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Original Research

Comparative evaluation of efficacy of polyvinyl siloxane impressions for fixed impression materials using two different impression techniques

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ABSTRACT

Background: Vinyl polysiloxane silicones are considered state-of-the-art for fixed partial denture impressions. The present study was conducted to compare efficacy of polyvinyl siloxane impressions for fixed impression materials. **Materials & Methods:** The present study was conducted on 40 patients of both genders requiring fixed partial denture. In all patients, two master impressions were made of each patient using two different techniques with polyvinyl siloxane (PVS) putty-wash impression technique such as PVS impression material and putty (very high consistency) combinations. Techniques included technique 1- single stage double mix technique and technique 2- two stage technique with using a spacer. Every impression was visually examined using a Heine binocular magnifying loupe.

Results: Out of 40 patients, males were 20 and females were 20. Technique I showed voids in 2, bubbles in 4 and pulls in 5 patients. Technique II showed voids in 4, bubbles in 4 and pulls in 5 patients. The difference was significant ($P < 0.05$). In technique I, 4 defects were at margin and 7 were at area beside the margin. In technique II, 8 were at margin and 10 were at area beside the margin. The difference was significant ($P < 0.05$). **Conclusion:** There were less defects with technique 1 (single stage double mix technique) as compared to technique 2 (two stage technique with using a spacer).

Key words: Fixed denture, single stage, Vinyl polysiloxane silicones

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INTRODUCTION

Dimensional accuracy when making impressions is crucial to the quality of fixed prosthodontic treatment, and the impression technique is a critical factor affecting this accuracy. Dental impression making remains a challenging procedure due to the potential for voids and tears, which may adversely affect the precise fabrication of indirect restorations.¹ Polyvinyl siloxane impression materials (PVS) were successfully introduced in the 1970s. Since that time and especially in past decade, these materials have gained in their acceptance and account for a larger share of the impression material market and used as impression materials in fabricating fixed partial dentures, removable appliances, and implant prostheses.² Vinyl polysiloxane silicones are considered “state-of-the-art” for fixed partial denture impressions. They constitute the most

widespread use of impression materials for fixed prosthetics. The materials are presented in the form of two pastes (a base and an accelerator) which can be hand spatulated or autospensed from a dual cartridge, and mixed in equal quantities for use.³

Polyvinyl siloxane (PVS), also called poly-vinyl siloxane, vinyl polysiloxane, or vinylpolysiloxane, is an addition-reaction elastomer (an addition silicone). It is a viscous liquid that cures (solidifies) quickly into a rubber-like solid, taking the shape of whatever surface it was lying against while curing. As with two-part epoxy, its package keeps its two component liquids in separate tubes until the moment they are mixed and applied, because once mixed, they cure (harden) rapidly. Polyvinyl siloxane is widely used in dentistry as an impression material.⁴ The present study was conducted to compare efficacy of polyvinyl siloxane impressions for fixed impression materials.

MATERIALS & METHODS

The present study was conducted in the department of prosthodontics. It comprised of 20 patients of both genders requiring fixed partial denture. The study protocol was approved from institutional ethical committee and all patients were informed regarding the study and written consent was obtained.

General data such as name, age, gender etc. was recorded. In all patients, two master impressions were made of each patient using two different techniques with polyvinyl siloxane (PVS) putty-wash impression technique such as PVS impression material and putty (very high consistency) combinations. Techniques included technique 1- single stage double mix technique and technique 2- two stage technique with using a spacer. In group I, 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. In group II, 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. Every impression was visually examined using a Heine binocular magnifying loupe. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 40		
Gender	Males	Females
Number	20	20

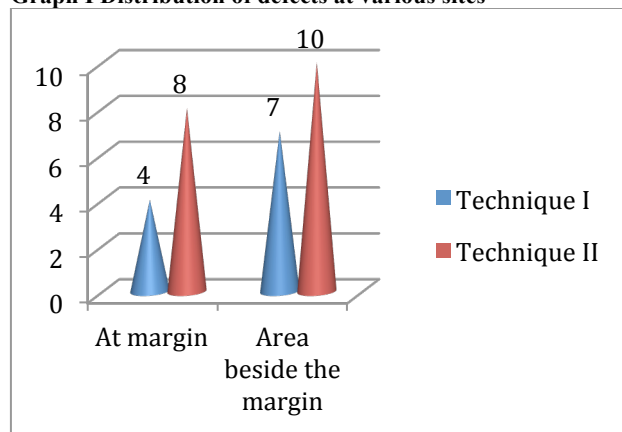
Table I shows that out of 40 patients, males were 20 and females were 20.

Table II Defects in both techniques

Defects	Technique I	Technique II	P value
Voids	2	4	0.01
Bubbles	4	6	0.05
Pulls	5	8	0.01

Table II shows that technique I showed voids in 2, bubbles in 4 and pulls in 5 patients. Technique showed voids in 4, bubbles in 4 and pulls in 5 patients. The difference was significant (P<0.05).

Graph I Distribution of defects at various sites



Graph I shows that in technique I, 4 defects were at margin and 7 were at area beside the margin. In technique II, 8 were at margin and 10 were at area beside the margin. The difference was significant (P<0.05).

DISCUSSION

Polyvinyl siloxane silicone is also used in other contexts where an impression similar to a dental impression is needed, such as in [audiology](#) (to take ear impressions for fitting custom hearing protection or hearing aids) or in industrial applications (such as to aid in the inspection of interior features of machined parts, for example, internal grooves inside [bores](#)).⁵ Polyvinyl siloxane was commercially introduced in the 1970s. Although polyvinyl siloxane silicones (PVS) have some of the best properties among elastomers they are also among the most expensive types of elastomers. Dentists, also practice impression making, without automixing systems and use hand mixing products to decrease the cost of impression. For the best clinical outcome it is essential to know the technique that produces least defects with hand mixing technique.⁶ The present study was conducted to compare efficacy of polyvinyl siloxane impressions for fixed impression materials.

In present study, out of 40 patients, males were 20 and females were 20. Technique I showed voids in 2, bubbles in 4 and pulls in 5 patients. Technique showed voids in 4, bubbles in 4 and pulls in 5 patients. Shreshtha et al⁷ compared the defects present in impressions between three different techniques using hand mixing elastomers. Three master impressions were made from each 32 crown preparations with three different techniques totaling to 102 master impressions. PVS impression material, putty (Aquasil) and light-body (Reprosil) viscosity combinations were used for every patient with the three techniques i) single stage double mix technique ii) two stage technique with using a spacer and iii) two stage technique without using a spacer. Among the three techniques used, the single stage double mix technique showed the least presence of any type of defects in the impressions with (21%) followed by two stage technique without using a spacer (35%) and then the two stage technique using a spacer (44%). Majority of the defects were voids (59%) and bubbles (30%) followed by pulls (11%). The number of defects located at the margins were 75% and 25% were located at others areas.

Idris B et al⁸ stated that there is tendency for more bubbles to be produced and included in the set impression with the putty/ wash one step impression technique, and with the use of two step technique this source of error can be minimized. Petropoulos et al⁹ stated that dimensional accuracy when making impressions is crucial to the quality of fixed prosthodontic treatment, and the impression technique is a critical factor affecting this accuracy.

Lu H et al¹⁰ conducted an in vitro study to compare the dimensional accuracy of the casts obtained from one step double mix, two step double mix polyvinyl siloxane putty- wash impression techniques using three different spacer thicknesses (0.5mm, 1mm and 1.5mm), in order to determine the impression technique that displays the maximum linear dimensional accuracy. 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 on stone casts poured from the impressions of the mild steel model. The stone dies obtained with all the techniques had significantly larger or smaller dimensions as compared to those of the mild steel model. 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.

CONCLUSION

There were less defects with technique 1 (single stage double mix technique) as compared to technique 2 (two stage technique with using a spacer).

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