ORIGINAL ARTICLE

INFLUENCE OF TIME, TEMPERATURE AND HUMIDITY ON THE ACCURACY OF ALGINATE IMPRESSIONS

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Background The goal of the current in vitro study was to assess the dimensional accuracy of dental impressions when stored at different times, temperature and humidity. **Methods:** Impressions were poured to an aluminium triangular die and three teeth placed at the three corners of the die. A total of 130 impressions were made, in which 10 were poured immediately following manufacturers' instructions and the remaining 120 specimens were divided into two groups on the basis of relative humidity during storage. Group-1: 100%, Group-2: 50% relative humidity. Impression was poured with type IV gypsum. The below points were chosen to determine the length between in each of the specimens using the traveling microscope with 10x magnifications after 24 hours of model recovery for calculating the effect of changes in storage conditions- relative humidity, temperature and delay in pouring the impressions, on dimensional accuracy. **Results:** Analysis of the results revealed that the casts achieved by pouring alginate impressions without delay were most accurate than the delay pouring. With the increase in temperature and time, the distance between the points increased and the casts obtained were bigger. **Conclusion:** Irreversible hydrocolloids should be poured immediately for optimum dimensional stability.

Keywords: Dental impressions; Irreversible hydrocolloid; Dimensional accuracy

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INTRODUCTION

Irreversible hydrocolloid impression materials are frequently used in dental clinics. Used to make stone models in almost every department of dentistry, they are famous, principally, as of their reduced cost and easy use in contrast to other impression materials.[1] For a successful prosthesis, it is required that the impression should be made correctly and the cast so produced should be accurate. Irreversible hydrocolloids, owing to their simplicity of handling, mixing and minimal equipment requirement, have become the most commonly used impression materials in the dental field.[2,3] Even though these are mostly used for diagnostic impressions but in certain situations like a clasp-retained, removable partial denture, obturators, maxillofacial prosthesis, alginates are used for definitive impressions also.[4,5] Thus, in these patients, the prosthesis success and overall management depend on the master cast accuracy which turns to the dimensional precision of the alginate impression material.[6–8]

In most of the clinical scenarios, immediate pouring of alginate impression is differed due to time constrain and clinicians desire to transfer replicas to dental labs for the production of the model.[9] Therefore, a substantial delay occurs in pouring the cast, after removing the impression from the oral cavity; which resulted in dimensional variations in the impression, thus the precision of the final model is affected, which can produce in defective restorations.[10] This discrepancy in dimension could be reduced if irreversible hydrocolloids are stored appropriately while the delay in pouring. Storage of alginate in open-air causes the shrinkage known as syneresis due to the evaporation of water. On the other hand, store in the wet environment causes distortion and swelling due to imbibition.[1] Subsequently, if alginate is stored at 100% relative humidity (RH) the insignificant dimensional alterations occur, while obvious shrinkage because of syneresis can also be seen.[11] These dimensional modifications can be related to the internal material characteristics of the alginate.[12]

In the literature search, it was found that studies had been performed to assess the dimensional stability of alginate in different storage situations and for various store times after replica making.[10,14] Although, we didn't identify any study which had evaluated and compared dimensional stability of alginate under variations of humidity, time and temperature. Thus, the current study was designed to calculate the precision of alginate impressions when stored at different times, temperature and humidity. The null hypothesis formulated was there will be no variation in the efficiency of set alginate impressions stored at a range of time intervals, temperature and humidity, and dimensional accuracy after the setting is independent of any storage conditions.

MATERIAL AND METHOD

The study was planned and performed in the Prosthodontics Department, College of Dentistry, King Khalid University, Kingdom of Saudi Arabia. It was conducted to assess the precision of irreversible hydrocolloid impression by pouring material with the difference in humidity and temperature of storage as well as delay in pouring. Velplast irreversible hydrocolloid (Keller laboratories), calcium sulphate hemihydrate Type IV die gypsum Kalrock (Kalabhai manufacturers, Mumbai) & Heat polymerize acrylic resin (Dental Product of India Ltd) were consumed in the current study. Gadgets & Equipment used in current research were Alginator (Algimax-II; Holy medical Ltd), Vernier caliper and customized Humidor with attached digital clock showing relative humidity and temperature, Room heater (Lazer; quality appliances, India), traveling microscope (INCO, Ambala, Haryana India), Custom made Nickel-Chromium plated Aluminium die, mixer (Cuumyx; confident), Electrical balance (Aiwa, India Ltd), Vaccum, perforated acrylic impression tray, Jelenko dental surveyor, acrylic Box frame for pouring cast. For making an impression, an aluminium triangular die was specially prepared for this study. It consisted of three teeth placed at the three corners of the die. The pinpoint marks were made on mesial cusp tip of left and right first permanent molar (point B and C), mesioincisal angle of the left central incisor (Point A). With the help of the traveling microscope, the distance between the points on the metal die was calculated AB 27.41 mm, BC 32.61 mm, and AC 26.32mm. This metal die was placed on a customized base, which was fabricated to adapt to the surveying table. For ease of making impressions and standardization, the impression was made with custom made perforated acrylic impression tray. The custom plate was made-up of heat polymerized resin. A stone final model (MC) was got by copying the die. A 3 mm thickness baseplate wax spacer was placed as per the area designed on the cast, and then the cast was copied by alginate to achieve a replica of the final cast, above which the acrylic custom tray was made. After making individual tray, adapt 3 mm wax on the cast to hold the alginate.

The 1 mm diameter holes were then pierced by using round stainless steel bur in the area of about 1 cm from one another. Following this, each tray was fitted with a bolt-on the external surface, whose respective screw was attached with the vertical arm of the surveyor. On the top of the vertical arm, a platform was attached to place a load during impression making. Finally, the tray so made was attached to the vertical arm with screw and bolt and space was maintained during impression making by fixing the surveyor table height and angulations (zero degrees). This helped in assuring the uniform thickness of the alginate in the individual acrylic tray and metal die. The gap of 3 mm among the and custom acrylic plate and tissue surface of the die 1mm width of holes with 1cm gap in 2 holes were made as per the ADA recommendations for the use of irreversible impression to eliminate any issue on the precision of the alginate and thus on the cast produced by the impression pouring. Alginate was mixed by alginator with a mixing time of ten seconds as per the manipulation specifications by the manufacturer. Distilled water was consumed so that to avoid the effect of minerals on the alginate. The powder water ratio for Velplast was 55 gms of powder and 20ml of water was used as per company directions.

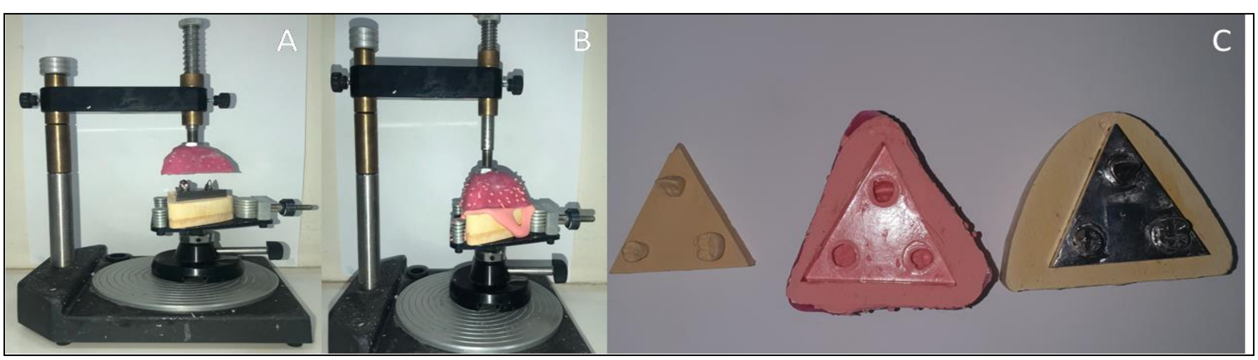

Figure-1: Impression making procedure A) Jelenko dental surveyor with impression tray, B) Impression making procedure, C) Die, Impression, and Cast

Table-1: Group distribution and storage time

Group-1 at 100% Relative humidity, n=60					
Group-1a		Group-1b		Group-1c	
Storage at 25 degree		Storage at 30 degree		Storage at 40 degree	
Group 1a.a	Group 1a.b	Group 1b.a	Group 1b.b	Group 1c.a	Group 1c.b
Delay in pouring by 20 min	Delay in pouring by 30 min	Delay in pouring by 20 min	Delay in pouring by 30 min	Delay in pouring by 20 min	Delay in pouring by 30 min
10 samples	10 Samples	10 Samples	10 Samples	10 Samples	10 Samples
Group-2 at 50% Relative humidity, n=60					
Group-2a		Group-2b		Group-2c	
Storage at 25 degree		Storage at 30 degree		Storage at 40 degree	
Group 2a.a	Group 2a.b	Group 2b.a	Group 2b.b	Group 2c.a	Group 2c.b
Delay in pouring by 20 min	Delay in pouring by 30 min	Delay in pouring by 20 min	Delay in pouring by 30 min	Delay in pouring by 20 min	Delay in pouring by 30 min
10 samples	10 Samples	10 Samples	10 Samples	10 Samples	10 Samples

All impression was made as per manufacturers' advice in normal laboratory situations (23±1 °C, 50±10% RH). A total of 130 impressions were made, in which 10 were poured immediately following manufacturers' instructions and the remaining 120 specimens were divided into two groups on the basis of relative humidity during storage. Group 1- 100%; Group 2- 50% relative humidity. Each group was further divided into three subgroups on the basis of storage temperature. Group 1a/2a-25 degrees Centigrade, Group 1b/2b-30 degrees Centigrade, Group 1c/2c-40 degrees Centigrade. Further, under each subgroup, two sub-sub groups were made on the basis of delay in pouring 20 mins and 30 mins. (Table-1)

Replicas were poured in gypsum type IV (Die Stone – As per manufacturer instructions 30 ml of water and 145.5 gm powder of die stone was mixed) under special environmental situations and store time according to the pre-decided procedure of the study.

The below points were got to calculate the space between the samples by the traveling microscope with 10x magnifications following 24 hours of cast recovery for assessing the effect of discrepancies in storage conditions- relative humidity, temperature and delay in pouring the impressions, on dimensional accuracy.

B-C = Representing – the distance in a transverse plane

A-B= Representing – the distance in Sagittal plane on right side

A-C = Representing – the distance in Sagittal plane on the left part

The measurements were deliberated by the below formula:

Total count = Vernier scale reading+Main scale reading x Least count

The minimum measurement for the microscope in the current study was 0.01 mm. The data on constant parameters are obtainable as Standard deviation (SD) and Mean. The inter-group statistical association of means of continuous parameters is done by an independent sample t-test. The intra-group (pair-wise) statistical comparisons of means are done using paired t-test and measures analysis of variance (RM ANOVA) in each study group. The whole data is statistically tested by Statistical Package for Social Sciences (SPSS ver 21.0, IBM Corporation, USA) for Windows X.

RESULT

Analysis of the results revealed that the models gained by pouring alginate impressions instantly were most precise, the distribution of mean immediate distance A-B, B-C, A-C did not differ significantly between 50% and 100% humidity groups (p-value>0.05). Also, the statistically insignificant differences between the points were observed when impressions were stored at 25 °C of temperature for 20 mins and 30 mins both in 100% and 50% relative humidity. The distribution of mean 20-min, 30-min (at 25 °C) distance A-B, B-C, A-C did not differ significantly between 50% and 100% humidity groups (p-value>0.05 for both). But, the allocation of mean 20-min, 30-min (at 30 and 40 °C) distance A-B, B-C, A-C is significantly higher in 50% humidity group compared to 100% humidity group (p-value<0.05 for all). With the increase in temperature and time, the distance between the points increased and the casts obtained were bigger. The distribution of mean distance A-B, B-C, A-C at 40 °C is significantly higher compared to mean distance A-B, B-C, A-C at 30 °C in 50% and 100% humidity groups (p-value<0.001 for all). The distribution of mean distance A-B, B-C, A-C at 30 min is significantly higher compared to mean distance A-B, B-C, A-C at 20 min in each humidity group at each temperature (p-

value<0.05 for all). This research can show as a step forward for enhanced assessment of dimensional precision of irreversible hydrocolloid impression materials by other parameters having the possibility to affect dimensional stability and dimensional exactness. Therefore, this can be concise that there is a specific association among time of pour, humidity and room temperature for storage in pouring impression on the dimensional correctness of the gypsum casts.

The distribution of mean immediate distance A-B did not differ significantly between 50% and 100% humidity groups (p-value>0.05).

The distribution of mean 20-min, 30-min (at 25deg) distance A-B did not differ significantly between 50% and 100% humidity groups (p-value>0.05 for both).

The distribution of mean 20-min, 30-min (at 30 and 40 deg) distance A-B is significantly higher in 50% humidity group compared to 100% humidity group (p-value<0.05 for all).

The distribution of mean distance A-B at 30 deg and 40 deg is significantly higher compared to mean distance A-B at 25 deg in 50% and 100% humidity groups (p-value<0.001 for all).

The distribution of mean distance A-B at 40 deg is significantly higher compared to mean distance A-B at 30 deg in 50% and 100% humidity groups (p-value<0.001 for all).

The distribution of mean distance A-B at 30 min is significantly higher compared to mean distance A-B at 20 min in each humidity group at each temperature (p-value<0.05 for all).

The distribution of mean distance A-B at 20-min and 30 min is significantly higher compared to mean distance A-B measured immediately in each humidity group at each temperature (p-value<0.05 for all).

The distribution of mean immediate distance A-C did not differ significantly between 50% and 100% humidity groups (p-value>0.05).

The distribution of mean 20-min, 30-min (at 25deg) distance A-C did not differ significantly between 50% and 100% humidity groups (p-value>0.05 for both).

The distribution of mean 20-min, 30-min (at 30 and 40 deg) distance A-C is significantly higher in 50% humidity group compared to 100% humidity group (p-value<0.05 for all).

The distribution of mean distance A-C at 30 deg and 40 deg is significantly higher compared to mean distance A-C at 25 deg in 50% and 100% humidity groups (p-value<0.001 for all).

The distribution of mean distance A-B at 40 deg is significantly higher compared to mean distance A-C at 30 deg in 50% and 100% humidity groups (p-value<0.001 for all).

The distribution of mean distance A-C at 30 min is significantly higher compared to mean distance A-C at 20 min in each humidity group at temperatures 25 deg and 30 deg (p-value<0.05 for all).

The distribution of mean distance A-C at 30 min did not differ significantly compared to mean distance A-C at 20 min in each humidity group at temperature 40 deg (p-value>0.05).

The distribution of mean distance A-C at 20-min and 30 min is significantly higher compared to mean distance A-C measured immediately in each humidity group at each temperature (p-value<0.05 for all).

The distribution of mean immediate distance B-C did not differ significantly between 50% and 100% humidity groups (p-value>0.05).

The distribution of mean 20-min (at 25 deg) distance B-C did not differ significantly between 50% and 100% humidity groups (p-value>0.05 for both).

The distribution of mean 30-min (at 25 deg) distance B-C is significantly higher in the 50% humidity group contrasted to the 100% humidity group (p-value<0.05).

The distribution of mean 20-min, 30-min (at 30 and 40 deg) distance B-C is significantly higher in 50% humidity group compared to 100% humidity group (p-value<0.05 for all).

The distribution of mean distance B-C at 30 deg and 40 deg is significantly higher compared to mean distance B-C at 25 deg in 50% and 100% humidity groups (p-value<0.001 for all).

The distribution of mean distance B-C at 40 deg is significantly higher compared to mean distance B-C at 30 deg in 50% and 100% humidity groups (p-value<0.001 for all).

The distribution of mean distance B-C at 30 min is significantly higher compared to mean distance B-C at 20 min in each humidity group at each temperature (p-value<0.05 for all).

The distribution of mean distance B-C at 20-min and 30 min is significantly higher compared to mean distance B-C measured immediately in each humidity group at each temperature (p-value<0.05 for all).

Table-2: The inter-humidity, inter-Temperature and inter- time distribution of mean distance A–B.

Distance A-B (mm)		Humidity (%)				
		50.0% (n=10)		100.0% (n=10)		*p*-value (Inter-Humidity)
Time	Temperature	Mean	SD	Mean	SD	
Immediate		27.45	0.18	27.45	0.18	0.999^NS
20-min	25°	27.56	0.21	27.52	0.18	0.640^NS
	30°	28.02	0.18	27.77	0.17	0.006**
	40°	28.41	0.23	28.09	0.17	0.003**
p-value (Inter-Temp)	25° v 30°	0.001***		0.001***		
	25° v 40°	0.001***		0.001***		
	30° v 40°	0.001***		0.001***		
30-min	25°	28.03	0.23	27.88	0.17	0.118^NS
	30°	28.29	0.23	28.03	0.15	0.008**
	40°	28.49	0.22	28.15	0.16	0.001***
p-value (Inter-Temp)	25° v 30°	0.001***		0.001***		
	25° v 40°	0.001***		0.001***		
	30° v 40°	0.001***		0.001***		
p-value (Inter-Time)						
Immediate v 20-min	25°	0.036*		0.001***		
	30°	0.001***		0.001***		
	40°	0.001***		0.001***		
Immediate v 30-min	25°	0.001***		0.001***		
	30°	0.001***		0.001***		
	40°	0.001***		0.001***		
20-min v 30-min	25°	0.001***		0.001***		
20-min v 30-min	30°	0.001***		0.001***		
20-min v 30-min	40°	0.001***		0.002**		

p-values (Inter-humidity) by independent sample t test. *p*-value (Inter-Temp) and *p*-value (Inter-Time) by repeated measures analysis of variance (RMANOVA). *p*-value<0.05 is considered to statistically significant. * *p*-value<0.05, ** *p*-value<0.01, *** *p*-value<0.001, NS-Statistically non-significant.

Table-3: The inter-humidity, inter-Temperature and inter- time distribution of mean distance A–C

Distance A-C (mm)		Humidity (%)				
		50.0% (n=10)		100.0% (n=10)		*p*-value (Inter-Humidity)
Time	Temperature	Mean	SD	Mean	SD	
Immediate		26.36	0.21	26.36	0.21	0.999^NS
20-min	25°	26.53	0.22	26.43	0.17	0.276^NS
	30°	26.96	0.22	26.69	0.18	0.007**
	40°	27.22	0.32	26.91	0.31	0.043*
p-value (Inter-Temp)	25° v 30°	0.001***		0.001***		
	25° v 40°	0.001***		0.003**		
	30° v 40°	0.052		0.049*		
30-min	25°	26.97	0.23	26.78	0.17	0.057^NS
	30°	27.28	0.23	26.96	0.17	0.003**
	40°	27.46	0.21	27.06	0.15	0.001***
p-value (Inter-Temp)	25° v 30°	0.001***		0.001***		
	25° v 40°	0.001***		0.001***		
	30° v 40°	0.001***		0.001***		
p-value (Inter-Time)						
Immediate v 20-min	25°	0.003**		0.001***		
	30°	0.001***		0.001***		
	40°	0.001***		0.001***		
Immediate v 30-min	25°	0.001***		0.001***		
	30°	0.001***		0.001***		
	40°	0.001***		0.001***		
20-min v 30-min	25°	0.001***		0.001***		
20-min v 30-min	30°	0.001***		0.001***		
20-min v 30-min	40°	0.057^NS		0.186^NS		

p-values (Inter-humidity) by independent sample t test. *p*-value (Inter-Temp) and *p*-value (Inter-Time) by repeated measures analysis of variance (RMANOVA). *p*-value<0.05 is considered to statistically significant. **p*-value<0.05, ***p*-value<0.01, ****p*-value<0.001, NS-Statistically non-significant.

Table-4: The inter-humidity, inter-Temperature and inter- time distribution of mean distance B–C.

Distance B-C (mm)		Humidity (%)				
		50.0% (n=10)		100.0% (n=10)		*p*-value (Inter-Humidity)
Time	Temperature	Mean	SD	Mean	SD	
Immediate		32.65	0.18	32.65	0.18	0.999^{NS}
20-min	25°	32.82	0.19	32.72	0.19	0.225^{NS}
	30°	33.25	0.17	32.98	0.17	0.002**
	40°	33.66	0.16	33.29	0.17	0.001***
p-value (Inter-Temp)	25° v 30°	0.001***		0.001***		
	25° v 40°	0.001***		0.001***		
	30° v 40°	0.001***		0.001***		
30-min	25°	33.27	0.16	33.08	0.17	0.019*
	30°	33.54	0.17	33.23	0.16	0.001***
	40°	33.75	0.15	33.35	0.16	0.001***
p-value (Inter-Temp)	25° v 30°	0.001***		0.001***		
	25° v 40°	0.001***		0.001***		
	30° v 40°	0.001***		0.001***		
p-value (Inter-Time)						
Immediate v 20-min	25°	0.001***		0.001***		
	30°	0.001***		0.001***		
	40°	0.001***		0.001***		
Immediate v 30-min	25°	0.001***		0.001***		
	30°	0.001***		0.001***		
	40°	0.001***		0.001***		
20-min v 30-min	25°	0.001***		0.001***		
20-min v 30-min	30°	0.001***		0.001***		
20-min v 30-min	40°	0.001***		0.001***		

p-values (Inter-humidity) by independent sample t test. *p*-value (Inter-Temp) and *p*-value (Inter-Time) by repeated measures analysis of variance (RMANOVA). *p*-value<0.05 is considered to statistically significant. * *p*-value<0.05, ** *p*-value<0.01, *** *p*-value<0.001, NS-Statistically non-significant.

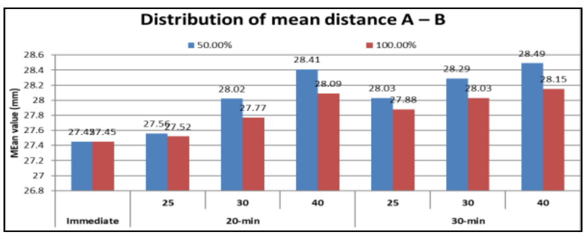

Figure-2: The inter-humidity, inter-Temperature and inter- time distribution of mean distance A–B

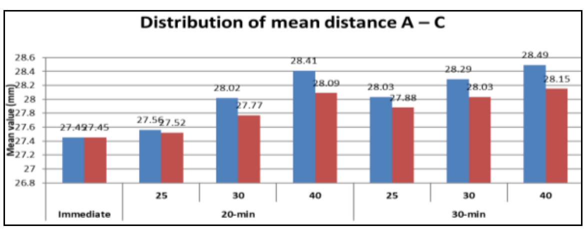

Figure-3: The inter-humidity, inter-Temperature and inter- time distribution of mean distance A–C

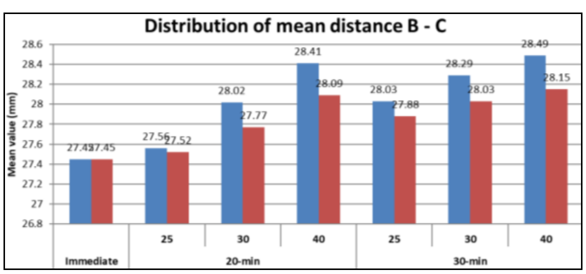

Figure-4: The inter-humidity, inter-Temperature and inter- time distribution of mean distance B–C

DISCUSSION

In any of the prosthodontic management methods, the precise impression is the key to success. The Alginate is the commonly used impression material but is associated with a major shortcoming of considerable dimensional change of set impressions after removal from the mouth, if not poured immediately.[15] To reduce this dimensional change in the alginate impression it should be stored properly so as to constrict the dimensional changes within clinical acceptance.[16] The most important areas controlling the precision of irreversible hydrocolloids are condition and storage time.[17] The current study, consequently, designed at exploring the influence of features on the dimensional precision of set Irreversible hydrocolloids impressions. The outcomes of the study rejected the null hypothesis as the dimensional reliability of irreversible hydrocolloids impressions was affected by time delay in pouring, the temperature of storage and relative humidity.

In the present study, it was tried to develop a storage condition for alginate impressions, suitable for dental clinics. The parameters of time, temperature and humidity were selected which is commonly observed in the clinics. Generally, 2030 mints are required to complete most of the procedure after making an alginate impression and most of the dental clinics maintain a temperature range of 25 °C to 40 °C, thus justifying the use of these variables in the study. The master die and specimen preparations were in accordance with the previous studies and all manipulations, storage and readings were performed by the chief researcher, resulting in a comprehensive exercise period to regulate the study protocol.

The results, of the study, can be clearly understood if the awareness of the oligomer base structure of irreversible hydrocolloids is known and followed. The Irreversible hydrocolloids powder mainly comprises calcium sulphate, potassium, sodium, or ammonium alginates, sodium phosphate and filler particles.[18] The calcium sulphate with the alginate actively forms the network. These alginates are unbranched polysaccharides comprising of related block copolymers (20–320 kDa) of anhydro-β-d-mannuronic acid, high molecular-weight and anhydro-β-d-guluronic acid.[17,19,20] The mannuronan (M) areas are flat, flexible and stretched while the guluron (G) blocks were least elastic. Consequently, the flexibility and rigidity of the set polymer mainly rely on the G:M ratio.[21,22] The translation as of the unset sol to the set gel state by the addition of water is done when calcium ions are freed from diffused calcium sulphate hemihydrate or dihydrate, making cross-linking points.[5,17,23,24] Furthermore, storage time and conditions are major parameters that affect the properties of the impression.[1,10,25]

Results of our study clearly depicted that when poured instantly after retrieval from the patient's oral cavity, precise models can be attained from the alginate impressions, similar to various previous studies.[1,3,10,14,19,26] Conversely, the dimensional accurateness of alginate is jeopardized when they are not stored properly. Therefore, the exactness of the master cast is affected, which would outcome in compromised restorations.[10,27] The variables like time, temperature and humidity individually affect the accuracy of the impressions.[28] When stored for 20–30 mins at 25 °C at 50–100% relative humidity the dimensional changes were statistically insignificant but as the temperature increases 30 °C, 40 °C the significant changes (the expansion)were noticed even in 20 mins at 50–100% relative humidity. The casts obtained were larger than the master die and the distance between the points was more, which in turn would be clinically unacceptable and this is so because during shrinkage if alginate is attached closely with trays than the impression was pulled to the tray which leads an elevate the arch widths and tooth. Through imbibition, it was deformed by swelling. The contraction of alginate that acquires against the bulk of the material is in harmony with the research by Wadhwa SS *et al*.[29]

An encouraging point noticed was at 100% relative humidity the mean distances between the points measured were less at any time and temperature thus, it could be recommended that use of humidor with 100% relative humidity would reduce the dimensional changes in the casts hence can be used for storage of alginate impressions owing to the time and temperature control. This result is in association with the study of Douglas *et al*[30], they established satisfactory dimensional precision of irreversible hydrocolloid impressions which stored for 72 hours at 100% virtual humidity. Dahl *et al*[31] said that alginate may be stored for 24 hours at 100% relative humidity without impairing the dimensional precision of the main materials. Unlike previous studies, we opted for a maximum of 30 mins as this much would be mostly taken in a clinical setting for pouring delay of alginate impressions. The results of the present study specify that at 100% relative humidity also shrinkage occurs which could be attributable to the syneresis. Syneresis occurs by means reorganization of polymer strings and the progressing polymerization and making of hydrogen bonds among polymer chains, accordingly, the skeletal complex of the gel shrinks and forces intermicellar solution outwards, resultant in an exudation of liquid.[6,19,32] Except impressions are placed in the dental office, otherwise, dentists will not be able to manage either the time among impression taking and pouring or the storage situations used in the dental labs.

During impression and making of model irregular faults may occur from several sources like inaccurate powder water ratio, inappropriate extent of the tray, debonding of impression from the custom tray, tray motion through gelation, inappropriate retrieval of the tray and long-standing interaction with the gypsum material[33,34] Gypsum stuff show growth during the setting period. Microstone has the highest net expansion of 0.12%, possibly because of the negation effects of imbibitions.[33] Throughout gelation as of uneven force stress may happen and are stress-free after removal of the tray from the oral cavity which may occur in a deformed impression[35] The research demonstrated the alteration ranging from 100 to 500 μm during mandibular impression taking.[35,36] Furthermore, acrylic dentures making may establish additional and probably major haphazard faults. The current study uses Alginator which provided simple consistent mixes, saves time and cleans up with an even bubble-free mixer.[36] Automatic mixing would create impressions much easier to finished.[30]

The present study explained the production of dimensionally accurate occlusal splints, casts, removable partial denture frameworks, and appliances are likely with suitable storage within the confines (100% humidity). Alginate impression might enlarge, which shows the procedures other than dehydration, plus imbibition and polymerization.

The storage of impression for a practical time could progress the time of chairside methods, which proposes a possible benefit to the clinician[33] but in contrary to our outcomes, Wadhwa SS *et al*. illustrated impression storage in a zip-lock plastic container for up to one hour without any major deformation. It might be due to compositional discrepancies as the impression material consumed in the current study is changed.[29]

The restriction of the present study is that dimensional alterations of impression and final cast are multifactorial; it relies on cast design, company-composition, environmental factors, and controlling factors, etc. Although the study had a single experienced operator and consistently carried out all methods to avoid coarse manipulative differences. But the study is done in-vitro; this might be one of the factors when contrast to the mouth which includes saliva. The current study permits multicentre same manufacturer, multi-operator randomized blinded studies with big sample size beside compositional assessment for every lot of material to ensure the changes if any.

CONCLUSION

Within the limitations of the study, the below conclusions can be drawn: Irreversible hydrocolloids should be poured immediately for optimum dimensional stability. Dimensional accuracy of this material is related to delay in pouring, the humidity of the atmosphere and temperature. In a clinical scenario if alginate impressions are to be stored it should be stored in a humidor at 25 °C for a maximum of 30 mins at 50–100% relative humidity for best results. During maintenance of temperature, humidity, and transport take a major part so that the decrease alterations make the successful prosthesis. The company directions with the water powder ratio, environment, and temperature of mixing water play the main task in decreasing the distortion.

AUTHORS' CONTRIBUTION

MWH: Conceptualization. SC: Data collection, methodology. TAN: Proof reading, result analysis. ARA: Research supervisor. GD: Manuscript writing. MHR: Literature search. AMA: Proof reading.

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