

Original ARTICLE

Comparative analysis of impression techniques using polyvinylsiloxane for Fixed Partial Dentures

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ABSTRACT

Background: Making impressions to replicate oral conditions and tooth morphology is an integral part of prosthetic dentistry. Polyvinyl siloxane impression materials have the best fine detail reproduction and elastic recovery of all available materials. 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. **Aim of the study:** To compare impression techniques using polyvinylsiloxane for Fixed Partial Dentures. **Materials and methods:** The present study was conducted in the Department of Prosthodontics of the Dental institution. We selected 100 patients reporting to the Department clinic requiring fixed partial denture (FPD) as their dental treatment for the study group. The age of the subjects ranged from 10- 40 years. Patients having history of allergic reaction to materials to be used in study were excluded from the study. **Results:** We observed that defects were more commonly seen in impressions made from technique 2 (n=42). Most common defect seen in both of the techniques was Voids in the impression (n=9 for technique 1; n=19 for technique 2). We observed that bubbles in the impressions were more commonly seen at areas beside the margins (52.87%). Pull defects were seen solely at the margins. The voids in the impression were seen more commonly at areas beside margins (66.22%). **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.

Key words: Impression technique, Fixed partial denture

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INTRODUCTION

Making impressions to replicate oral conditions and tooth morphology is an integral part of prosthetic dentistry.¹ Polyvinyl siloxane impression materials have the best fine detail reproduction and elastic recovery of all available materials. 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.^{2, 3} The difficulty in obtaining an acceptable impression increases exponentially as the number of abutments increases, because of the problems encountered in controlling the tissue fluids and saliva, while a free flowing impression material is injected simultaneously. The addition type silicone impression materials, polyvinyl siloxanes (PVS) have been reported to be the most accurate and dimensionally stable materials.^{4,5} Some authors

claim that the extent of accuracy of dies is determined more with the technique than by the material itself and others reporting that the impression accuracy is governed more with the material employed.^{5,6} Hence, the present study was conducted to compare impression techniques using polyvinylsiloxane for Fixed Partial Dentures.

MATERIALS AND METHODS

The present study was conducted in the Department of Prosthodontics of the Dental institution. We selected 100 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 10- 40 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 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 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=42). Most common defect seen in both of the techniques was Voids in the impression (n=9 for technique 1; n=19 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 (52.87%). Pull defects were seen solely at the margins. The voids in the impression were seen more commonly at areas beside margins (66.22%).

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	7	12	0.1
Bubbles	6	11	0.03
Voids	9	19	0.02
Total	22	42	

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

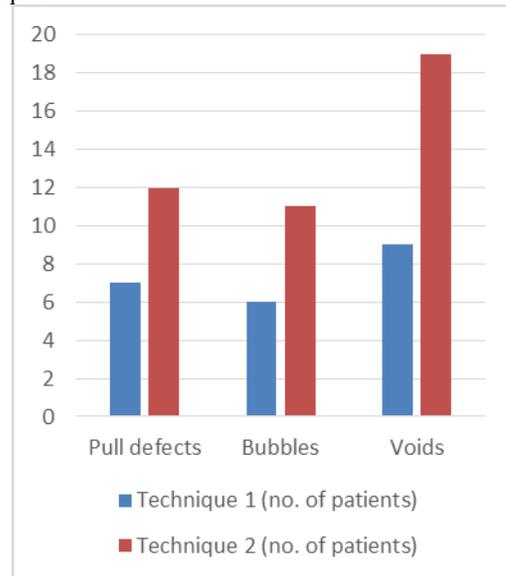


Table 2: Distribution of voids, bubbles and pull defects

Defects	Location of the defects	
	At margins (%)	Areas beside the margins (%)
Bubbles	50.33	52.87
Pull defects	82.31	78.9
Voids	31.72	66.22

DISCUSSION

In the present study, we observed that 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. McCracken MS et al determined which impression and gingival displacement techniques practitioners use for single-unit crowns on natural teeth; and tested whether certain dentist and practice characteristics are significantly associated with the use of these techniques. Dentists participating in the National Dental Practice-Based Research Network were eligible for this survey study. The study used a questionnaire developed by clinicians, statisticians, laboratory technicians, and survey experts. The questionnaire was pre-tested via cognitive interviewing with a regionally diverse group of practitioners. The survey included questions regarding gingival displacement and impression techniques. Survey responses were compared by dentist and practice characteristics using ANOVA. The response rate was 1777 of 2132 eligible dentists (83%). Regarding gingival displacement, most clinicians reported using either a single cord (35%) or dual cord (35%) technique. About 16% of respondents preferred an injectable retraction technique. For making impressions, the most frequently used techniques and materials are: poly(vinyl siloxane), 77%; polyether, 12%; optical/digital, 9%. A dental auxiliary or assistant made the final impression 2% of the time. Regarding dual-arch impression trays, 23% of practitioners report they typically use a metal frame tray, 60% use a plastic frame, and 16% do not use a dual-arch tray. Clinicians

using optical impression techniques were more likely to be private practice owners or associates. This study documented current techniques for gingival displacement and making impressions for crowns. They concluded that certain dentist and practice characteristics are significantly associated with these techniques. Jayaraman S et al assessed the effects of different final-impression techniques and materials used to make complete dentures, for retention, stability, comfort, and quality of life in completely edentulous people and partially edentulous people. They included randomized controlled trials (RCTs) comparing different final-impression techniques and materials for treating people with complete dentures (CD) and removable partial dentures (RPD). For CD, they included trials that compared different materials or different techniques or both. In RPD for tooth-supported conditions, they included trials comparing the same material and different techniques, or different materials and the same technique. In tooth- and tissue-supported RPD, they included trials comparing the same material and different dual-impression techniques, and different materials with different dual-impression techniques. They concluded that there is no clear evidence that one technique or material has a substantial advantage over another for making complete dentures and removable partial dentures. Available evidence for the relative benefits of different denture fabrication techniques and final-impression materials is limited and is of low or very low quality. More high-quality RCTs are required.^{7,8}

Alhoumaidan A et al evaluated the knowledge, attitude and fixed prosthodontics practice guidelines amongst dental practitioners of Qassim in Saudi Arabia. A descriptive cross-sectional study was done amongst the Dental Practitioners of Qassim Province, Saudi Arabia in 2018. A total of 290 dentists were selected randomly (from public and private dental clinics and dental schools). A survey was conducted through printed and online questionnaire composed of 19 open and multiple-choice questions. Data from the completed questionnaires were analysed using the SPSS Statistical Software Package (version 25). This study showed that 227 (78.3%) of the participants assessed abutment tooth radiographically, also most of them fabricated study cast before starting crown and bridge procedures 37.2% (108). The vitality test for restored abutments was always done by 132 (45.5%) respondents, and 111 (38.3%) of them used poly vinyl siloxane for making final impression, which provides the level of quality of final impression. A total of 117 (40.3%) of them always used retraction cord before making final impression. Both written prescriptions and verbal instructions were used by 209 (72.1%) of the practitioners for communication with the lab. The study revealed that there were no significant differences between males and females in answering questions 11, 13 and 17. They concluded that the dental practitioners (DPs) of Qassim displayed an acceptable level of knowledge and a level of awareness of fixed prosthodontics practicing. Moldi A et al surveyed integrated impression techniques evolved all over the years for fixed partial dentures. A total of 1000 questionnaires were sent to various practitioners in India, out of which 807 questionnaires were filled. Results. 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 relined with/without spacer (77.2%); other techniques are multiple-mix and monophasic techniques. Conclusion. 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 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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