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Comparison of The Surface Area Coverage of The Impressions Made of Impression Compound And Alginate: An in Vitro Evaluation.

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Abstract
Introduction: *The history of complete denture impression procedures have been influenced largely by the development of impression materials from which new techniques arose. Selection of material is left to the desertion of the dentist, who makes choices based on personal preferences and experience. This study has been conducted to compare the surface area coverage in the maxillary and mandibular primary impressions using alginate and impression compound.*
Materials & method: *A total of 20 primary maxillary impressions and 20 mandibular primary impressions are made; out of which 10 primary maxillary and 10 mandibular primary impressions are made using impression compound and remaining 10 primary maxillary and mandibular impressions are made using high viscosity alginate. After disinfection, the casts were poured using dental plaster and divided in two groups. The examinations for surface area coverage were performed on the plaster models using sketch and cal software. The results for the surface area coverage were subjected to the two way ANOVA statistical test.*
Result: *In Intragroup comparison of group 1, Subgroup 1 recorded surface area of 18.87 ± 0.357 cm^2 where as Subgroup 2 recorded surface area of 11.69 ± 0.248 cm^2. In intragroup comparison of group 2, Subgroup 1 recorded surface area of 23.062 ± 0.468 cm^2 where as Subgroup 2 recorded surface area of 14.678 ± 0.311 cm^2. In intergroup comparison between two groups, group 2 (Impression compound) recorded mean surface area of 37.44 ± 0.113 where as group 1 recorded surface area of 30.56 ± 0.233 cm^2.*
Conclusion: *The impression compound is a better material for fabricating complete denture for edentulous patients as compared to alginate in terms of surface area coverage. Maxillary arches are found to have more surface area as compared to their counterpart mandibular arches.*
Keywords: *Impression, mandibular, maxillary, surface.*

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I. Introduction

An impression is a record, a facsimile of mouth tissues taken at an unstrained rest position or in various positions of displacement. In the case of an edentulous arch, this requires a unique combination of managing movable soft tissue commensurate the integrating different materials and a technique for accurate reproduction.[1] The history of complete denture impression procedures have been influenced largely by the development of impression materials from which new techniques arose. All the present literature in standard textbooks[2,3,4] recommends making primary impressions in complete dentures with the help of high viscosity alginate or putty. Only, Swenson[5] recommends making it with the help of Impression compound. Selection of material is left to the desertion of the dentist, who makes choices based on personal preferences and experience.In the last few decades, many newer materials have been introduced, which claim to have better properties than the older and more traditional materials. Irrespective of this, many of the dentists still prefers to use the impression compound and alginate the material of choice for the making of primary impression.Hence, this study has been conducted to compare the surface area coverage in the maxillary and mandibular primary impressions using alginate and impression compound. Null hypothesis suggests no difference in surface area coverage in both alginate and Impression compound.

II. Materials And Methods

A total of 20 primary maxillary impressions and 20 mandibular primary impressions are made; out of which 10 primary maxillary and 10 mandibular primary impressions are made using impression compound and remaining 10 primary maxillary and mandibular impressions are made using high viscosity alginate. Standard edentulous maxillary and mandibular mold was used to make these impressions. DPI alginate was used to make impressions with alginate and the DPI pinnacle impression compound was used to make impressions with impression compound. Plastic rim locked stock trays (U3 & L3) were used to make impressions with alginate and edentulous stock trays (U3 & L3) for making impressions with impression compound. Alginate was mixed according to manufacturer's instructions to obtain a smooth hard consistency. The impression compound was kneaded and softened in hot water bath at 55^0C and loaded onto the tray. Impressions were made on the standard edentulous mold. After disinfection, the casts were poured using dental plaster and divided in two groups. The examinations for surface area coverage were performed on the plaster models using sketch and cal software. The results for the surface area coverage were subjected to the two way ANOVA statistical test.

III. Results

The observations recorded were statistically analyzed. In Intragroup comparison of group 1, Subgroup 1 recorded surface area of 18.87 ± 0.357 cm^2 where as Subgroup 2 recorded surface area of 11.69 ± 0.248 cm^2. In intragroup comparison of group 2, Subgroup 1 recorded surface area of 23.062 ± 0.468 cm^2 where as Subgroup 2 recorded surface area of 14.678 ± 0.311 cm^2.In intergroup comparison between two groups, group 2 (Impression compound) recorded mean surface area of 37.44 ± 0.113 where as group 1 recorded surface area of 30.56 ± 0.233 cm^2. The results were interpretated and one way analysis of variance was carried out. The impressions made by impression compound were found to be covering more surface area than the impressions made by alginate as a primary impression material. Also, in both the groups, maxillary primary impressions covered more surface area than the mandibular primary impressions.

IV. Discussion

Primary objective of impression making to make an impression of denture bearing alveolar residual ridge spaciously in order to gain extensive load bearing surface so that masticatory efficiency can be better enhanced.[3] In order to obtain the above said the extension of the tray and selection of the material is very crucial. The chemistry and properties of the material used plays an important role in the surface area coverage. Two materials tested were alginate and impression compound which are used interchangeably and most commonly in clinics.[6] Though, Alginate possesses the qualities of reproduction of good surface details because of its better flow, It lacks the capability to compress the tissues and don't have sufficient tear strength.[7] Null hypothesis suggesting no difference in surface area coverage in both alginate and impression compound stands rejected as a positive interaction was found between the two materials tested on the basis of surface area coverage. Alginate impression materials are hydrophilic in nature and this facilitates the making of accurate impressions in the presence of saliva and blood. Because of its high flow even the undercut areas can also be recorded easily; but because the tear strength is less it can tear upon removal of the impression.[8] On the other hand, the flow of impression compound is less and has high tear strength; it will be very difficult to retrieve the impression from severe undercuts. Alginate impression has a low wetting angle; hence full arch impressions are easily captured. Impression compound on the other hand, becomes rigid on reaching mouth temperature and compresses the movable oral tissues, thus allowing maximum coverage of the alveolar bone proper.[9] Various textbooks[2,3] suggest usage of maximum surface area for proper retention in complete dentures. Jacobson and Krol[10] suggested edentulous ridge to perform ***snowshoe effect***.[11] To provide proper support, forces acting should properly distribute over the entire ridge rather than some particular points.[12] The purpose of the study was to evaluate the surface area recorded by Alginate and Impression compound and to affirm which one of the two materials tested is better in terms of obtaining primary impression. Group 2 (Impression compound) recorded mean surface area of 37.44 ± 0.113 where as group 1 (Alginate)recorded surface area of 30.56 ± 0.233 cm^2. This means Impression compound covers more surface area than Alginate. Also, minor manipulations can be successfully carried out in impression compound impression where as alginate impression has to be discarded and remade in case of any loss of border or detail. Boucher always suggests making primary impressions slightly over extended which can only be achieved by a material which is rigid in nature.

In intragroup comparison in both the subgroups of Alginate, Maxillary denture sub group recorded mean surface area coverage of 18.876 cm2 where as mandibular surface area group recorded 11.691 cm^2. In intragroup comparison in both the subgroups of Impression compound, Maxillary denture sub group recorded mean surface area coverage of 23.062 cm^2 where as mandibular denture surface area group recorded 14.678 cm^2. Boucher[2] also suggests the maxillary and mandibular denture base area to be 24 cm^2 and 14 cm^2 respectively. This confirms the result obtained in our study in terms of usage of impression compound as primary impression material and is far above the readings in alginate group. Vohra et al[13] also conducted similar

study and found impression compound to be most popular material for primary impressions. The more surface area coverage in impression compound leads to better retention, stability and support in completed dentures.[14] Alginate records the impression in mucostatic and the impression compound records the impression records the impression in mucocompressive so the selection of the material will be greatly influenced by the technique which is being used.[15] Because of the limitations of these materials, these materials are used for the making of primary impression based on meticulous selection of the impression material.

V. Conclusion

The impression compound is a better material for fabricating complete denture for edentulous patients as compared to alginate in terms of surface area coverage. Maxillary arches are found to have more surface area as compared to their counterpart mandibular arches.

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SNO.	Group 1 (Alginate)		Group 1 (Alginate)	Group 2 (Impression Compound)		Group 2 (Impression Compound)
	Maxilla (cm^2)	Mandible (cm^2)	Mean (cm^2)	Maxilla (cm^2)	Mandible (cm^2)	Mean (cm^2)
1	20.12	13.24	33.36	25.23	15.32	40.55
2	18.64	14.12	32.76	27.11	16.25	40.36
3.	18.02	11.32	29.34	23.19	14.23	37.42
4.	19.72	10.23	29.95	21.22	13.68	34.90
5.	21.01	11.66	32.67	20.86	12.24	33.10
6.	19.92	12.85	32.77	21.88	14.54	36.42
7.	16.63	13.43	30.06	22.67	15.11	37.78
8.	18.21	09.24	27.45	23.12	15.90	39.02
9.	17.93	10.17	28.10	23.45	14.97	38.42
10.	**18.56**	**10.65**	**29.21**	**21.89**	**14.54**	**36.43**

Table 1: Observations recorded.

Alginate	Sub group 1	Sub group 2	Total
N	10	10	20
$\sum X$	188.76	116.91	305.67
Mean	18.876	11.691	15.2835
$\sum X^2$	3578.2088	1391.1393	4969.3481
Std. Dev	1.2985	1.6447	3.9579

Table 2: Statistics in Group 1.

Source	SS	Df	MS	F
Between treatments	258.1211	1	258.1211	
Within treatments	39.5195	18	2.1955	117.56669
Total	297.6407	19		

Table 3: f value calculated of Group 1.

Impression Compound	Sub group 1	Sub group 2	Total
N	10	10	20
∑X	230.62	146.78	377.4
Mean	23.062	14.678	18.87
$\sum X^2$	5350.9814	2166,264	7517.2454
Std. Dev	1.898	1.1464	4.5636

Table 4: Statistics in Group 2.

Source	SS	Df	MS	F
Between treatments	351.4573	1	351.4573	
Within treatments	44.2501	18	2.4583	142.96529
Total	395.7074	19		

Table 5: f value calculated of Group 2.

Group	group 1	group 2	Total
N	10	10	20
∑X	305.67	374.40	80.076
Mean	30.567	37.44	34.0035
$\sum X^2$	9385.0873	14066.655	23451.7423
Std. Dev	2.1518	2.3362	4.1484

Table 6: Intergroup comparison between Group 1 and group 2.

Source	SS	Df	MS	F
Between treatments	236.1906	1	236.1906	
Within treatments	90.7914	18	5.044	46.82636
Total	326.9821	19		

Table 7: f value calculated in Intergroup comparison between group 1 and group 2.

Figure 1: Primary maxillary Impression made with Impression compound.

Figure 2: Primary mandibular Impression made with Impression compound.

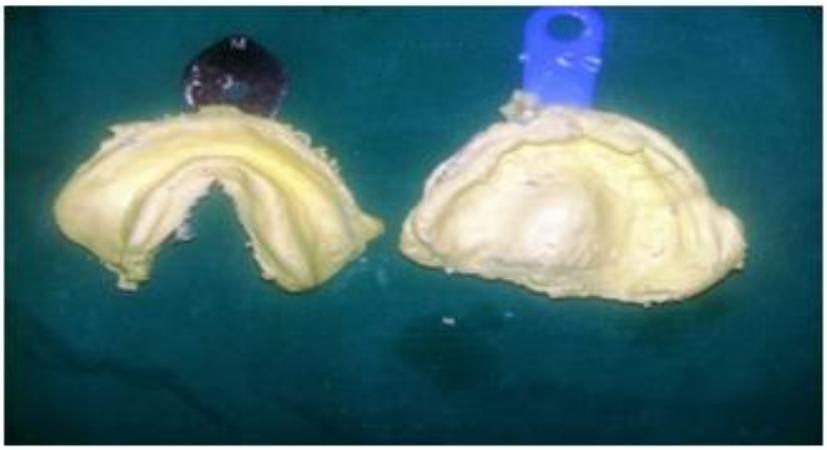
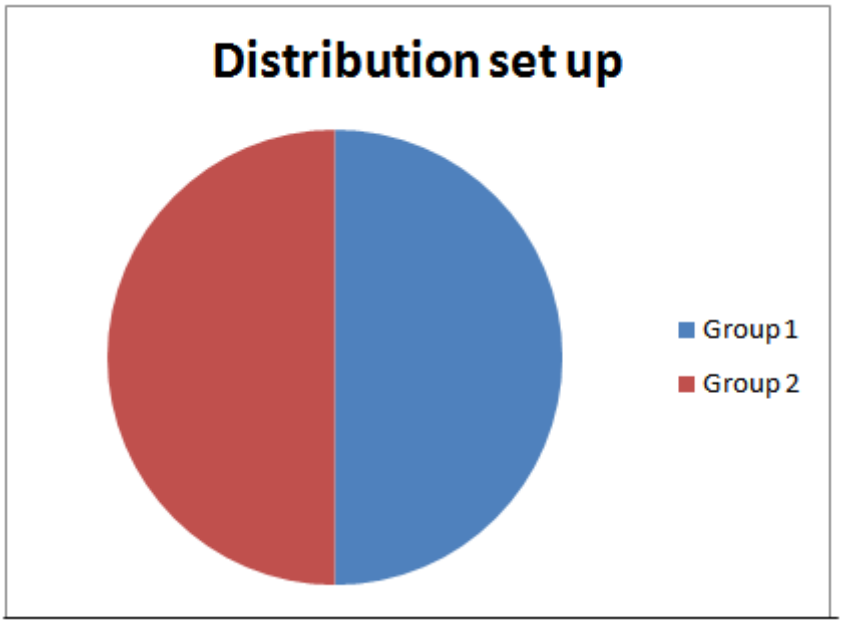


Figure 3: Primary maxillary and mandibular Impressions made with Alginate.



Graph 1: Distribution set up

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