

Impression Inaccuracies in Impressions Taken by Graduate and Undergraduate Students Using Irreversible Hydrocolloid Impression Material

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Impression Inaccuracies in Impressions Taken by Graduate and Undergraduate Students

ABSTRACT

Objective: Current study was carried out to assess the impression inaccuracies in impressions using Alginate material (Irreversible Hydrocolloid impression material) taken by graduate and undergraduate students in Prosthodontic department of Isra Dental College Hyderabad. Good impressions were taken by using alginate impression material by proper or skilled techniques. For fabrication of any prosthesis, accurate impression is required.

Study Design: Descriptive study

Place and Duration of Study: This study was conducted at the Department of Prosthodontics at Isra Dental College Hyderabad completed in one year from Feb, 2018 to Jan, 2019.

Materials and Methods: Alginate impressions of total 600 patients were taken by graduate and undergraduate students. Impression errors were assessed by single person in all impressions taken by students and noted in the designed questionnaire. Data was analyzed thru SPSS version 21. Descriptive statistics such as frequency distribution, percentage and cross tabulation were included in Data analysis. The level of significance was set at $<0.05\%$.

Results: The current research discovered the more frequent inaccuracies occurs in 600 alginate impressions which were taken by graduates and undergraduate dental students were air bubbles (60%), insufficient sulcus record (54%), tearing of impression material from tray (41.2%), inappropriate material mixing leading to incorporation of unmixed dehydrated material (37.2%), voids occurrence (36.4%), recording of insufficient distal surface (31.4%), recording of inappropriate palate (30.1%), under-extended recording (28.3%), inappropriate occlusal thickness (28.5%), incorrect selection of the tray which causes impression rotated (18.3%) and material separation from impression tray (16%).

Conclusion: In the current research, maximum percentage of errors were occurrence of air bubbles when impressions were taken by using the irreversible hydrocolloid impression materials by both graduate and undergraduate students and minimum errors were find out the material separation from the impression tray.

Key Words: Irreversible hydrocolloid material, Impression material, Impression inaccuracies.

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INTRODUCTION

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An impression is a negative replica of oral soft and hard tissues taken in physiological rest position. Most commonly used impression materials in the field of dentistry which are dimensionally stable and recording of exact impressions of oral tissues are the prime and main stages of the construction of a effective and well-fitted prosthesis¹. Accurate impressions of oral hard and soft tissues are necessary for construction of the prosthesis².

There are various impression materials which are used for reproduction of the accurate impressions. Various impression materials are available in market such as agar (reversible hydrocolloid impression material), alginate (irreversible hydrocolloid impression material), impression compounds, plaster, silicones, polysulfides and polyether impression materials³.

Alginate is the material which is frequently used for impressions and from the alginate impressions making

diagnostic models and working models. Alginate is the impression material which is easy in usage, records fine details, and cost-effective elastic impression materials⁴⁻⁸.

Alginate impression material was initially established in 1930s. Before 1978, an alginate impression material was mixed manually, after that mixing device became available which are now used for mixing of an alginate impression material⁹. Alginate impression material is an elastic irreversible hydrocolloid impression material. An alginate impression material is presented in various systems such as powder and pastes forms. Water is used for mixing with the powder form and both pastes are mixed together. Good surface detail qualities are found in this irreversible hydrocolloid impression material even though the material show some inaccuracies like in deep undercuts, impression tear occurs, unsteady in the moistness, less exact replica of details¹⁰. Dimensional changes occur in alginate impression material when exposed to air and moisture which causes syneresis or disappearance of water and imbibition or gaining of water respectively^{11, 12, 13, 14}.

There are few points which kept in mind for effective recording of impressions with irreversible hydrocolloid impression material such as proper selection of the tray, accurate amount of impression material, accurate material mixing and accurate material loading in impression tray, proper insertion of material loaded tray in to oral cavity, centrally seating of the tray in accurate location and tray removal from the mouth¹⁵. For excellent results, properly followed these steps and if not followed then impression errors developed such as errors consist of tears in impression material, insufficient oral cavity recording, occurrence of air bubbles and voids¹⁶.

The purpose of current research was to assess the inaccuracies in alginate impressions which were taken

by graduate and under-graduate dental students by using irreversible hydrocolloid impression material, to discover the reasons of progress of these inaccuracies and to determine the resolutions these impression errors.

MATERIALS AND METHODS

This was a cross sectional study conducted in the Department of Prosthodontics at Isra Dental College Hyderabad completed in one year from Feb, 2018 to Jan, 2019.

The sample size of this study was 600 patients impressions were recorded by under-graduate and graduate students, using convenience non probability sampling technique. Irreversible hydrocolloid impression material used to record upper jaw impressions by under graduates and graduates and was assessed by only one dentist using proper light. Errors were distinguished in designed Proforma.

SPSS version 21 was used for analysis of data. The descriptive statistics was calculated as percentage, cross tabulation and frequency distribution. The level of significance was set at <0.05%.

RESULTS

Current research included 600 patients. Irreversible hydrocolloid impressions of upper jaws of patients were noted in the current study. Later on, recording the alginate impressions, errors were distinguished. Errors noticed were air bubbles, material tearing, insufficient sulcus depth, under-extended material, inappropriate material mixing, inappropriate palatal records, insufficient distal records, occlusal thickness not appropriately recorded, an inappropriate selection of the tray, separation of material from the tray and voids presence.

Table No.1: Inaccuracies in impressions recorded by graduate and undergraduate students with irreversible hydrocolloid impression material

Inaccuracies in Alginate Impression Material	Graduate Frequency percentage	Undergraduate Frequency percentage	Total	P-Value
Inadequate Sulcus Record	77 (52.1%)	83 (54.1%)	160 (54%)	0.730
Tearing Of Impression Material	59 (38.7%)	60 (40.7%)	119 (41.2%)	0.723
Improper Mixing Of Material	49 (32.8%)	59 (38.8%)	108 (37.2%)	0.728
Under Extended Record	38 (26.1%)	44 (28.1%)	82 (28.3%)	0.697
Inappropriate Recording Of Palate	41 (27.2%)	45 (31.4%)	87 (30.1%)	0.339
Inadequate Distal Surface Records	40 (27.3%)	49 (32.0%)	89 (31.4%)	0.376
Presence Of Air Bubbles	89 (58.8%)	91 (60.1%)	179 (60%)	0.815
Occlusal Thickness Not Properly Recorded	44 (28.7%)	37 (25.3%)	81 (28.5%)	0.516
Improper Tray Selection	25 (17.4%)	26 (16.1%)	51 (18.3%)	0.757
Voids Present	57 (38.7%)	47 (30.7%)	104 (36.4%)	0.145
Material Separated From Tray	25 (16.1%)	22 (14.9%)	47 (16%)	0.750

In this current research, an irreversible hydrocolloid impressions tearing were occurs in 41.2%. Insufficient sulcus depth recording with an irreversible hydrocolloid impression material usage was occurs in 54%. 28.3% were the impressions in which the material not appropriately extended beyond the tray for recording of complete surface area correctly. Inappropriate alginate impression material mixing causes assimilation of not properly mixed dehydrated material was noted in 37.2%. 30.1% of impressions were observed in not properly recorded the palatal surface area.

In the current research, 60% air bubbles were found in the alginate impression materials used by both groups of students which are the maximum percentage. In 31.4% of impressions, material not entirely extended distally and insufficient distal recording was noted. 28.5% were noted that the occlusal thickness was not accurately recorded in alginate impression material. In 18.3% impressions were rotated impression because of wrong selection of the tray and impression not centrally placed. In 36.4% of alginate impressions, voids were present (Table 1).

DISCUSSION

In this current research, 600 impressions were observed using irreversible hydrocolloid impressions material (alginate) and were assessed by only one dentist using proper light system; various inaccuracies assessed and were noted in the designed proforma. Several researches have been done previously by different researchers on irreversible hydrocolloid impression materials^{16, 17}. Properties of irreversible hydrocolloid impression materials were studied by Williams and Watkins¹⁷. Some inaccuracies in irreversible hydrocolloid impressions were recognized by Robert W. Rudd¹⁶. Robert W. Rudd research gives the inaccuracies prevention by using an appropriate mixing of alginate impression material, mixing play major role to prevent the inaccuracies.

In our current research, out of 600 impressions, impression material's tearing were observed in 41% of alginate impressions as presented in table 1, though other researches observed maximum ratio of irreversible hydrocolloid impressions tear¹⁸. Tearing of impression materials occurs when the impression is removed from the oral cavity rapidly due to insufficient asset. In Current research, 54% of impressions were insufficiently recording the sulcus depth when using an irreversible hydrocolloid impression material. Same results were found in the research of W. Robert et al¹⁶. Accurate tray size is important for proper impression and adequate space will provide for the alginate impression material and enough area for recording the required tissues, whereas using too small impression tray, impingement and distortion occurs in soft tissues from the tray borders.

Un-mixed dehydrated material in irreversible hydrocolloid impression was observed in 37% of impressions due to the inadequate mixing of impression material revealed in Table 1. Research of Rubell B.S² showed that improper addition of water to the irreversible hydrocolloid impression material which is in powder form during mixing causes unmixed alginate impression material and incorrect impression record.

In our research, 28% of impressions taken by both students (graduates and under-graduates) in which alginate material not properly record the entire surface area because of the improper flowing of material beyond the tray. If the thick consistency of mixed alginate impression material was used for impression, then loaded tray during impression taking not properly extended into the inter-dental spaces and obviously result in inappropriate tissue record of the oral cavity. Thus, whenever using irreversible hydrocolloid impression material, always adding powder in the water for proper mixing and always got greatest outcomes. When impressions were taken with irreversible hydrocolloid material, 30% impressions were revealed that palatal surface area was not appropriately recorded (Table 1). Proper sized impression tray was used for recording palatal tissue and ascending ramus of the mandible, these structures not accurately recorded if large sized tray were used.

36% voids observed in impression of irreversible hydrocolloid impression material which were taken by both groups of students in our research (Table1). For accurate impression tray must be appropriately filled out with the alginate impression material, spatula used for removing an extra material from the borders of the tray. Impression material not supported by the tray causes the distortion of the model antero-posteriorly specially in distal areas of maxillary and mandibular impressions. This distortion occurs because of the weight of an extra material.

In our study, 31% of impressions were observed with insufficient distal recording because of an impression material not properly extended distally which was taken by both groups of the students. In 28% of irreversible hydrocolloid impressions of both groups of students, inappropriate occlusal thickness was assessed. Approximately 3-4mm space for impression material must be present among the dentition and impression trays borders for accurate recording of the occlusal thickness (Table 1). Impression tray selection is very important for the accurate impression recording, sometimes trays should be modified with wax, impression compound, green stick compo or silicones putty. In this study 18% of the rotated impressions observed because of the inaccurate tray selection. It's also very important that impression tray should be place properly without any movement and don't give an extra pressure.

60% which is the greatest percentage of air bubbles in the irreversible hydrocolloid impressions were assessed in current research taken by both graduates and under-graduates students. Accurate water power ratio of irreversible hydrocolloid impression material and proper spatulation is essential for avoiding the air bubbles. Air trapping is greater in hand mixing of the irreversible hydrocolloid impression material using bowl and spatula, so reduce the air trapping with adding powder into the water in order and speedy mixing procedure thru automatic mixing vibratory system^{19, 20}. Water used for mixing of alginate impression material should be of room temperature because setting time of the material will be increases using cold water and reduces with warm water. To avoid creating the air bubbles, irreversible hydrocolloid impression material is mixed in required mixing time using spatula and rubber bowl and mixing is doing against the walls of the rubber bowl. During mixing of irreversible hydrocolloid impression material don't propel the material in vertical motion up and down, stirring it in rounded manner and tapping the rubber bowl properly. To avoid the air bubbles using properly mixed material and instantly pour the impression.

Formation of voids seen when mixing consistency of the irreversible hydrocolloid impression material was thin and it's very difficult to handle and control the material in impression tray. Material escapes out and flows out from the impression tray, consequently outcomes will be inappropriate recording of the oral hard and soft tissues.

When irreversible hydrocolloid impression material would not stick homogeneously with simple impression tray, tray material separation happens after setting. In current research, separation of the tray material was minimally assessed using alginate impression material by graduates and under-graduates students.

CONCLUSION

It can be concluded in our research that errors such as air bubbles occurs in highest percentage when irreversible hydrocolloid impression materials used by both graduate and undergraduate students and minimum inaccuracy was find out the impression material separation from impression tray.

Author's Contribution:

Concept & Design of Study: Farzana Memon
 Drafting: Rabia Chandio, Rafia Khan
 Data Analysis: Amber Faryal, Syed Ahmed Omer, Sameer Quraeshi
 Revisiting Critically: Farzana Memon, Rabia Chandio
 Final Approval of version: Farzana Memon

Conflict of Interest: The study has no conflict of interest to declare by any author.

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