Short Communication

Technique for Spacer Adaptation and Custom Tray Fabrication in Impression Making for Fixed Prosthodontics

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Abstract

The objective is to minimize the inaccuracies in two-step impressions by homogenizing the polymerization shrinkage of elastomeric impression material in fixed prosthesis fabrication. The objective is accomplished by the technique of spacer adaptation and custom tray fabrication for two-step impressions. The technique makes the use of two vacuum-adapted spacers, selected based on the viscosity of elastomeric impression, and a vacuum-adapted custom tray. The procedure of using the specially fabricated custom tray for impression making is also presented. Consistent thickness of the two different viscosities of impression material is maintained due to vacuum adaptation of the spacers. This homogenizes the polymerization shrinkage of the elastomeric material in different regions of impression, as uniform space is occupied by the material in the space created by the spacer. The procedure of vacuum adaption of the tray material also limits the dimensional change of the tray. The technique minimizes the inaccuracies of impression by homogenizing the polymerization shrinkage of the elastomeric impression, thus promising a well-fitting prosthesis.

Keywords: *Bridge, crown, custom tray, fixed dental prosthesis, spacer*

Introduction

The satisfactory outcome of a fixed dental prosthesis depends on the accurate replication of hard and soft tissues in the impression.[1,2] The custom tray fabricated for making the impression of the dental arches has an important role in determining the quality of the impression and fit of the prosthesis.[3] The spacer of the tray must maintain the uniform thickness of impression material such that the inevitable polymerization shrinkage of the elastomeric impression is homogeneous throughout the impression. The tray should be dimensionally stable as changes in the size of the tray can reduce the accuracy of the impression.[4,5] The tray should also be rigid such that it does not flex during the retrieval of the impression from the mouth or during the preparation of the cast.[6]

A technique for the fabrication of the custom tray for two-step impressions in fixed prosthodontics is presented. The objective is to minimize the inaccuracies in two-step impressions by homogenizing the polymerization shrinkage of elastomeric impression material in fixed prosthesis fabrication.

Technique

1. Mark the extent of the tray, spacer, and tissue stops on the diagnostic cast. The tray extension is marked 5 mm apical to the free gingival margin of the teeth. The spacer extension is marked 2 mm coronal to the tray extent. Two square-shaped tissue stops (2 mm × 2 mm dimension) are marked on the nonfunctional cusp of the posterior teeth on either side of the arch. One anterior tissue stop (2 mm × 2 mm in dimension) is marked on the incisor or canine, extending on the labial and lingual surface of the tooth
2. To form the first spacer, adapt a 0.5 mm thick resilient polyvinyl sheet (BIOPLAST; Scheu-Dental GmbH) using a vacuum-forming machine (BIOPLAST; Scheu-Dental GmbH) according to the recommended time and pressure (6 MPa) on the cast. Trim the adapted spacer to extend till the previously scribed lines on the cast
3. Cut the three tissue stops in the selected sites on the adapted spacer
4. Apply a thin layer of Vaseline on the spacer and exposed region of the cast
5. To adapt the second spacer, adapt a 1.5 mm thick resilient

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polyvinyl sheet (BIOPLAST; Scheu-Dental GmbH, Iserlohn, Germany) using a vacuum-forming machine (BIOPLAST; Scheu-Dental GmbH, Iserlohn, Germany) according to the recommended time and pressure (6 MPa) on the cast. Trim the adapted spacer to extend till the first spacer as shown in Figure 1

6. Apply a thin layer of Vaseline on the second spacer and exposed region of the cast
7. Adapt thermoplastic acrylic resin (Biocryl-Resin C; Scheu-Dental GmbH, Iserlohn, Germany) of 3.0 mm thickness using a vacuum-forming machine (BIOPLAST; Scheu-Dental GmbH, Iserlohn, Germany) according to the recommended time and pressure (6 MPa) over the spacer previously adapted on the cast. This completes the arch form of the tray
8. Fabricate a handle in the midline using autopolymerizing polymethyl methacrylate (PMMA) (DPI Cold Cure; Dental Products of India, Mumbai, India) on the polished surface of the arch form of the tray
9. Before making the first step of the impression, the spacers are peeled off from the tray as shown in Figure 2. The second spacer is discarded. This creates space for the heavy viscosity elastomeric impression material (Aquasil Ultra, Heavy viscosity; Dentsply Caulk, Milford, Delaware, USA). The first spacer is adapted on the dental arch [Video 1]
10. Impression of the first spacer on the dental arch is made using heavy body viscosity of elastomeric impression material (Aquasil Ultra, Heavy viscosity; Dentsply Caulk, Milford, Delaware, USA). The first spacer is picked in the first step of the impression as shown in Figure 3 and Video 1
11. After the impression is set and removed from the mouth, the first spacer is removed from the impression. The space created is injected with low-viscosity elastomeric impression material (Aquasil Ultra, Low viscosity; Dentsply Caulk, Milford, Delaware, USA), and the impression of the dental arch is made as shown in Figure 4 and Video 1. This completes the second step of the two-step impression.

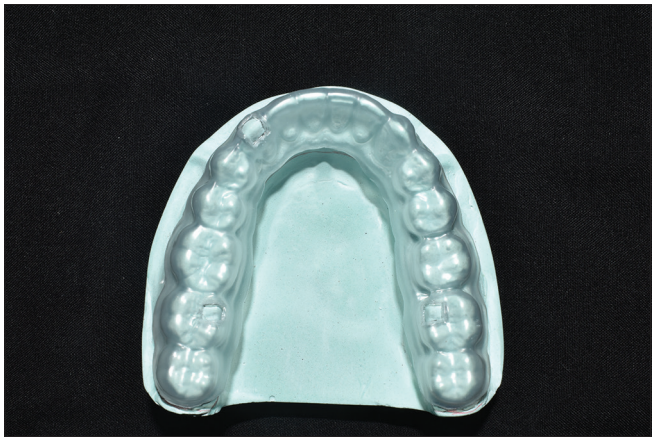

Figure 1: First and second spacers adapted on the cast

Discussion

This technique helps fabricate a custom tray for a two-step impression procedure for fixed dental prostheses. The vacuum-adapted spacer eliminates the variability in thickness that can be present with a wax spacer. A wax spacer is adapted using a flame that can cause excessive thinning in regions that are excessively heated. Adaptation by finger pressure can also thin out the wax in regions where the excessive pressure is applied. The uniform space created by the vacuum adaptation of the spacer ensures homogeneous polymerization shrinkage of the impression material.[7] This eliminates the unequal dimensional change of the cast in different regions. The increase in thickness of the impression material results in a decrease in the inter-abutment space, creating a significant concern when undertaking impressions for fixed partial dentures.[8] The thermoplastic vacuum-adapted spacer is easy to peel off from the tray as shown in Video 1. The removal of this spacer is quick and does not require hot water or flame. Complete elimination of the spacer is achievable when compared to the removal of the wax spacer. The use of two separate spacers assures control of the thickness of two distinct elastomeric impression material viscosities.

The custom trays that are fabricated either by dough method or sprinkle method of adaptation of autopolymerizing PMMA resin can induce variable degrees of shrinkage of PMMA in different regions of the tray due to uneven thickness of the adapted PMMA. It has been studied that autopolymerization not only affects shrinkage but also can hamper physicomechanical properties, water absorption

Figure 2: Custom tray, first spacer, and second spacer arranged from left to right

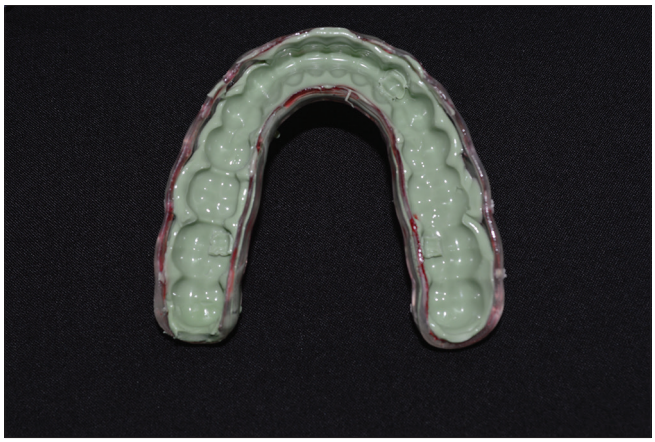

Figure 3: First step of the impression carrying the first spacer in it

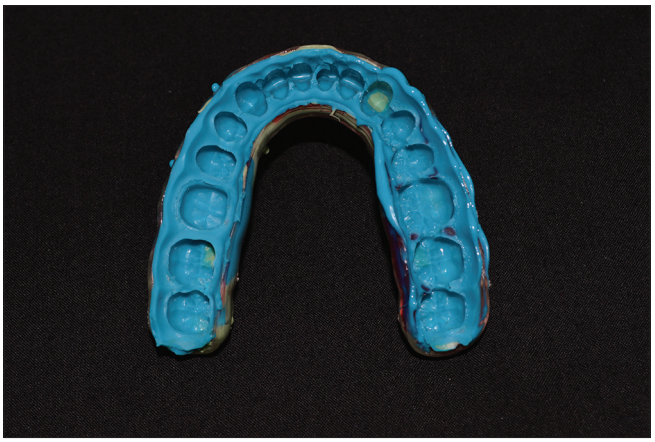

Figure 4: Completed impression

rate, surface roughness, residual monomer, and flexural strength.[9] The dimensional instability of the tray can adversely affect the dimensional stability of the impression, and this feature is diminished with the use of thermoplastic vacuum-adapted rigid resin material. Accurate impressions are the foundation of a successful prosthesis.[10] The rigidity of the vacuum-adapted thermoplastic material used for the fabrication of the tray ensures that the tray does not flex either during impression making or during the preparation of the cast. The thermoplastic sheets are easily available. A variety of options are available for the selection of the thickness of the sheet to be used as a spacer. This enables the use of a variety of elastomeric impression materials with these types of custom trays.

The drawback of the technique is the procurement of special materials for the fabrication of the custom tray. In addition, the two steps of spacer adaptation increase the time of fabrication of the tray.

Conclusions

An alternate technique for the fabrication of the custom tray for two-step impressions in fixed prosthodontics has been presented. The features of the tray minimize the risk of inaccuracies in impression making and hence in the final prosthesis.

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Conflicts of interest

There are no conflicts of interest.

References

1. Chidambaranathan AS, Reddy R, Rajendran S, Balasubramaniam MK. Modified technique for making auto-polymerized polymethylmethacrylate resin custom tray. J Clin Diagn Res 2016;10:H08-9.
2. Li H, Bai H, Ma K, Sun F, Chen H. Fabricating a digital custom tray and interim complete denture base: A dental technique. J Prosthet Dent 2024. doi: 10.1016/j.prosdent.2024.03.009.
3. Gautam N, Ahmed R, Sharma S, Madineni PK, Hasan S. A comparative study to evaluate the accuracy of various spacer thickness for polyvinyl siloxane putty-wash impression techniques: An *in vitro* study. Int J Clin Pediatr Dent 2020;13:536-42.
4. Shafa S, Zaree Z, Mosharraf R. The effects of custom tray material on the accuracy of master casts. J Contemp Dent Pract 2008;9:49-56.
5. Khan SA, Tushar T, Nezam S, Singh P, Kumari N, Singh SS. Comparison and evaluation of linear dimensional accuracy of three elastomeric impression materials at different time intervals using vision inspection system: An *in vitro* study. J Int Soc Prev Community Dent 2020;10:736-42.
6. Tavakolizadeh S, Razaghi MJ, Pakravan P, Sedaghat Monfared M, Beyabanaki E, Ghoveizi R. Effect of multiple pouring on the accuracy of casts made using 3D-printed custom trays with different spacer thicknesses: A research study. J Dent Res Dent Clin Dent Prospects 2020;14:37-40.
7. Kaur H, Nanda A, Verma M, Koli D. Technique for adapting a spacer for a custom impression tray. J Prosthet Dent 2016;116:851-2.
8. Rajapur A, Dixit S, Hoshing C, Raikar SP. The influence of tray space and repeat pours on the accuracy of monophasic polyvinylsiloxane impression. J Contemp Dent Pract 2012;13:824-9.
9. Morita K, Tsuka H, Kato K, Tsuga K. Effect of polymerization temperature on the properties of autopolymerizing resin. J Prosthet Dent 2018;119:840-4.
10. Mishra S, Chaturvedi S, Ali M, Pandey KK, Alqahtani NM, Alfarsi MA, *et al.* Dimensional stability of light-activated urethane dimethacrylate denture base resins. Polymers (Basel) 2023;15:744.