

Original Article

Comparison of One-step technique and Two-step technique for Making Impressions using Polyvinylsiloxane for FPD

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ABSTRACT:

Background: The impression process includes careful transfer of the patient's soft and hard tissues to laboratory and is a major part of fixed prosthetic treatments. The impression technique determines the restoration of finish line. Moreover, the significance of margin in the longevity of restoration and the effect of impression technique on marginal adaptation of restoration indicate the necessity of applying an accurate impression technique. **Aim of the study:** To compare one-step technique and two-step technique for making impressions using polyvinylsiloxane for FPD. **Materials and methods:** The present study was conducted in the Department of Dentistry, Shridevi Institute of Medical Sciences and Research Hospital, Tumkur, Karnataka, India. We selected 35 patients reporting to the Department clinic for fixed partial denture (FPD) as their dental treatment for the study group. The age of the subjects ranged from 22- 60 years. For each patient, two different techniques with polyvinylsiloxane impression material were performed for making master impression. The techniques were i) technique 1 was single stage double mix technique; and technique 2 was two stage technique with spacer. **Results:** We observed that number of patients with defects in Technique 1 were 14 and in technique 2 were 15. The most common defect was voids in impression in both the techniques. The results on comparison were observed to be statistically non-significant ($p > 0.05$). **Conclusion:** The one step technique and two-step technique using polyvinylsiloxane are equally effective for impression making. The impression voids are most commonly seen defects seen in the impression by both the techniques.

Key words: Polyvinylsiloxane, impression, Fixed partial denture.

Received: 18 January 2018

Revised: 16 February 2018

Accepted: 27 February 2018

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This article may be cited as: Kumar VK, Shubha, LN Akshatha, HG Suhas, Thopachiche S. Comparison of One-step technique and Two-step technique for Making Impressions using Polyvinylsiloxane for FPD. J Adv Med Dent Scie Res 2018;6(4):55-58.

INTRODUCTION:

The impression process includes careful transfer of the patient's soft and hard tissues to laboratory and is a major part of fixed prosthetic treatments. Since the patient's soft and hard tissues are transferred, having anatomic knowledge about periodontal tissues, making an accurate impression especially in the finish line, and using proper impression materials and an appropriate impression technique are important in making a suitable and accurate impression.^{1, 2} The impression technique determines the restoration of finish line. Moreover, the significance of margin in the longevity of restoration and the effect of impression technique on marginal adaptation of restoration indicate the

necessity of applying an accurate impression technique. Polyvinyl siloxane impression materials have the best fine detail reproduction and elastic recovery of all available materials.³ Because there is no by-product, they possess remarkable dimensional stability and are odorless, tasteless and pleasant for patients. They are provided in wide range of viscosities, rigidities, and working and setting times. Impression techniques can be categorized as monophasic or dualphase.⁴ Techniques that use dual-phase materials such as the putty and light-body may be accomplished in one or two step. The one-step putty/light-body technique requires less chair-side time. In the two-step putty/ light-body technique, the details are recorded by the light-body

material only.⁵ The problem of accuracy of impressions has reported that over 89% of the impressions investigated had one or more observable errors. Several factors can influence the quality of impressions, including technique the material the bulk of material and others.⁶ Hence, we planned the study to compare one-step technique and two-step technique for making impressions using polyvinylsiloxane for FPD.

MATERIALS AND METHODS:

The present study was conducted in the Department of Dentistry, Shridevi Institute of Medical Sciences and Research Hospital, Tumkur, Karnataka, India. The ethical clearance for the study was obtained from the ethical committee of the institute prior to commencing of the study. We selected 35 patients reporting to the Department clinic for fixed partial denture (FPD) as their dental treatment for the study group. An informed written informed consent was obtained from each patient after verbally explaining them the procedure of the study. The age of the subjects ranged from 22- 60 years. Patients having history of allergic reaction to materials to be used in study were excluded from the study.

For each patient, two different techniques with polyvinylsiloxane impression material were performed for making master impression. The techniques were i) technique 1 was single stage double mix technique; and technique 2 was two stage technique with spacer. The abutment teeth were prepared. After completion of tooth preparation, gingival retraction cord was used to reveal the subgingival margins of the prepared tooth. The selection of proper impression tray was done for both maxillary and mandibular arches in each case. For group 1, the simultaneous use of putty and wash impression material was done in this technique. The manual mixing of wash material

was done and with help of 3 ml syringe, was dispensed around prepared tooth. For group 2, the 2-step technique was used with a polyethylene spacer. A polyethylene sheet was placed over the teeth. The preliminary putty impression was made and allowed to set for 10 minutes. Wash material was then added in the putty impression and the tray resealed after removal of the gingival retraction cord and allowed to set for 12 minutes. The visual examination of the impressions was done by the same prosthodontist for each impression of each patient. The impressions were rated from 1 to 4, 1 being excellent and 4 being unacceptable. The defects observed in the impression were known as bubbles, voids, tears, or pull defects. The results were tabulated and analyzed.

The statistical analysis of the data was done using SPSS 10.0 for windows. Student’s t-test and Chi-square test were used for the verification of statistical significance of the data. A p-value <0.05 was predefined as statistically significant.

RESULTS:

Table 1 shows the number of patients with different defects in technique 1 and technique 2. We observed that number of patients with defects in Technique 1 were 14 and in technique 2 were 15. The most common defect was voids in impression in both the techniques. The results on comparison were observed to be statistically non-significant (p>0.05). **[Fig 1]. Table 2** shows the distribution of voids, bubbles and pull defects. We observed that bubbles in the impressions were more commonly seen at areas beside the margins (67%). Pull defects were seen solely at the margins. The voids in the impression were seen more commonly at areas beside margins (71%) **[Fig 2]**.

Table 1: Number of patients with different defects in technique 1 and technique 2

Defect	Technique 1 (no. of patients)	Technique 2 (no. of patients)	p-value
Pull defects	2	1	0.221
Bubbles	5	4	
Voids	7	10	
Total	14	15	

Figure 1: Comparison of frequency of different impression defects between Technique 1 and 2

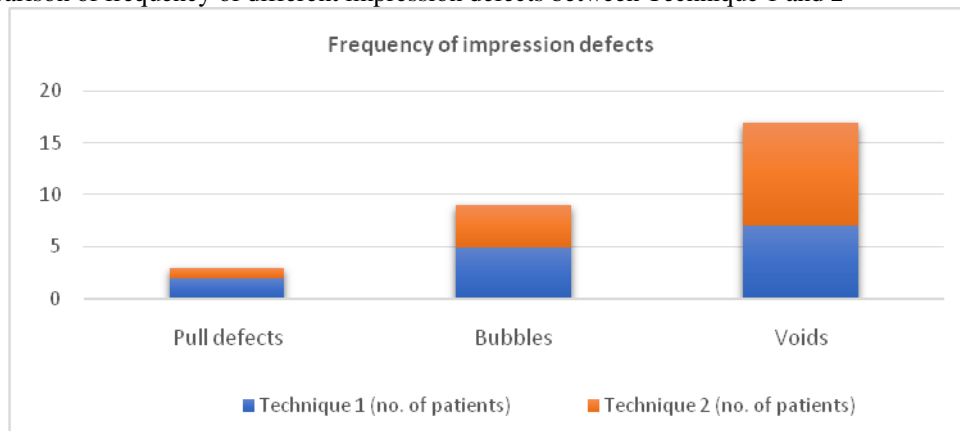
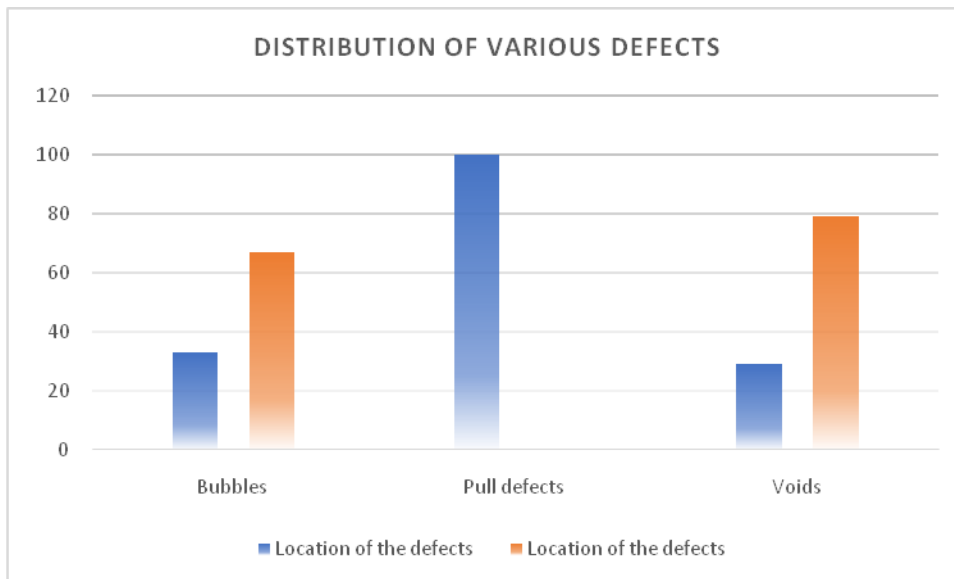


Table 2: Distribution of voids, bubbles and pull defects

Defects	Location of the defects	
	At margins (%)	Areas beside the margins (%)
Bubbles	33	67
Pull defects	100	0
Voids	29	71

Figure 2: Comparison of different defects at various locations in the impression



DISCUSSION:

In the present study we compared two techniques for impression making using polyvinylsiloxane for Fixed Partial Dentures. We observed that both the techniques had defects in impression making. The most commonly seen defect was voids in both the techniques. But the results were statistically non-significant. The results were compared with previous studies and results were consistent with previous studies. Kumar MP et al compared the accuracy of the matrix impression system with conventional putty relined and multiple mix technique for individual dies by comparing the inter-abutment distance in the casts obtained from the impressions. Three groups, 10 impressions each with three impression techniques (matrix impression system, putty relined technique and multiple mix technique) were made of a master die. Typodont teeth were embedded in a maxillary frasco model base. The left first premolar was removed to create a three-unit fixed partial denture situation and the left canine and second premolar were prepared conservatively, and hatch marks were made on the abutment teeth. The final casts obtained from the impressions were examined under a profile projector and the inter-abutment distance was calculated for all the casts and compared. The results from this study showed that in the mesiodistal dimensions the percentage deviation from master model in Group I was 0.1 and 0.2, in Group II was 0.9 and 0.3, and Group III was 1.6

and 1.5, respectively. In the labio-palatal dimensions the percentage deviation from master model in Group I was 0.01 and 0.4, Group II was 1.9 and 1.3, and Group III was 2.2 and 2.0, respectively. In the cervico-incisal dimensions the percentage deviation from the master model in Group I was 1.1 and 0.2, Group II was 3.9 and 1.7, and Group III was 1.9 and 3.0, respectively. In the inter-abutment dimension of dies, percentage deviation from master model in Group I was 0.1, Group II was 0.6, and Group III was 1.0. They concluded that the matrix impression system showed more accuracy of reproduction for individual dies when compared with putty relined technique and multiple mix technique in all the three directions, as well as the inter-abutment distance. Dugal R et al determined the impression technique that displays the maximum linear dimensional accuracy. A Mild steel model with 2 abutment preparations was fabricated, and impressions were made 15 times with each technique. All impressions were made with an addition-reaction silicone impression material (Express, 3M ESPE) and customarily made perforated metal trays. The 1-step putty/light-body impressions were made with simultaneous use of putty and light-body materials. The 2-step putty/light-body impressions were made with 0.5-mm, 1mm and 1.5mm-thick metal-prefabricated spacer caps. The accuracy of the 4 different impression techniques was assessed by measuring 7 dimensions (intra- and inter

abutment) (20- μ m accuracy) on stone casts poured from the impressions of the mild steel model. The data were analyzed by one sample 't' test. The stone dies obtained with all the techniques had significantly larger or smaller dimensions as compared to those of the mild steel model ($P < 0.05$). The order for highest to lowest deviation from the mild steel model was: single step putty/light body, 2-step putty/light body with 0.5mm spacer thickness, 2-step putty/light body 1.5mm spacer thickness, and 2-step putty/light body with 1mm spacer thickness. Significant differences among all of the groups for both absolute dimensions of the stone dies, and their standard deviations from the master model were noted. It was concluded that the 2-step putty/light-body impression technique with 1mm spacer thickness was most dimensionally accurate impression methods in terms of resultant casts.^{7,8}

Nissan J et al assessed the accuracy of 3 putty-wash impression techniques using the same impression material (polyvinyl siloxane) in a laboratory model. The 3 putty-wash impression techniques used were (1) 1-step (putty and wash impression materials used simultaneously); (2) 2-step with 2-mm relief (putty first as a preliminary impression to create 2-mm wash space with prefabricated copings. In the second step, the wash stage was carried out); and (3) 2-step technique with a polyethylene spacer (plastic spacer used with the putty impression first and then the wash stage). For each technique, 15 impressions were made of a stainless steel master model that contained 3 complete crown abutment preparations, which were used as the positive control. Accuracy was assessed by measuring 6 dimensions (intraabutment and interabutment) on stone dies poured from impressions of the master model. One-way analysis of variance showed statistically significant differences among the 3 putty-wash impression techniques, for all intraabutment and interabutment measurements ($P < .001$). Overall discrepancies of the 2-step technique with 2-mm relief putty-wash impression technique were significantly smaller than that in the 1-step and polyethylene putty-wash impression techniques. It was concluded that the polyvinyl siloxane 2-step, 2-mm, relief putty-wash impression technique was the most accurate for fabricating stone dies. Moldi A et al conducted a survey was to integrate impression techniques evolved all over the years for fixed partial dentures and to know the techniques and materials which are used in the present day by the practitioners. A total of 1000 questionnaires were sent to various practitioners in India, out of which 807 questionnaires were filled. The results showed that 84.8% of prosthodontists (65.56%, urban areas) use elastomeric impression materials as well as irreversible hydrocolloids and 15.2% use irreversible hydrocolloid only. Amongst other practitioners,

55.46% use irreversible hydrocolloid (45%, rural and semiurban areas) and 44.54% use elastomeric impression materials. Elastomeric impression technique practiced most commonly is putty reline with/without spacer (77.2%); other techniques are multiple-mix and monophasic techniques. The ideal materials, technique, and armamentarium are required for the long-term success of the treatment for fixed partial denture. Also, if the ideal procedure is not followed, it will lead to a compromised fit of the final prosthesis and failure of the treatment.^{9,10}

CONCLUSION:

Within the limitations of the study, we conclude that the one step technique and two-step technique using polyvinylsiloxane are equally effective for impression making. The impression voids are most commonly seen defects seen in the impression by both the techniques.

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Source of support: Nil

Conflict of interest: None declared

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