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ORIGINAL RESEARCH

Comparison of two impression making techniques for Fixed Partial Dentures using polyvinylsiloxane

Sunny Sharma¹, Ramandeep Singh²

¹MDS, Prosthodontist, Private Practitioner, Dhangri, Rajouri, ²MDS Prosthodontist, Private Practitioner, Nai Basti, R.s Pura, Jammu and Kashmir, India

ABSTRACT:

Background: Clinicians frequently offer crowns to patients as a treatment option. Whether to protect a tooth from fracture, improve esthetics, or restore decayed surfaces, crowns provide a solution for a variety of restorative needs. 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. **Materials and methods:** The present study was conducted in the Department of Prosthodontics of the Dental institution. We selected 50 patients reporting to the Department clinic requiring fixed partial denture (FPD) as their dental treatment for the study group. For each patient, two different techniques with polyvinylsiloxane were performed for making master impression. The techniques were i) technique 1 was single stage double mix technique; ii) technique 2 was two stage technique with using spacer. **Results:** We observed that defects were more commonly seen in impressions made from technique 2 (n=18). Most common defect seen in both of the techniques was Voids in the impression (n=7 for technique 1; n=10 for technique 2). We observed that bubbles in the impressions were more commonly seen at areas beside the margins (51.77%). Pull defects were seen solely at the margins. The voids in the impression were seen more commonly at areas beside margins (70.18 %). **Conclusion:** Within the limitations of the present study, it can be concluded that the one step technique using polyvinylsiloxane has comparatively fewer defects in the impression as compared to two step techniques. The most commonly seen defect in both the techniques was impression voids.

Keywords: Impression, FPD, Polyvinylsiloxane, wash impression

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Corresponding author: Dr. Ramandeep Singh, MDS Prosthodontist, Private Practitioner, Nai Basti, R.s Pura, Jammu and Kashmir, India

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INTRODUCTION

Clinicians frequently offer crowns to patients as a treatment option. Whether to protect a tooth from fracture, improve esthetics, or restore decayed surfaces, crowns provide a solution for a variety of restorative needs.¹ Although crowns are a common factor in daily practice, little is known about the prevalence of different techniques used to make crown impressions, or variations in techniques that may exist regionally or by practice/dentist characteristics. 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.^{2,3} 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.^{4,5}

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. The accuracy of impression techniques is revealed when restoration with suitable marginal adaptation and minimum gap is obtained.⁶ Hence, the present study was conducted to compare two impression making techniques for Fixed Partial Dentures using polyvinylsiloxane.

MATERIALS AND METHODS

The present study was conducted in the Department of Prosthodontics of the Dental institution. We selected 50 patients reporting to the Department clinic requiring 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 were performed for making master impression. The techniques were i) technique 1 was single stage double mix technique ; ii) technique 2 was two stage technique with using spacer.

Procedure:

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. The impressions made using 1 step technique were labeled as 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 1, impressions were subjected to the 1-step technique. Putty and wash impression materials were used simultaneously. The wash material was manually mixed and dispensed with a 3ml syringe around the prepared tooth with simultaneous removal of the retraction cord. The putty was mixed manually, loaded on the impression tray and placed over the whole arch. The impression was allowed to set in the mouth for 12 minutes. 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 reseated 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 analysed. The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistical significant.

RESULTS

Table 1 shows the number of defects with respect to the various techniques. We observed that defects were more commonly seen in impressions made from technique 2 (n=18). Most common defect seen in both of the techniques was Voids in the impression (n=7 for technique 1; n=10 for technique 2) [Fig 1]. On comparing the results, a statistical significant difference was seen ($p<0.05$). **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 (51.77%). Pull defects were seen solely at the

margins. The voids in the impression were seen more commonly at areas beside margins (70.18 %) [Fig 2].

Table 1: Number of defects with respect to the various techniques

Defect	Technique 1 (no. of patients)	Technique 2 (no. of patients)	P value
Pull defects	4	5	0.001
Bubbles	3	3	0.02
Voids	7	10	0.03
Total	14	18	

Figure 1: Showing number of defects with respect to the different techniques

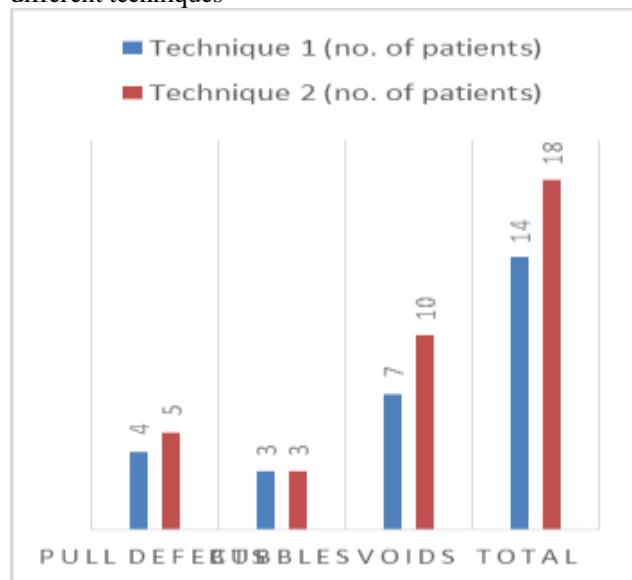


Table 2: Distribution of voids, bubbles and pull defects

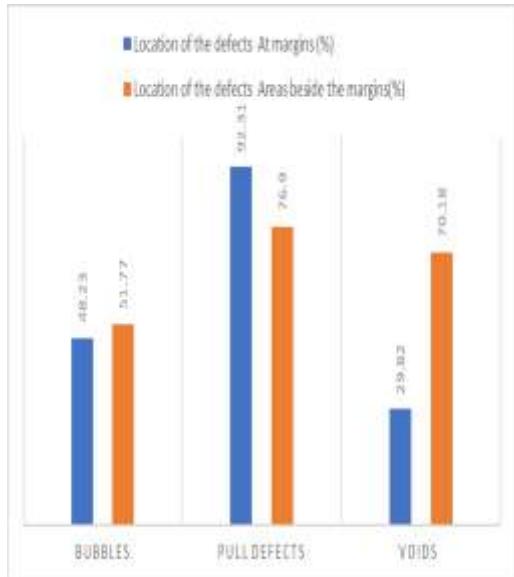
Defects	Location of the defects	
	At margins (%)	Areas beside the margins (%)
Bubbles	48.23	51.77
Pull defects	92.31	76.9
Voids	29.82	70.18

DISCUSSION

In the present study, we observed that Technique 2, i.e., the 2-step technique had more defects as compared to technique 1, i.e., one step technique. The most commonly seen defect was voids in both the techniques. The results of current study are consistent with previous similar studies in the literature. Moldi A conducted this survey 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.

Fig 2: Showing distribution of voids, bubbles and pull defects



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 monophase techniques. They concluded that 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. Haghi HR et al evaluated the effects of the materials and techniques used to take an impression on the vertical misfit of implant-supported, screw-retained, three-unit bridges. The principal model used was an acrylic block with two ITI implants. A 1.5-mm abutment was attached to fixtures with torque of 25 N.cm. A base-metal framework was built on the abutment in the acrylic block. The abutments of the acrylic model were unscrewed and fixture-level impressions were made. The impression techniques included open/closed-tray techniques and the impression materials were polyether and polyvinyl siloxane. Forty acrylic custom trays were built for each impression. The marginal gap in the framework at three points (buccal, lingual, and distal) was measured using an optical microscope with $\times 250$. It is demonstrated that in all 360 evaluated samples, the mean vertical misfit in polyether samples of molar and premolar teeth was significantly lower than in polyvinyl siloxane in all three locations of the molar and lingual premolar examined (buccal, lingual, and distal), the mean vertical misfit of the polyether samples was significantly lower than those of polyvinyl siloxane. On the other hand, although the mean vertical misfit using the open-tray technique in the molar teeth was significantly lower than

with the closed-tray method, no statistical difference was seen between the open-tray and closed-tray technique in general. They concluded that the following conclusions can be drawn: The impression method had no effect on marginal discrepancy of 3-unit screw retained fixed partial dentures. A higher marginal accuracy was obtained using polyether impression material compared to polyvinyl siloxane.^{7,8}

Kumar MP et al compared the accuracy of the matrix impression system with conventional putty reline 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 reline technique and multiple mix technique) were made of a master die. Typodont teeth were embedded in a maxillary frasaco 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 reline technique and multiple mix technique in all the three directions, as well as the inter-abutment distance. Kaushik P et al compared the most commonly used techniques and materials for dimensional accuracy. Two types of spacers were designed to compare the addition silicon and polyether and their techniques. A metal die was used to make the impressions. A total of 60 impressions were made using multiple mix and monophasic techniques for addition silicon and polyether in custom trays. A travelling microscope was used to measure the dimensional accuracy of die stone casts retrieved from impressions. The results were compared using paired t test and SPSS software. The study was highly significant. The polyether was more accurate than the addition silicon and spacer design I (adapted to the edentulous area) was more accurate than the design II (spacer over the abutments, not adapted to edentulous area). The multiple mix technique was more accurate than the monophasic for addition silicon. They concluded that the combination of multiple mix technique with spacer design I for addition silicon gave the best accurate results.^{9,10}

CONCLUSION

Within the limitations of the present study, it can be concluded that the one step technique using polyvinylsiloxane has comparatively fewer defects in the impression as compared to two step techniques. The most commonly seen defect in both the techniques was impression voids.

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