

The effect of using different impression techniques and materials on vertical tissue displacement in free end extension ridges. (Dental survey and clinical study)

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ABSTRACT

Background: Various impression techniques used in the construction of free- end extension partial denture are based on theories relative to the compressibility and behaviour of the soft tissue during impression making and during function, the aim of the study was to measure vertical tissue displacement during impression making for free- and extension using different impression technique and materials.

Material and methods: the study consisted of two parts (question are and clinical) the questionnaire was circulated among (90) dentists at different working places, to see which impression technique they use in free- and extension. In the clinical part (24) mandibular distal extension impression were made using three impression techniques and materials (special tray with alginate, special tray with polyether and double tray with zinc- oxide eugenol impression paste). The amount of vertical tissue displacement was measured on stone cast using (dial indicator dimension).

Results: The results of the survey showed that (44%) of the dentist tend to use special tray with alginate, and (38.1%) of prosthodontist use double tray impression, the clinical part showed that there was significant difference between the impression techniques.

Conclusions: The most popular impression technique used is special tray with alginate, which showed more tissue displacement in the clinical part of the study, while the double tray impression technique showed the least displacement.

Keyword: Tissue displacement, free- end extension, impression technique. J Bagh Coll Dentistry 2009; 21(1):9-14

INTRODUCITON

The major problem that may face the dentist during making impression is the soft tissue displacement, since the oral tissue is of varying degree of displacability according to their health and support. To provide physiologically and mechanically acceptable function, it is fundamental that the soft tissue must be copied with out distortion to prevent impingement and injury by the prosthesis ⁽¹⁾. In the impression-making procedure for free-end extension removable partial denture, the pressure produced at eh interface of he soft mucosal tissue and the impression is the most important factor for the stability of the saddle under functional load⁽²⁾. To achieve an impression with minimum tissue displacement, soft tissue displacement, impression concepts, impression techniques, and impression materials are to be taken in consideration, studies were carried out to evaluate and measure tissue displacement of free-end extension during impression making⁽³⁻⁵⁾. One study showed that the space between the inner surface of the tray and mucosal tissue, the flow of the impression material, and the size of the tray are interrelated with each other⁽⁶⁾.

The tissue displacement can be under control according to the impression theory used (mucostatic mucofunctional, selective pressure)⁽⁷⁻⁹⁾. The application of these theories is though single impression, sectional impression and special try impression technique^(10,11). In the presence of all these factors (impression theories, impression materials, and impression techniques), this study was designed to find out which impression techniques and material is mostly used by dentist as first part, and the second part of the study was to measure the amount of vertical tissue displacement of distally extended ridges made by three impression techniques and materials and correlate it with the survey results, to reach a conclusion and suggest an impression technique, that cause least amount of distortion.

MATERIAL AND METHODS

Survey part: A questionnaire was distributed among 90 dentist (general, specialist and prosthodontist) at different working place (ministry of health, dental college, and private clinic), to find out which impression technique and material they use for free- extension lower partial denture. The results were analyzed to be correlated with the results of the clinical part.

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Clinical part: The clinical part of the study was carried out on 15 patients with total of 24 mandibular free-end extension ridges with age range (24-45) years, attending the prosthodontic clinic, college of dentistry, university of Baghdad. All patients have healthy natural teeth, free from periodontal involvement with last abutment as first or second premolar; the saddle area was healthy with well attached mucosa and no previous prosthesis. Three impressions were made for each patient; the impression technique and material was special tray with alginate, special tray with polyether and double tray impression (zinc oxide-eugenol paste and alginate). The special tray with alginate impression was secured with a special perforated tray constructed from autopolymerising acrylic resin form preliminary cast with wax spacer and stopper over the anterior teeth and residual ridge for proper seating of the tray and to control the pressure during the impression. The alginate (cavex-Holland) was mixed according to manufacture instruction, the impression obtained was wax boxed a poured figure 1. As for the double tray impression technique, an auto polymerising custom tray with one layer of base plate wax as spacer was constructed over the edentulous area excluding the teeth, but with occlusal stopper on last abutment to control the pressure from a preliminary impression. Border molding was made in the usual manner and impression for the edentulous area was made using zinc oxide- eugenol (S.S white group England), after setting the impression was removed and inspected, then it was resealed in patient mouth with a suitable size stock tray loaded with alginate an overall impression was made for the teeth and removed picking with it the zinc oxide- eugenol impression tray, so that the final impression is made two sections, the teeth with alginate and the edentulous area with zinc oxide- eugenol paste as shown in figure 2. Finally an impression with polyether impression material (medium viscosity, impregum, Germany), using perforated spaced special tray as shown in figure 3.

Measurement and data collection: To measure and compare the amount of vertical tissue displacement of three casts for each patient, a measuring machine with measuring accuracies (0.001mm), (Mitutoyo corporation, Tokyo-Japan), was used. To ensure the same relation parallism of each cast to the measuring machine, an autopolymerising acrylic plate was constructed to the height of the occlusal surface and incisal edge of the remaining teeth. The cast and palate was placed on surveyor table with the

indicator of the measuring machine touching on three selected points on the acrylic plate as shown in figure 4. Measurements of vertical tissue displacement were made on the cast at three selected points (A, B, C) which represent approximately the area of missing (first premolar, first and second molar). The occlusal surface of the last abutment was used as reference point, as shown in figures 5, 6.

RESULTS

Survey results: The statistical analysis of the survey results showed that a high percentage of dentists (44.44%) used special tray with alginate impression material, while 15.56% prefer the use of double tray impression as shown in table 1. According to working places, dentist in ministry of health showed high percentage (50%) in favor of special tray with alginate and 12.5% used double tray impression, while in university 35.71% used special tray with alginate and 14.29% used double tray impression. Finally private clinic dentist 46.67% used special tray with alginate, and 20% double tray impression as shown in table 2. According to specialty 50% of the general dentists prefer to use special tray with alginate, while 16.67% used double tray impression, other specialists (51.28%) used special tray with alginate, and 2.56% used double tray impression, as for prosthodontists 23.8% used special tray with alginate and 38.1% used double tray impression as shown in table 3.

Clinical results: The mean, standard deviation, standard error, and coefficient of variation for different impression techniques are shown in table 3 for the points (A,B,C), it revealed that the use of polyether impression material with special tray gave the least amount of displacement compared with double tray impression and special tray with alginate. Table 5 show that the special tray with alginate. The compression between double tray impression and single tray impression are shown in table 6, there were no significant differences in the amount of tissue displacement at points (A,B,C) between double tray impression and special tray with alginate. The compression of different impression technique and materials at each selected points are shown in table 7, which revealed that there was no significant difference in the amount of tissue displacement at points (A,B) a significant difference existed at point ©, and special tray with polyether and double tray causes less displacement that special tray with alginate.

DISCUSSION

The results of the survey showed that dentist in working places used different impression techniques. Most dentist in the ministry of health and private practice used the special tray with alginate impression material, this may be because of its easy manipulation, relativity inexpensive, time saving and comfortable to the patient, while he result of the clinical part of the study showed that the sue of special tray with alginate impression material caused more soft tissue displacement when compared with the polyether with special tray and double tray techniques. Dentist in the dental school used all types of impression techniques; this may be due to that the dental school as teaching institute is responsible of teaching student all concepts and impression techniques.

According to dentist specialty, half of the general dentist used the special tray with alginate and the vest uses the other techniques, while dentist with other specialties other than prosthodontist use special tray with alginate, in addition to the use of polyether with special tray, which indicate that specialist tend to use techniques that causes less tissue displacement prosthodontist prefer the use of double tray impression which according to the clinical results showed that least tissue displacement equally with the polyether, this is because prosthodontist are deeply involved in their filed in problems of support, retention, resorption and tissue displacement. There was as significant difference in the amount of tissue displacement between

different impression techniques and materials at point © which represent the area of the first molar, may be extracted at different time during life resulting in variable amount of bone loss at that area. The results also showed that there was significant difference between double tray impression (less displacement at point ©) when com pared with special tray with alginate, this may be explained that the flow of impression material influence tissue displacement and the use of easy flowing zinc oxide- eugenol impression paste recorded the soft tissue at time of set gave better results when compared with alginate which is effected by may factors such as water/ powder ratio, humidity, temperature, mixing time, in addition to the syneresis and imbibitions that may cause poor dimensional stability. These results agreed with Leupold⁽³⁾, James⁽¹²⁾, and Holmes⁽¹³⁾, who all demonstrated that alginate impression with special tray causes more tissue displacement, but disagree with Wang⁽¹⁴⁾ who believed that it is comparable to double tray. As for the points (B and C) the results showed that there was significant difference between the special tray with alginate and special tray with polyether and the later showed least amount of tissue displacement. The results of tissue displacement at points (A,B,C) showed no significant difference between special tray with polyether and double tray techniques, this results agreed with EL- Shilich and abdel hakim⁽¹⁵⁾, AL- Judy, AL-Obaidi⁽¹⁷⁾, and Frant⁽¹⁸⁾.



Figure 1: Special tray with alginate impression material

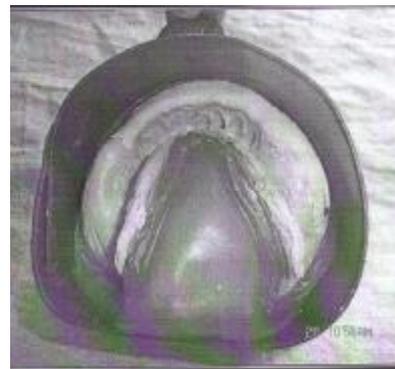


Figure 2: Double tray impression (zinc oxide-eugenol paste and alginate impression material)



Figure 3: Special tray with polyether impression material

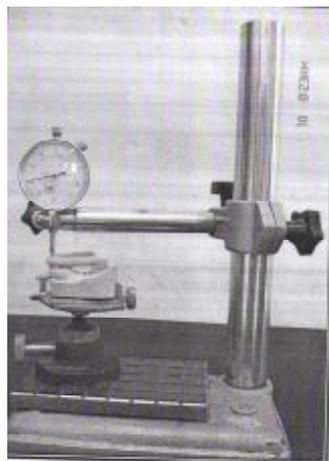


Figure 4: Ensure the parallelism between the cast and measuring apparatus

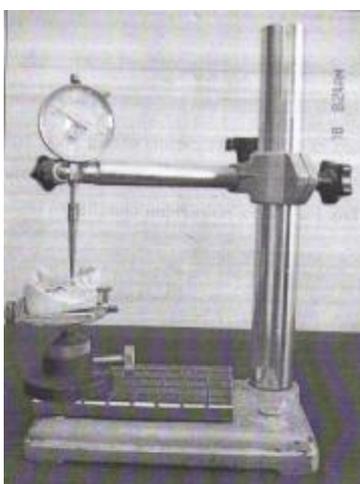


Figure 5: A vertical sliding pointed tool descending on the occlusal surface of the last tooth to be used as a reference point

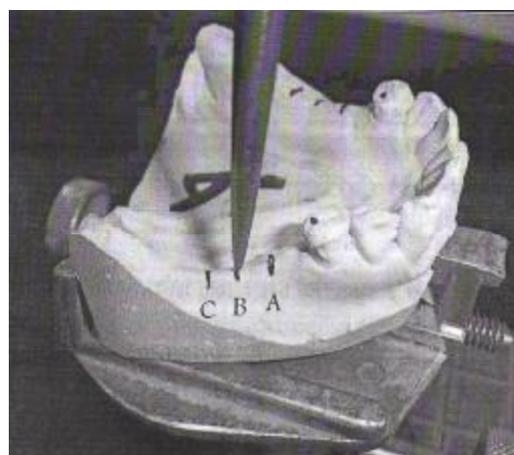


Figure 6: Selection of three measurement points (A, B and C)

Table 1: Questionnaire results according to the preference of the dentists.

Impression techniques	No. of dentist	%
Stock tray with alginate	16	17.78
Special tray with alginate	40	44.44
Double tray	14	15.56
Special tray with rubber base	20	22.22

Table 2: Number and percentage % of dentists in different working places with their choices of impression techniques.

Impression techniques	Ministry of health (32)		University (28)		Private clinic(30)	
	No. of dentist	%	No. of dentist	%	No. of dentist	%
Stock tray with alginate	6	18.75	5	17.86	5	16.67
Special tray with alginate	16	50	10	35.71	14	46.67
Double tray	4	12.5	4	14.29	6	20
Special tray with rubber base	6	18.75	9	32.14	5	16.67

Table 3: Number and percentage % of dentists with different specialties and their choices of impression techniques.

Impression techniques	General dentist (30)		Specialist (39)		Prosthodontist(21)	
	No. of dentist	%	No. of dentist	%	No. of dentist	%
Stock tray with alginate	5	16.67	7	17.95	3	14.29
Special tray with alginate	15	50	20	51.28	5	23.81
Double tray	5	16.67	1	2.56	8	38.1
Special tray with rubber base	5	16.67	11	28.21	5	23.81

Table 4: Mean, standard deviation, standard errors and coefficient of variation of displacement for the different impression techniques and materials at each measured points.

Statistic	Impression techniques and materials								
	Special tray with alginate impression material			Double tray impression			Special tray with polyether impression material		
	Point A	Point B	Point C	Point A	Point B	Point C	Point A	Point B	Point C
Mean	8.311	9.077	8.491	8.063	8.766	8.025	8.132	8.674	7.885
SD	1.786	1.706	1.627	1.814	1.653	1.581	2.010	2.042	2.124
SE	0.364	0.348	0.332	0.370	0.337	0.322	0.410	0.416	0.433
CV%	21.49	18.795	19.161	22.498	18.857	19.7	24.7	23.5	26.94

Table 5: t-test of displacement for two impression materials [special tray with alginate and special tray with polyether]

Point	Statistical	Special tray with alginate and special tray with polyether	t-test	P-value	Sig.
A	MD	0.179	1.361	0.187	NS
	SD	0.643			
B	MD	0.403	2.832	0.009	S
	SD	0.142			
C	MD	0.605	3.336	0.003	S
	SD	0.189			

*P>0.05 Non significant

**P<0.05 Significant

MD: mean differences

Table 6: t-test of displacement for two impression techniques [Double tray impression technique & single impression technique]

Point	Statistical	Double tray impression and special tray with polyether	t-test	P-value	Sig.
A	MD	0.068	0.364	0.719	NS
	SD	0.924			
B	MD	0.092	0.423	0.676	NS
	SD	0.013			
C	MD	0.140	0.473	0.641	NS
	SD	0.296			

*P>0.05 Non significant

**P<0.05 Significant

MD: mean differences

Table 7: F-test for different impression techniques and materials [special tray with alginate impression material, double tray impression, and special tray with polyether impression material] at each measured points.

Point	F-test	p-value	Sig.
A	1.185	0.314	P>0.05 NS
B	2.604	0.084	P>0.05 NS
C	3.388	0.042	P<0.05 S

*P>0.05 Non significant

**P<0.05 Significant

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