*Shorter storage time of irreversible hydrocolloid impressions before pouring is desirable, although this may not be necessary for the extended-pour types. The lack of a standardized technique for studying the effect of storage condition, makes it difficult to make clear recommendation.*

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Date of Submission: 27-12-2018 Date of acceptance: 12-01-2019
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## I. Introduction

Irreversible hydrocolloid impression materials are regularly used in the dental office. Used to produce stone casts in almost every field of dentistry. Diagnostic casts provide valuable information for diagnosis, treatment planning, patient education and consultation with other dental care providers. Clinicians also can use diagnostic casts for fabrication of custom trays and removable prostheses. The vast majority of diagnostic casts are produced by making an impression with an irreversible hydrocolloid and casting it in a type III gypsum product.

They are popular primarily because of their low cost and ease of use compared to other impression materials. An impression material capable of accurately reproducing not only the form of an individual tooth but also that of an entire dental arch is a necessary part of every dentist's armamentarium. Irreversible hydrocolloid is but one of several impression materials which produce accurate impressionsand unquestionably it is the easiest to use and least expensive of such materials.

Since many different alginate materials are available, clinicians often prefer to use one material rather than another. Dimensional stability of irreversible hydrocolloids is an important and thoroughly discussed topic. It is generally recommended that irreversible hydrocolloid impressions be poured immediately or within a few minutes from removal from the mouth without wrapping in a wet paper towel, because irreversible hydrocolloid materials are water-based and could undergo dimensional changes due to factors related to the condition and length of storage,also it is not possible to determine the amount of water absorbed or whether the right shape and dimensions of the oral tissues have been reproduced precisely. Thus, the purpose of this study was to investigate the dimensional stability of irreversible hydrocolloid impression materials as a function of pouring time.

## II. Material And Methods

The mandibular arch of a standard dentoform was used to construct the master cast (Fig. 1). Grooves were cut buccolingually on the distobuccal cusp of the left second molar and buccolingually on the buccal cusp tip of the left first premolar to provide registrations for the anteroposterior measurements. Grooves were cut mesiodistally on the distolingual cusp of the left and right first molars to provide registrations for lateral measurements. All grooves were made with a bur. Hundred impressions of the dentoformmodel were made with alginate.

Fig. 1. Master model showing the points of measurement for the buccolingual (A) and mesiodistal measurements (B).

Prior to pouring, hundred impressions of alginate were subjected to five different storage methods as follows: (1) immediate pour following removal from the master model; (2) 1/2hr after impression removed from mouth and seal in plastic bag; (3) 1/2-hr storage in a wet paper towel; (4) 1-hr storage in a wet paper towel and (5) 4-hr storage in a wet paper towel. All impressions were made in perforated plastic trays at a constant water-powder ratio as recommended by the manufacturers and a constant water temperature. The alginate was spatulated by hand for approximately 30 seconds. After the alginate tray was seated, it was allowed to set 4 minutes with a constant weight of 2 pounds as applied by weight. All casts were poured using a vibrator in a Type III gypsum stone at a constant water-powder ratio (30 C.C. water per 100 grams powder) and carefully following manu- facturer's instructions. The water temperature was constant. The gypsum stone was hand spatulated approximately fifty times in order to control dimensional change of the stone. The stone casts were allowed to bench set for 1 hour prior to separation from the alginate impressions. All casts were allowed to bench set a minimum of 24 hours prior to mea- surement. Anteroposterior and lateral measurements were made of the master. These same measurements were then made on each of the hundred stone casts. All measurements were recorded, and the arith- metic mean and standard deviation were determined and statistically analyzed using the analysis of variance. A vernier calliper was used to make all measurements. This study provided a comparison of the dimensional stability alginate products under investigation when casts were poured immediately as recommended by the manufacturers. In addition, a comparison was made of dimensional stability of the algi- nates when various storage methods were used prior to pouring of the casts.

## III. Results

The means and standard deviations of the mesiodistalmeasurements of all experimental casts, arranged according to the methods of storage, are presented in Table I. Means and standard deviations of the buccolingual measurements are shown in Table II.

**Table I. Mesiodistal measurements based on method of storage**

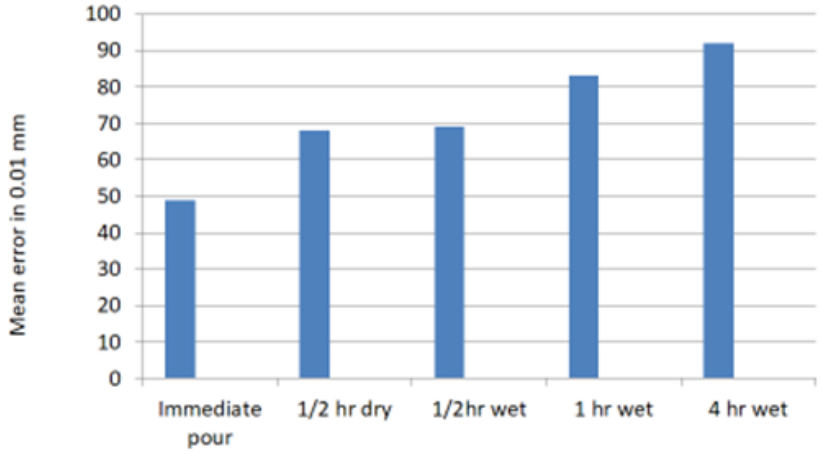
| Storage Method | True Measurment | Mean | Difference | Standard Deviation |
|---|---|---|---|---|
| Immediate pour | 1.480cm | 1.476cm | 0.004 | 0.2415 |
| 1/2hr-dry Towel | 1.480cm | 1.409cm | 0.071 | 0.2405 |
| 1/2hr-wet Towel | 1.480cm | 1.4495cm | 0.0305 | 0.2413 |
| 1hr-wet Towel | 1.480cm | 1.4005cm | 0.0795 | 0.2310 |
| 4hr-wet towel | 1.480cm | 1.395cm | 0.085 | 0.2299 |

**Table II.Buccolingual measurement based on method of storage**

| Storage Method | True Measurement | Mean | Difference | Standered Deviation |
|---|---|---|---|---|
| Immediate pour | 4.8cm | 4.797 | 0.003 | 0.08570 |
| 1/2hr-dry Towel | 4.8cm | 4.757 | 0.043 | 0.08565 |
| 1/2hr-wet Towel | 4.8cm | 4.7345 | 0.0655 | 0.08432 |
| 1hr-wet Towel | 4.8cm | 4.7085 | 0.0915 | 0.08312 |
| 4hr-wet Towel | 4.8cm | 4.7175 | 0.0825 | 0.08354 |

Statistical analyses of the data collected in this study revealed significant findings that may be helpful to users of alginate impression materials. When the data reporting theaccuracy of the alginate materials in the study were subjected to the Duncan Multirange Test for total error, significant interaction between the materials and the methods of handling the materials prior to pouring of the casts was noted.

The immediate-pour method produced less total error in the casts than the other four storage methods. However, the immediate-pour method was not significantly different statistically from the 1/2hr-wet method, 1/2hr in a dry towel, and 1 hour in a wet towel. The methods involving 4hr wet towel shows more difference than immediate pour,1/2hr-wetpour, 1/2hr dry pour,1hr wet pour.




## IV. Discussion

Irreversible hydrocolloids are hydrophilic materials that can capture hard and soft tissue details in the presence of moisture. These waterbased materials are inexpensive and can be easily manipulated by following the manufacturer's instructions. Concerns about their performance include low tear strength, dimensional instability upon delay of pouring and the inability to produce accurate casts when repoured. It is not surprising to find that the dimensional stability of the various brands of irreversible hydrocolloids decreases with increased storage time. This lack of accuracy is caused by water gain or loss from the impression after setting. Imbibition (absorption of fluid by a colloid that results in swelling), evaporation and syneresis (expulsion of a liquid from a gel) result in dimensional changes. The effects of water evaporation and imbibition can be minimized by pouring the impression as soon as possible. Several studies supported immediate pouring or pouring within 10 minutes5-9, 24 without wrapping in a wet towel to avoid any absorption of water by the material[2].

## V. Summary

A total of 100 alginate impressions were made from a standard dentoform model that was grooved at four points to provide precise sites for making buccolingual and mesiodistal measurements to determine dimensional stability. Each alginate impression materials was subjected to five different storage methods prior to pouring in an effort to determine which storage method produced the most accurate casts. Twenty casts were produced from each storage method. Means and standard deviations were computed from the buccolingual and mesiodistalmeasurements of each group of twenty casts. These measurements were then compared with the same measurements of the standard model. An analysis of variance and the Duncan Multirange Test were used to determine total error, taking intoaccount each storage method.

The immediate-pour technique produced the most accurate casts. And there is no significant difference in measurement made at different time interval.

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Dr.SmitaKhalikar. "A Comparative Evaluation of Diamensional stability of irreversiblehydrocolloid impression materials –An invitro study. "IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 1, 2019, pp 54-56.