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"COMPARATIVE EVALUATION OF RETENTION OF MANDIBULAR SPECIAL TRAY BY USING THREE DIFFERENT MATERIALS FOR BORDER MOULDING AND FINAL IMPRESSION"

Original Research Paper

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ABSTRACT- purpose: To compare the retention of impressions made by using three different border molding and final impression materials i.e. green stick with incremental technique, condensation silicon and polyether with single step technique.

INTRODUCTION : For the success of complete denture three contributing factors are responsible that are- retention, stability and support. Retention provides psychologic comfort, stability provides physiologic comfort to the patient and support provides longevity to the complete denture. 2Retention in turn depends upon the following factors- adhesion, cohesion, interfacial surface tension, intimate tissue contact, peripheral seal, gravity, atmospheric pressure, neuromuscular control. 3,4Retention can be achieved by border molding which is necessary for the maintenance of the contact of denture borders with adjacent vestibular tissues during rest as well as in functional activities. There are various materials and techniques used for border moulding. - Materials used for border moulding are Green stick compound, autopolymerizing resins, polyether, putty elastomeric impression materials, mouth temperature waxes and soft liners.[1, 7,8] Methods/Techniques used are Single step or simultaneous border moulding- in which the entire periphery of the tray is refined in a single step .using polyether and condensation silicon and Incremental or sectional border moulding- in which portions of the periphery of the tray are refined individually using green stick compound. [9,10,11] There are few shortcomings if border moulding is done by green stick compound. To overcome the drawbacks of conventional method, different materials such as elastomeric impression materials can be used. When elastic impression materials are used for making complete denture impression, good results can be obtained with less difficulty and less expenditure of time. But literature review revealed no such study which has compared the retentiveness of mandibular denture bases fabricated by green stick border moulding method and border moulding by elastomers.Therefore this study was conducted on edentulous subjects to compare the retention of impressions made by using three different border moulding and final impression material materials i.e. green stick with incremental technique, condensation silicon and polyether with single step technique.

Figure 1 digital weighing meter

Materials and Armamentarium:-

- Digital weighing meter.(fig1)
- Green stick border molding compound .

- Zinc oxide eugenol paste.
- Polyether elastomeric impression material.
- Condensation silicone elastomeric impression material.

METHOD: All total 10 patients were selected each having border molding and final impression by using three different customs trays and impression materials

A. GROUP A- All 10 Patients, border molding with green stick by incremental technique and final impression made with Zinc oxide eugenol impression paste.
B. GROUP B- All 10 Patients, border molding with condensation silicon by single step technique and final impression made with Light body elastomeric impression material (condensation silicon) .[11]
C. GROUP C- All 10 patients, border molding with polyether by single step technique and final impression made with Light body elastomeric impression material (polyether).

Green stick with zinc oxide eugenol impression paste is taken as a control

Primary impression was made with impression compound for each of the patient selected and the cast was poured with dental plaster. 10Three custom trays were fabricated for each patient. Three custom trays were prepared with autopolymerization resin with stops. The spacer was provided with thickness of 1.0mm to 1.5mm and borders are 2 to 3 mm short from the sulcus. For the first custom tray border molding was done section wise(incremental technique) with low fusing compound (Green stick compound) and final impression was made with zinc-oxide eugenol impression paste , impression was washed with water and placed back in to the mouth and retention was checked. For the second custom tray, border moulding was done with putty material condensation silicon elastomeric impression material (Zeta Plus) in single step technique and final impression was made with light bodied condensation silicon elastomeric impression material (Zhermack) , impression was washed with water and placed back in to the mouth and retention was checked. [11,13] For the third custom tray border moulding was done with medium bodied polyether elastomeric impression material(Impregum soft, 3M ESPE) in single step technique and final impression was made with light bodied polyether elastomeric impression material(Impregum soft, 3M ESPE) . Impression was washed with water and placed back into the mouth and retention was checked.

Assesment of Denture Retention :

- In all three groups , retention of mandibular arch was tested at the time of secondary impression. A digital weighing meter was used to measure a mandibular retention to vertical displacement by applying a pulling force on a metal hook located in the geometric center of each mandibular arch. Based on geometrical principle identification of the geometric centre for each mandibular arch was carried out .The centers of the retromolar pads and the midlines were marked on the custom trays, three lines bisecting the three angle of the triangle were then drawn on the primary cast base, the intersection of these three lines was considered the geometric centre.[12]
- Three “V” shaped grooves were created on the mandibular custom trays one was made on the lingual flange at the midline region just below the central incisors , the other two grooves were created at the retromolar pad area just near to the second molar of both side.
- A wrought wire of 19-gauge stainless steel was then bent at its center and adjusted so as not to encroach on the tongue space and to run 2cm above the occlusal plane from the retromolar pad groove of one side to the retromolar pad groove of the other side.
- A second wrought wire of the same diameter was adjusted to extend from the groove at the lingual flange upward, 2cm above the occlusal plane.[12]
- The two wires were then bent forward each other until they met the identified geometric center, and shaped to form a “C-shaped” loop above the geometric center. The free end of the wires were then fixed to the custom tray of the lower denture by self-cure acrylic resin and excess acrylic resin was then removed. Each patient was asked to sit comfortably in a dental chair with his head on the headrest and the occlusal plane is parallel to the floor of the room.
- After secondary impression insertion , tongue freedom and loop position were checked and 3min. seating time was allowed before taking the measurements.
- The metallic probe of the digital weighing meter was then attached to the C-shaped metal hook created at the geometric center of the mandibular secondary impression custom tray and a vertical pulling force was applied to measure retention , retention strength was measured in gram .[12]

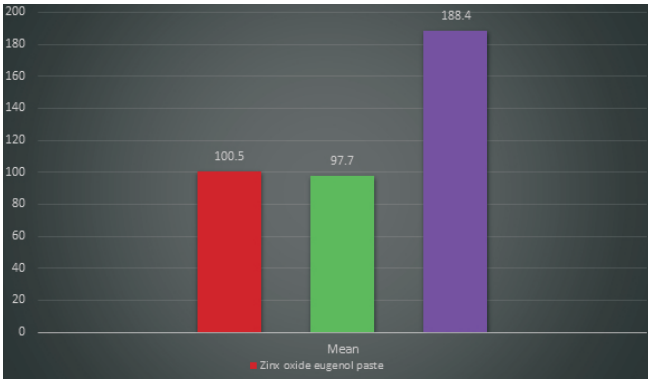
RESULTS

Statistical Analysis

After completion of the Data, appropriate statistics were applied. All data were analyzed using IBM statistical package for social sciences (SPSS) - version 21 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0 (SPSS Inc., Chicago, USA). Armonk, NY: IBM Corp.) Descriptive statistics included calculation of means and standard deviation. Data distribution was assessed for Normality using Shapiro-Wilk test. Student's t-test was used for comparison between the groups. All values were considered statistically significant for a value of $p<0.05$.

Table 1: shows the retentive values of the three different materials used for border moulding and secondary impression (final impression) in grams.

S.no	Zinc oxide eugenol paste (in gms)	Condensation silicon (in gms)	Polyether in gms)
1.	107	86	185
2.	105	102	197
3.	101	107	192
4.	103	97	205
5.	96	98	165
6.	92	89	166
7.	112	104	216
8.	102	99	189
9.	98	101	191
10.	89	94	178



Graph 1. Bar Graph shows the mean values between three different materials used for border moulding and secondary impression (Final impression)

Table 2: shows the mean values for comparison between the three different materials used for border moulding and secondary impression (final impression).

S.no	Type of material	Total (N)	Mean	S.D	t-value$^{\perp}$	p-value
1.	Zinc oxide eugenol paste	10	100.50	6.948	45.740	<0.001*
2.	Condensation silicon	10	97.70	6.533	47.293	0.006
3.	Poly ether	10	188.40	15.987	37.265	<0.001*

*p< 0.005- statistically significant, $\perp$ Student t- test

Table 2. Presents the mean values for comparison between three different materials used for border moulding and secondary impression. The mean value (188.40) of polyether material was found to be statistically significant ($p <0.001$) and higher than that of condensation silicon (97.70) whose value is insignificant ($p= 0.006$) as well. Statistically significant value ($p <0.001$) was found amongst the zinc oxide eugenol paste material (100.50). Hence, in comparison with other two materials used for border moulding and secondary impression (final impression); polyether is considered to be the best material to be used for border moulding and secondary impression (final impression).

DISCUSSION : Complete denture is a fixed or removable dental prosthesis that replaces the entire dentition and associated structures of the maxillae or mandible . For the success of complete denture three contributing factors are responsible that are- retention, stability and support. Retention provides psychologic comfort, stability provides physiologic comfort to the patient and support provides longevity to the complete denture. Retention is defined as the quality inherent in the dental prosthesis acting to resist the forces of dislodgment along the path of placement. Retention in turn depends upon the following factors- adhesion, cohesion, interfacial surface tension, intimate tissue contact, peripheral seal, gravity, atmospheric pressure, neuromuscular control. Retention can be achieved by border moulding which is necessary for the maintenance of the contact of denture borders with adjacent vestibular tissues during rest as well as in functional activities. There are various factors associated with the retention of complete denture, which may be broadly grouped as biological, physical and mechanical. These factors of retention can be achieved by means of meticulous border moulding and an accurate final impression. 10 Border moulding is defined as the shaping of impression material along the border areas of an impression tray by functional or manual manipulation of the soft tissue adjacent to the borders to duplicate the contour and size of the vestibule. In this study, to compare the retentive values of the final impression, all total 10 patients were selected and divided into three groups, each having border moulding and final impression by using three different impression materials i.e- zinc-oxide eugenol impression paste, condensation silicon and polyether (border moulding with green stick compound and final impression with zinc-oxide eugenol is taken as an control) After completion of the Data, appropriate statistics were applied, Student's t-test was used for comparison between the

groups, the mean values for comparison between three different materials used for border moulding and secondary impression. The mean value (188.40) of polyether material was found to be statistically significant ($p < 0.001$) and higher than that of condensation silicon (97.70) whose value is insignificant ($p = 0.006$) as well. Statistically significant value ($p < 0.001$) was found amongst the zinc oxide eugenol paste material (100.50). Hence, in comparison with other two materials used for border moulding and secondary impression (final impression); polyether is considered to be the best material to be used for border moulding and secondary impression (final impression). In final impression sectionally border moulded custom tray with green stick performed better than the single step border moulding with putty material condentation silicon elastomeric impression material, this result is some what differ from Renu Gupta et al, Sanjeev Mittal et al and Rameshbabu Yarapatineni et al. which may be due to uniform scraping done along the border moulded low fusing impression compound peripheries allowing adequate space for final impression material and also aid in good flow of Zinc-Oxide eugenol impression paste impression material all over the peripheral surfaces and gives a good retention value, and this result favours the Anchal Qanungo et al [5,11,15,16,17]

CONCLUSION: In single step border moulding using putty consistency condentation silicon elastomeric impression material(Zeta Plus) , the result is some what differ from E.G.R.Solomon. which may be due to the peripheral areas of custom were not recorded well due to its low flowable property and less dimensionally stable because of high curing shrinkage, peripheral areas of custom tray were not trimmed prior to the final impression and hydrophobic nature, may have resulted in altered flow of light bodied elastomeric impression material(Zhermack) , leading to variable or uneven thickness of light bodied elastomeric impression material , which may lead to decreased peripheral seal and decreased retention value. "Lawson" suggested that thickening and widening of the sublingual region of the denture could result in more retention (Fig 14) and in this proper flow of putty material in sublingual region during border moulding is questionable .[18,19,20,21]

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