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Research Article

COMPARISON 0F DIFFERENT IMPRESSION PROCEDURES ON TISSUE DISPLACEMENT

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ABSTRACT

Background: In bilateral partial edentulous condition modified Mc Lean's Impression technique is most commonly advised, this over impression procedure may be time consuming clinically and possible errors too can be induced while recording. The purpose of this study was to determine the efficacy ofsingle custom tray using medium body elastomeric impression material overmodified Mc Lean's impression procedure using Zinc oxide eugenol impression paste.

Material and Methods: Six patients were selected with bilateral edentulous span in mandibular arch with at least all the molars missing. Patient was subjected to three different impression procedures and cast were constructed. Standardized acrylic occlusal platform was constructed and at three points of the edentulous span the vertical tissue displacement occurring due to different impression procedure was measured. ANOVA test showed the significance, post-hoc testing TukeyHSD was performed to explore the difference among the groups.

Results: The relative difference of edentulous tissue displacebility between irreversible hydrocolloid and custom tray A with medium body elastomeric impression material was -0.38, -0.92, -0.67 at 5mm from last present tooth, midway,retromolar pad respectively. At the same three points the difference of edentulous tissue displacebility between hydrocolloid impression procedure and custom tray B with Zinc oxide eugenol impression paste was -0.17, -0.66, -0.52. Study showed at all three positions of edentulous span the tissue displacebility was better with custom tray A using medium body elastomeric impression material and showed a statistical good agreement.

Conclusion: Single custom tray and use of medium body elastomeric impression material obtains better functional impression of distal extension edentulous span. This will help clinicians in reducing the chair side time and eliminates errors induced from two stage functional impression techniques.

INTRODUCTION

In distal extension partial dentures,support against the vertical forces of mastication is gained relatively from the rigid teeth, resilient mucosa and underlying bone. Correct impression procedures provide the best possible support to be gained from an edentulous ridge for a removable partial denture. (Truck, 1965; Mc Cracken, 1953; Applegate, 1955). Studies were conducted on irreversible hydrocolloid, one piece impression, altered cast technique, functional fluid wax , single impression technique with mercaptan rubber, selective pressure single impression technique with low viscosity polysulfide rubber impression material (Leupold,1966; Vahidi, 1978; Dumbrigue and Esquivel, 1998). Monteithet.al. proposed three concepts for managing the load distribution in distal extension prosthesis.

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The concepts were flexible denture base (use of stress breaking device was advocated), floating denture base (mucostatically recorded denture base) and mucofunctional concept (impressions recorded the tissues surfaces in the shape that the residual ridges assume under functional loading (Monteith, 1984; Monteith, 1984). Authors have suggested various functional impression procedures (Von Krammer, 1988; Diwan and Fahmi, 1988) and most of them favoring altered cast procedure as the best possible way to obtain the working cast by combining anatomic and functional impression (Dumbrigue and Esquivel, 1998; Leupold *et al*., 1992). The draw back associated with this procedure are time consuming, more number of clinical visits, possible laboratory errors making it more unpopular and less used techniques among the professionals (Frank *et al*., 2004). The literature review suggested scarce amount of tissue displacement studieswith relation to use of single custom tray and medium viscosity polysiloxane impression material in tooth tissue supported prosthesis construction. Hence the proposed study was to

measure the amount ofvertical tissue displacement occurring on the distal extension tissues under different impression procedures such as stock tray using mucostatic irreversible hydrocolloid impression material, single custom tray using medium body polysiloxane impression material and modified Mc Lean's impression procedure using zinc oxide eugenol and a irreversible hydrocolloid over impression. This study will also evaluate the relative tissue displacement in edentulous area from the last standing abutment.

MATERIALS AND METHODS

The study design, need for study, the data collection procedure was presented in scientific review board and ethical committee clearance was obtained. Thirty patients were screened from theout patient department who reported with the complaint of missing lower back teeth. In which only nine patients fulfilled the study's inclusion criteria such as- mandibular bilateral distal extension, at least one premolar present on each side of the arch and all lower anterior teeth present. Remaining twenty one patients had mobile lower anterior teeth, distal edentulous space with unsatisfactory wound healing, impacted mandibular third molar and edentulous space with distally one molar present.Out of the nine patient's selected three patients were not willing to participate in the study. The six patients who were willing to participate in the study were asked to sign an informed consent. This explained the necessity of recording three different impressions for reasons none other than to carry out the study.

Impression procedures

The patients were made comfortable in the dental chair and a stock tray was selected from the sterilized set.An impression with irreversible hydrcolloid material was recorded to obtain a preliminary cast.For fabricating the custom tray A , the occlusal and incisal surfaces were blocked with a layer of modelling wax, two stops were incorporated at either end of occlusal surfaces of last standing premolars and one at incisal surface.No relief or spacer was provided for the edentulous ridge. Using an autopolymerizing resin the entire dentulous and edentulous area was covered for the purpose of single impression procedure. (Figure 1). Custom tray B was constructed only on the edentulous ridge with a spacer using a layer of modelling wax and autopolymerizing resin over it for the purpose of modified Mc Lean's impression procedure. (Figure 2).Both the trays were made 2mm short of sulcus and it was reassessed in patient's mouth.Using a modelling compound the periphery of the trays were border molded.

Single impression technique

Elastomeric impression material (PolysiloxaneAquasilDentsply- medium viscosity) was dispensed in equal proportions (base and catalyst paste) on a clean, cool glass slab and was mixed according to manufacturer's instructions. The medium viscosity impression materialwas carried in custom tray A and impression was recorded under operator's finger pressure applied over the edentulous span.The tray was removed only after complete curing of the impression material, so that no distortion would occur. (Figure 3)

Figure 1. Single Impression Custom Tray (Custom tray A)

Figure 2. Custom tray for McLeans Impression technique (Custom tray B)

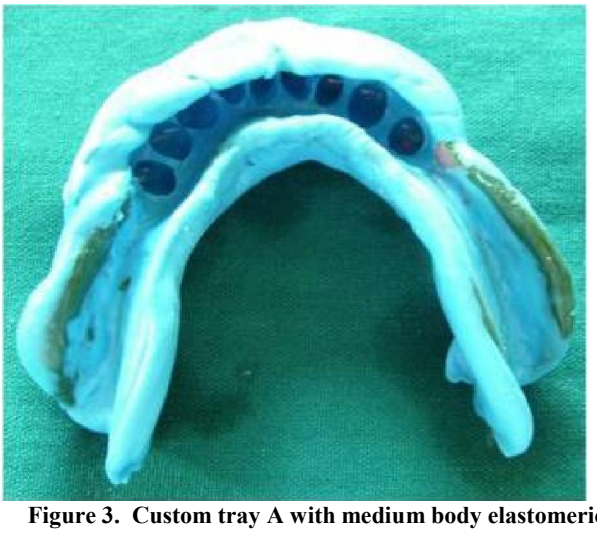

Figure 3. Custom tray A with medium body elastomeric impression material

Mc Lean's technique

Zinc oxide eugenolimpression paste (base and catalyst- DPI) was taken in equal proportions and mixed according to the manufacturer's instruction.The homogenous consistency of the paste was carried in tray B and impression was recorded under operator's finger pressure applied over edentulous span.After the final set of the material the tray was withdrawn from the mouth and excess was trimmed. This tray was then reseated, using pre-selected stock tray which was modified with holes in the edentulous ridge area to apply finger pressure and using

irreversible hydrocolloid impression material (Zelgan), the over impression of the dentulous and edentulous areas was recorded . (Figure 4 and 4a). To minimize any discrepancy between the negative and positive replicas, casts were constructed immediately from both the impressions. Also to minimize the hydrophobicity of the elastomeric impression material, a thin layer of surfactant spray was used before pouring the cast.

Figure 4a. Custom tray B with zinc oxide eugenol impression paste

Figure 4b. Over impression with irreversible hydrocolloid impression material.

Measuring device

To compare and measure tissue displacement, autopolymerising acrylic resin platform was constructed to the height of the occlusal surfaces and incisal edges of the remaining teeth on the control model (preliminary cast constructed from irreversible hydrocolloid impression material).These platforms were extended uptoretromolar pads and were appoximately 0.5 inch higher than the crest of the ridges. (Figure 5). Three measuring points were selected, on the crest of the ridge of the control model on each edentulous side.The reference points were located at the center of the retromolar pad, 5mm posterior to the last standing tooth and midway between two previous points.The cast and the standardized occlusal platform were stabilized using a surveyor. An endodontic file with a stopper was passed from the top of the acrylic platform till it contacted the crest of the control cast ridge.The distance between the stopper and the tip of the file was measured using a digital

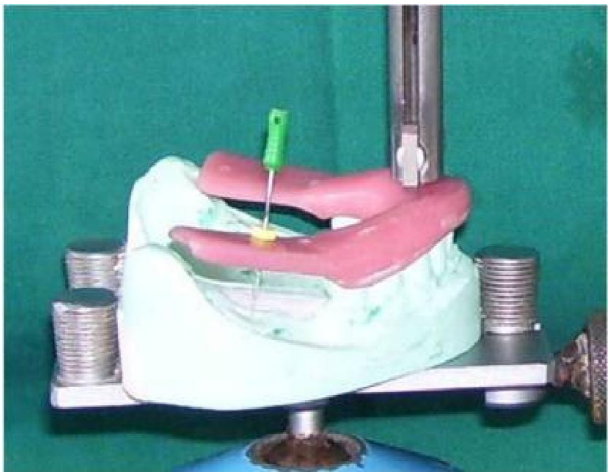

Figure 5. Standardized Occlusal Platform

Figure 6a. Occlusal platform stabilized on surveyor

Figure 6b. Digital Vernier caliper measuring endodontic file

Vernier calliper instrument (Insize, India) (Figure 6 and 6a). The single custom platform constructed was reseated in the cast constructed from custom tray A (single impression procedure) and custom tray B (modified Mc Lean's over impression procedure). The platform was stabilized using surveyor, the readings at the three selected points were obtained respectively for each cast (Figure 7). To obtain the tissue displacement value and its clinical significance, the relative difference between the preliminary cast and cast constructed from custom tray A was

grouped as I and the relative difference between the preliminary cast and cast constructed from custom tray B was grouped as II (Table 1). The mean relative difference of scores between the groups (and at three pre determined points (Table 2) were subjected tostatistical two way ANOVA test.The level of significance was set at P< 0.05. Post hoc testing Tukey HSD (honestly significant difference) was performed to explore the difference among the groups.

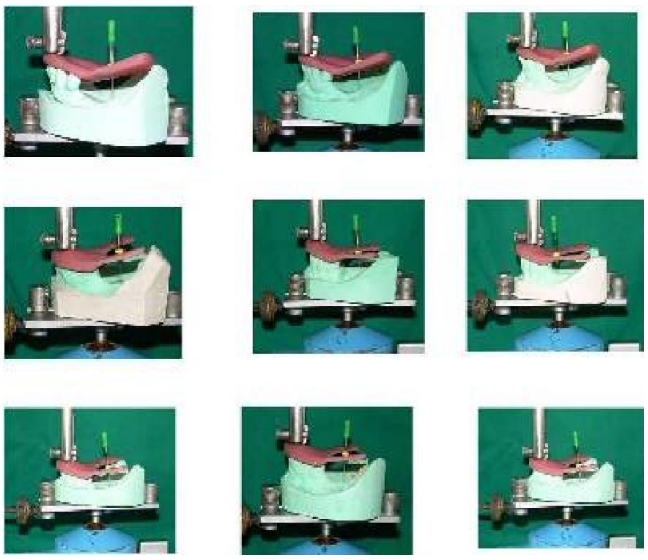

Figure 7. Measuring three different casts obtained from stock tray, custom tray A, Custom tray B

RESULTS

The mean values indicated that when elastomeric impression material (medium viscosity) was used in a custom tray- A, showed more tissue displaceability when compared to zinc oxide eugenol impression material, but this was shown as statistically insignificant with P value at 0.0827, 0.1686, 0.4588 (Table 3). The values between the positions and within the positions -5mm from last abutment, at the center of retro molar pad, midway between these positions showed a statistical significance with P value at 0.0273 and 0.0166 (Table 4). The Tukey HSDtest indicated a significant tissue displacebility was high at the mid way point and retromolar region with both Group I and Group II (Table 5)

Table 1. Relative difference between (two Groups) control cast and cast constructed from Tray A, and cast constructed from Tray B.

		GR-I	GR-II
5mm from THE LAST TOOTH	1	-0.52	0.31
	2	-0.18	-0.08
	3	-0.66-	-0.3
	4	0.61	-0.21
	5	-0.12	-0.07
	6	-0.2	-0.05
MIDWAY	1	-1.46	-1.03
	2	-0.64	-0.54
	3	-0.89	-0.56
	4	-1.11	-1.02
	5	-0.75	-0.41
	6	-0.69	-0.45
RETROMOLAR	1	-0.25	-0.16
	2	-0.97	-0.74
	3	-0.69	-0.54
	4	-1.22	-1.09
	5	-0.52	-0.36
	6	-0.42	-0.23

Table 2. Mean And Standard deviation of Group I and Group II impression material

	GROUP I		GROUP II	
Positions	Means	Std. dev.	Means	Std. dev.
5mm	-0.3817	0.2412	-0.1700	0.1188
MW	-0.9233	0.3126	-0.6683	0.2818
RM	-0.6783	0.3616	-0.5200	0.3501
Total	-0.6611	0.3691	-0.4528	0.3313

DISCUSSION

Vahidi Farad (Vahidi, 1978) stated in his study that there is a minimum tissue displacement in proximity to last abutment tooth, maximum tissue displacement in retromolar pad and the tissue displacement also depend on the factor of consistency of the material used to record the tissues.John B. Holmes (Holmes, 2001) conducted study on various impressions and concluded that tissues that are displaced functionally give the maximum support to the partial denture during occlusal loading. The current study and record values indicated that there is a gradual increase in edentulous tissue displacement at 5mm from last tooth to the retromolar pad, the tissue displacement was more at the midway of the edentulous span,

Table 3. Anova test between Group I and Group II impression material

Position x	Group	n	Mean	SD	L-value	p-value	Significant
5mm	I	6	-0.3817	0.2412			
	II	6	-0.1700	0.1188	-1.9283	0.0827	NS
MW	I	6	-0.9233	0.3126			
	II	6	-0.6683	0.2818	-1.4840	0.1686	NS
RM	I	6	-0.6783	0.3616			
	II	6	-0.5200	0.3501	-0.7705	0.4588	NS

Table 4. Anova test between positions of Group I and Group II impression material

GROUP	SV	DF	SS	MSS	F value	P value	Significant
I	Between positions	2	0.8829	0.4414			
	Within positions	15	1.4335	0.0956	4.6192	0.0273	S
	Total	17	2.3164				
II	Between positions	2	0.7857	0.3928			
	Within positions	15	1.0807	1.0807	5.4526	0.0166	S
	Total	17	1.8664				

Table 5. Tukey HSD test for Group I and Group II impression material Pairwise Comparison of Positions By TukeyHsd Test

Position	5mm	MW	RM
MEANS	-0.3817	-0.9233	-0.68
5mm			
MW	0.0216		
RM	0.2517	0.3794	

Pairwise Comparison of Positions By TukeyHsd Test

Position	**5mm**	**MW**	**RM**
MEANS	-0.1700	-0.6683	-0.52
5mm			
MW	0.0151		
RM	0.0935	0.6140	

which can offer better support to prosthesis and it's in close proximity to buccal shelf region and hence it was in accordance with the previous studies. The current study also showed that the single impression technique utilizing medium bodied polysiloxane material offers better tissue displacebity in comparison to Mc' Leans Impression techniqueutilizing rigid zinc oxide eugenol impression paste. The errors such as custom tray separation from over impression or inadequate finger pressure application occurring in modified Mc' Lean technique or any other two stage functional impression techniques can be more often possible than in single stage impression techniques (Rudd and Rudd, 2001; Rudd and Rudd, 2001; Rudd and Rudd, 2001).

Limitations of the Study

- The measurement were done only in one plane, three dimensional analysis of the tissue would give more accuracy of the tissue displacement.
- The measurement was made on the positive replica of the tissues (Cast), hence there would be always a margin of error occurring, and this error may be magnified in the mouth due to the 'Resiliency life like effect'.Further studies can be conducted with relation to long term survival rate of prosthesis constructed from single impressions utilizing medium bodied elastomeric impression and its three dimensional tissue responses.

Conclusion

Within the limitations of the study, it is observed that there is a definitive tissue displacement occurring in the impression recording method using medium body elastomeric impression material. Use of this type of impression procedure for bilateral or unilateral distal edentulous arches would enable dentist to achieve functionally displaced tissues in edentulous region and anatomically recorded dentulous region. Single impression technique'ssimple procedure makes it more clinical friendly procedure and error free procedure compared to other two stage impression techniques.

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