

Evaluation of Accuracy of Polyvinyl Siloxane Putty Reline Impression Techniques for the Fabrication of Dies

P.K NOUFAL¹, DEEPA SHENOY², UMA.K.C³,
P.SESHA.REDDY⁴ and ASHISH. R.JAIN⁴

¹Department of Prosthodontics, Al Azhar Dental College, Perumpillichira, Thodupuzha, Kerala, India.

²Department of Prosthodontics, Sree Anjaneya institute of dental science Modakallur, Atholi post, koilandy, India.

³Department of Prosthodontics, Asan Memorial Dental College and Hospitals, Chennai, India.

⁴Department of Prosthodontics, Government Dental College, RIMS, Putlampali, Kadapa, India.

⁵Department of Prosthodontics, Saveetha Dental College and Hospitals, Chennai, India.

*Corresponding author Email: dr.ashishjain_r@yahoo.com

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ABSTRACT

The addition type silicon impression materials, polyvinyl siloxanes have been reported to be most accurate and dimensionally stable. There is much discussion in the accurate fit of cast restoration. Several impression techniques have been advocated for obtaining accuracy of casts using a combination of putty-wash, heavy body, light body and medium body consistency of impression materials. The purpose of this study was to find out the most accurate polyvinyl siloxane putty- reline impression techniques for the fabrication of the most accurate stone dies. In this study, metallic models of two identical Fixed partial Denture abutments were prepared with the size of 12mm, 10mm and 8mm in diameter. The distance between the two abutments was measured using a traveling microscope. A total of 40 impressions were made. All the impressions were poured to obtain the casts, and were evaluated to assess the dimensional stability of four different polyvinyl siloxane putty reline impression techniques. The inter abutment distance was highest in Group I- 2.447 and least was in Group IV- 2.415. Percentage deviation from master model of each impression technique was highest in Group III- 0.77% and least in Group IV- 0.24%. Within the limitations of the study, a) Poly vinyl siloxane putty- reline one step impression technique is the most accurate for the fabrication of stone dies b) Among the two – step putty reline techniques, two step with polyethylene spacer was accurate technique, as the lining thickness increased the dies made from these impressions were least accurate.

Keywords: Abutment, Dies, Dimensional Stability, Impressions, Putty Reline.

INTRODUCTION

An accurate impression is key for success of any restoration, more so in field of fixed prosthodontics. Knowledge of impression materials and the techniques to which each is best suited is essential in achieving consistent results¹⁻². In Prosthodontics, impression materials are used to replicate intra oral structures involved for the

fabrication of definitive restoration³. The accuracy of this final restoration is highly dependent on the impression materials and technique utilized. It is prudent to consider the physical properties of an impression material to be certain that it can deliver the desired result when used with a selected impression technique⁴⁻⁵. The addition type silicon impression materials, polyvinyl siloxanes have been reported to be most accurate and

dimensionally stable⁶⁻⁹. There is much discussion in the accurate fit of cast restoration, some authors claim that impression materials have improved to such an extent that accuracy may be controlled more with technique than by not effect the accuracy¹⁰⁻¹⁵. Several technique have been suggested to improve the accuracy of polyvinyl siloxane impression. Putty-reline technique is frequently recommended for use with polyvinyl siloxanes. The Wash thickness is an essential factor that influences the accuracy of elastomeric impression materials. The most commonly used putty relined impression techniques are putty/reline one step technique and putty relined two step technique¹⁶⁻²¹. The purpose of this study is to assess the accuracy of these putty relined impression technique in a laboratory model that simulated the clinical practice. An accurate impression will result in precise fitting cast restoration This is one factor that determine the restorations longevity. Among various impression materials available, addition silicone impression material is believed to provide the best accuracy of reproduction and dimensional stability. Several impression techniques have been advocated for obtaining accuracy of casts using a combination of putty-wash, heavy body, light body and medium body consistency of impression materials. Technique with putty-wash impression material are most popular because these techniques are easy to use, do not require custom trays, and produce reasonably accurate cast. Conflicting reports have appeared literature about the relative accuracy of one step and two step putty-reline impression techniques. Therefore purpose of this study was to find out the most accurate polyvinyl siloxane putty-reline impression techniques for the fabrication of the most accurate stone dies.

MATERIALS AND METHOD

Preparation of Metal Die

In this study, metallic models of two identical Fixed partial Denture abutments were prepared with the size of 12mm, 10mm and 8mm in diameter. The abutment preparation was done with an occlusal taper of 6 degree with shoulder finish line of 2mm thickness. The metallic model consists of a base of 5mm on to which a platform of 1mm is built on. The platform of metal serves the purpose of closely seating the special perforated metal tray

on to the base while making the impression. Two identical fixed partial metallic abutments were mounted on to the base, which are cylindrical in shape, and has two perpendicular grooves engraved on to the occlusal surface which serves as a reference point for taking measurements. A rigid metallic perforated tray was fabricated, which could be placed on to the platform on the metallic model accurately.

Preparation of Model

For the purpose of impression making a perforated metallic tray was used, which was coated on the inside with tray adhesive material. The tray adhesive material serves the additional purpose of pulling the impression material towards the tray and thereby minimizing the dimensional shrinkage.

- a. President putty soft base and catalyst
 - b. President plus jet, light body
1. One step Technique: putty and wash impression materials used simultaneously.
 2. Two step Techniques: A polyethylene spacer used with putty impression first and then the wash stage.

Once the impression was made, all the impression were stored at room temperature for one hour before being poured. Class IV die stone was used for making master cast. The die stone was first mixed by hand for 20 seconds, all mixes were vibrated into the impression using a vibrator, set at high frequency of low amplitude, over the next 150 seconds. Casts were then allowed to set for one hour before separation from the impression. The cast recovered from the impression were allowed to dry. The distance between the two abutments A and B was measured using a traveling microscope, capable of measuring up to 0.001mm. All the measurements were observed three times and the mean value was recorded. The measurements on the master die and on the stone dies obtained with all four techniques were tabulated and statistically analysed.

RESULTS

In this study, a total of 40 impression were made. All the impression were poured to obtain the casts, and were evaluated to assess the dimensional stability of four different polyvinyl

Table 1: The inter abutment measurement, means and standard deviation (sd) for all the putty- reline impression techniques

S.No	Group I	Group II	Group III	Group IV
1	2.455	2.473	2.418	2.430
2	2.439	2.400	2.434	2.408
3	2.465	2.447	2.436	2.408
4	2.436	2.421	2.411	2.426
5	2.444	2.410	2.407	2.447
6	2.454	2.441	2.407	2.407
7	2.433	2.425	2.436	2.417
8	2.446	2.443	2.411	2.397
9	2.454	2.441	2.422	2.397
10	2.448	2.444	2.433	2.417
Mean	2.447	2.430	2.421	2.415
S.D	0.018	0.013	0.011	0.010

Table 2: Percentage Deviation From Master Model of Each Impression Technique

Group I	Group II	Group III	Group IV
0.290%	_-0.41%	_-0.77%	0.024%

siloxane putty reline impression techniques. The inter abutment distance was highest in Group I- 2.447 and least was in Group IV- 2.415 (Table I). Percentage deviation from master model of each impression technique was highest in Group III- 0.77% and least in Group IV- 0.24%. (Table II).

Percentage deviation = $\frac{msm - mmm}{mmm} \times 100 / Mmm$

Where, Msm = mean of the stone model,
Mmm= mean of the master model= 2.440

DISCUSSION

Polyvinyl siloxane impression materials are extremely popular because of their combination of excellent physical properties, handling characteristics and dimensional stability. Several variations of impression technique, the custom tray is not required, which saves a lot of clinical and laboratory time¹²⁻¹⁷. The stone casts produced from all the two step impression techniques showed a decrease in interabutment distance, which may be because in the two stage impression techniques for the lining As we are not using tray adhesive the polymerization the polymerization shrinkage may be towards the master die The interabutment distance between the techniques was statistically highly significant. The most dimensional difference was shown in the two step putty reline with 2mm relief followed by two step putty reline with 1mm relief difference was minimum with two step technique with polyethylene spacer and the difference was least with the one step putty- wash technique. Overall, it was observed that president brand putty and light body addition silicone impression material produced more accurate casts with one step putty- wash technique.

CONCLUSION

Within the limitations of the study, a) Poly vinyl siloxane putty- reline one step impression technique is the most accurate for the fabrication of stone dies b) Among the two – step putty reline techniques, two step with polyethylene spacer was accurate technique, as the lining thickness increased the dies made from these impression were least accurate.

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