



Impression Techniques for Tooth-Supported Fixed Partial Denture

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[Review Article](#)

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ABSTRACT

The success of a fixed dental prosthesis depends on the accuracy of the impression that precisely records the prepared tooth, adjacent tooth, and soft tissues. Various types of impression materials are available for this purpose like alginate, agar, polyether, polysulfide, condensation silicone, and addition silicone. Marginal integrity and internal fit of restoration are of utmost importance for the longevity of the prosthesis. An ill-fitting margin may result in dentin hypersensitivity, dental caries, cement dissolution, plaque retention, and periodontal problems. Literature has described various impression techniques for making an impression of tooth-supported fixed partial dentures to produce duplications as accurately as possible. Each of these techniques has its own advantages and disadvantages. The objective of this article is to review the literature about various impression techniques for a tooth-supported fixed partial denture.

Keywords: Dental Impressions, Fixed Partial Denture, Internal Fit, Ill-fitting Margin, Impression Materials, Marginal Fit, Impression Techniques.

Introduction

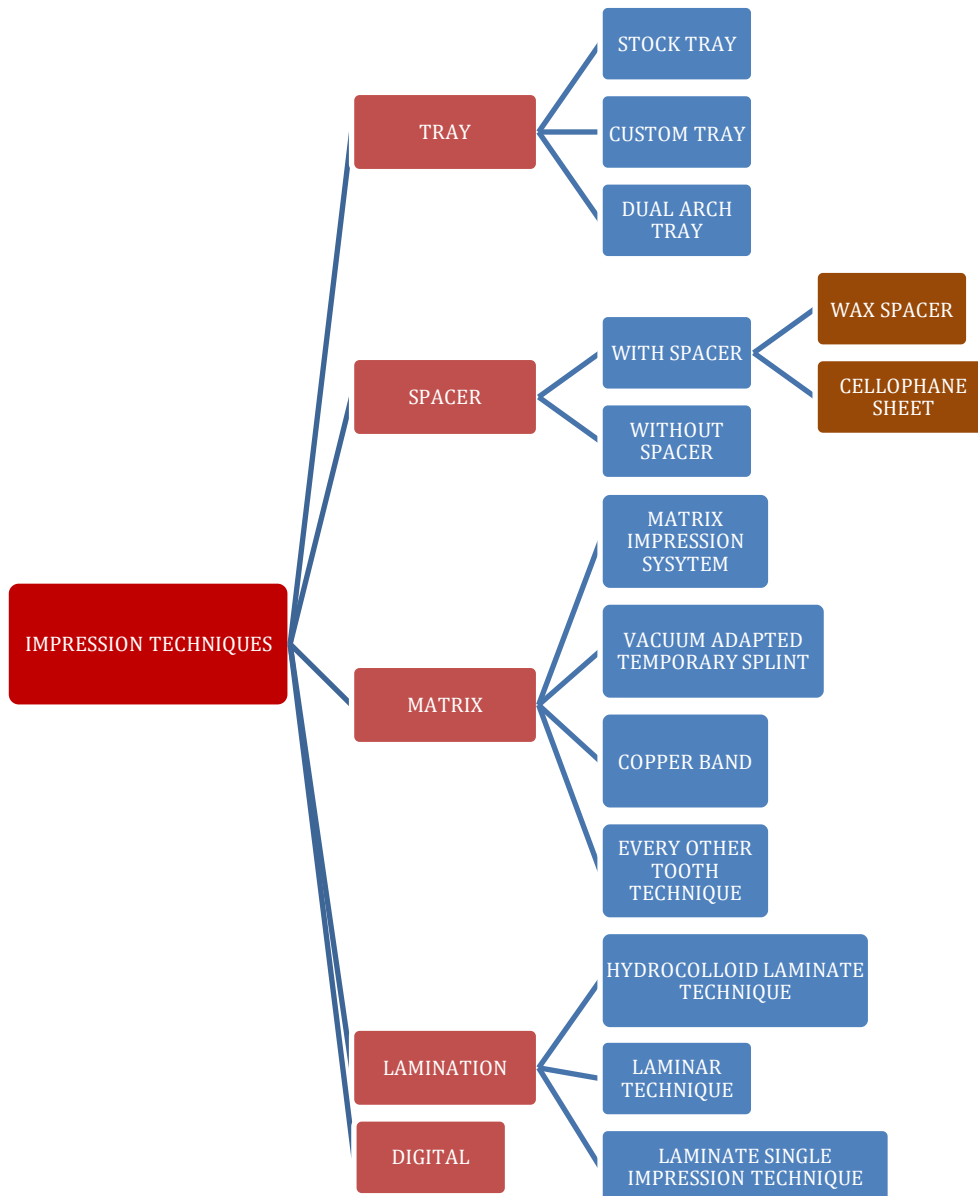
Restoration fit and marginal seal are of utmost importance in determining the longevity of fixed dental prosthesis (FDP).^{1,2} An ill-fitting margin may result in dentin hypersensitivity, dental caries, cement dissolution, plaque retention, and periodontal problems.³ Accurate impression making is most crucial for the fabrication of fixed partial denture.⁴ Various types of impression materials are available for this purpose like alginate, agar, polyether, polysulfide, condensation silicone, and addition silicone. Each has its own advantages and disadvantages.^{5,6} Impression materials should possess 3 important properties for precisely

recording the margins-accuracy, dimensional stability, and elasticity.⁷ Impressions are found deficient in several aspects due to voids or tearing of material in finish lines area or due to inaccurately following the instructions of manufacturers for manipulation of materials.⁸ Various impression techniques are described in the literature for making an impression of the prepared tooth.

The objective of this article is to review the literature about various impression techniques for a tooth-supported fixed partial denture.

Classification of Impression Techniques

Classification of impression techniques for FDP helps in easy understanding (**flowchart-1**).



Flow chart 1: Classification of impression techniques for FDP



I. On the basis of trays used

Various impression material necessitates an appropriate selection of trays for making an impression for a fixed prosthesis. Reversible hydrocolloid impression material requires water-cooled trays whereas other impression materials need prefabricated impression trays.⁹

The tray should possess adequate rigidity to prevent distortion and should provide control of impression material thickness. Perforations, rim lock, and adhesive provide retention in the tray.⁹

1. **Stock tray:** Metal or plastic prefabricated impression tray typically available in various sizes and used principally for preliminary impression.¹⁰
2. **Custom tray:** An individualized impression tray made from a cast recovered from a preliminary impression; it is used in making a final impression¹⁰. They are fabricated individually for each patient.
3. **Dual-arch tray:** Wilson and Warry described this technique in 1983. Dual-arch impression trays were developed by Werrin in 1979¹¹. Dual-arch trays control 2 important clinical variables:
 - a) During the opening, deformation or shift of the mandible is eliminated.
 - b) A maximum interdigitation record can be made.

Advantages

1. Less material is required.
2. Less time required.
3. Maximum intercuspation recorded.

II. On the basis of spacer used:

a) Two Step Putty Wash Technique Using Cellophane Sheet As Spacer

Initially, putty is manipulated and loaded into the tray. Over that thin cellophane, the sheet is adapted and an impression is made. After complete polymerization, the tray is removed from the mouth and the cellophane sheet is peeled off. This putty impression act as a custom tray. Light body impression material is dispensed around the prepared tooth and over the custom putty tray. A loaded tray placed in the mouth and removed after complete polymerization.¹²

Disadvantages

As there is no tissue stop or landmark in the putty tray, it becomes quite difficult to accurately replace the tray while making the wash impression.

b) An Alternative Putty/Wash Impression Technique

Fabrication of rigid custom tray provides even space for impression material and enhances the accuracy of the impression-making procedure. This technique provides an alternative by fabricating a custom tray of putty intraorally with a wax spacer. To reduce the polymerization shrinkage of the putty, polyvinyl siloxane materials are recommended use.

Soften a sheet of base plate wax and adapt it around the teeth. 2 mm square sections were in the premolar regions to act as occlusal stops. The closest fitting stock tray was selected to seat around the wax. Apply adhesive and load the tray with putty and insert it into the mouth. On polymerization, the tray is removed from the mouth, and the wax is peeled off. Now the putty will act as a custom tray. In the space previously occupied by wax, dispense low viscosity impression material and insert the tray.¹³

Advantages

- i. Reduced patients number of appointment required for custom tray fabrication.

- ii. The wax spacer prevents the putty from engaging undercuts; so the relocation of the tray for the wash impression becomes easy.
- iii. Provides uniform thickness of wash material of approximately 2 mm.
- iv. Modifications can be done easily in putty custom tray.

Disadvantages

- i. Surface contamination of the putty may influence the adhesion with wash impression.

c) Simultaneous OR Squash Impression Technique

This technique requires simultaneous manipulation of putty and light body elastomeric impression material. Putty loaded stock tray is placed over syringed light body around prepared tooth. No spacer is used in this method. This method of making the impression is unacceptable.¹²

Disadvantages

1. Impossible to control the thickness of impression material
2. Excess bulk of impression material is used
3. Light body impression material get displaced
4. Margin details are captured in putty which lacks the ability to record the marginal details.

d) Relieved Putty Impression

A close-fitting stock tray is used for making a putty impression. In the areas of tooth preparations, putty is relieved with the help of a scalpel or bur to provide space for light body impression material. An impression is washed with low-viscosity impression material.¹²

III. On The Basis of Matrix

Glossary of prosthodontics terms has defined matrix as a mold or impression in which something is formed.¹⁴

a. Matrix Impression System

The procedure starts with matrix carrier fabrication. 3 to 4 mm of space should be available between its walls and the prepared teeth and 2 to 3 mm between its walls and adjacent unprepared teeth. Carrier is filled with PVS impression material and placed over prepared teeth. After polymerization removes the matrix from the mouth and separates it from the carrier. Remove excess and carve the interproximal areas between adjacent prepared teeth to create spaces for the interdental gingival tissue. Relieve the matrix from an internal aspect to provide space for impression material. Do not trim the occlusal or incisal aspect as this will act as an occlusal stop. Apply adhesive to the outer and internal aspects of matrix. Dispense high viscosity impression material in the matrix and place it on the prepared teeth. Immediately make a mix of medium viscosity impression material, load the stock tray, and seat the tray over the matrix impression.¹⁵ (Figure - 1)

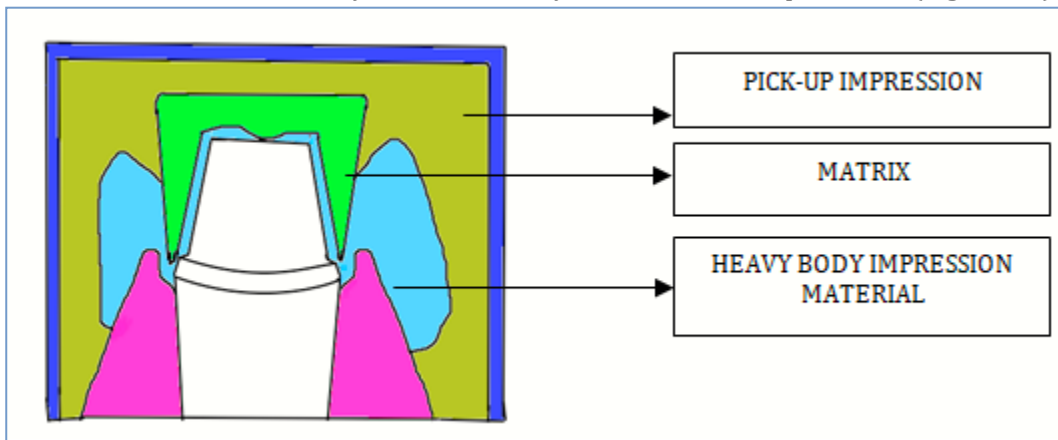


Figure 1: Matrix Impression System (MIS)

Advantages

Helps in more precise delivery of impression material into the sulcus.

B) Impression Using Vacuum Adapted Temporary Splint

Vacuum adapted splint was fabricated on the diagnostic impression which acted as a matrix or trays former. Quick setting acrylic was loaded in tray former and an impression of a prepared tooth was made after which tray former was peeled off. The acrylic tray was reshaped from all the aspects and relieved except one stop was left that acted as a vertical stop. Heavy body rubber base impression material was used to make a preliminary impression. Escape vents are provided in impression material after polymerization. Secondary impression of the preparation made by using a combination of equal parts of regular and light body rubber base impression material. A full arch impression is made in a stock tray using regular body rubber base impression material.¹⁶ (Figure - 2)

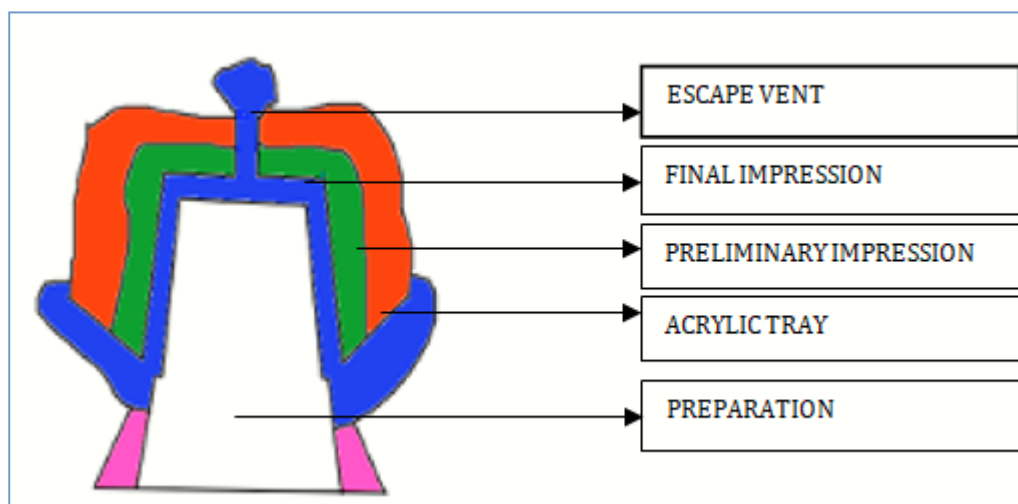


Figure 2: Impression using Vacuum adapted splints

Advantages

Vacuum-formed tray former acting as a carrier of impression material provides closed adaptation. The primary impression deflects the gingival tissue away from the cervical margins of the preparations, thus permitting the viscous rubber base material of the final impression to flow into contact with the cervical margins of the preparation.

C) Copper Band Impression Technique

Copper bands are selected to fit appropriately the prepared tooth. Wax adapted on heated stock metal tray adapted in the oral cavity. After applying adhesive, copper bands were loaded with impression material and placed over preparation. Over band, the stock impression made with rubber base material.¹⁷

Advantages

1. Superior gingival retraction than indirect retraction method.
2. Bubble and void free impression due to close adaptation of wax lined tray.

D) Every Other Tooth Impression Technique

This technique is indicated for teeth with root proximity as it prevents strangulation of gingival tissues during displacement.

In this technique following multiple adjacent tooth preparations, the matrix was made in the carrier with polyvinyl siloxane bite registration material. Separate impressions of each tooth, mark them according to tooth number, and relieve from the internal aspect. Retraction of every alternate tooth was done (**Figure - 3**), heavy body elastomer was loaded into the matrix, and the impression was done. (**Figure - 4**) The same was repeated for the remaining teeth. Seat all the matrix on designated teeth, then definitive pick-up impression with medium-viscosity made.¹⁸ (**Figure - 5**)

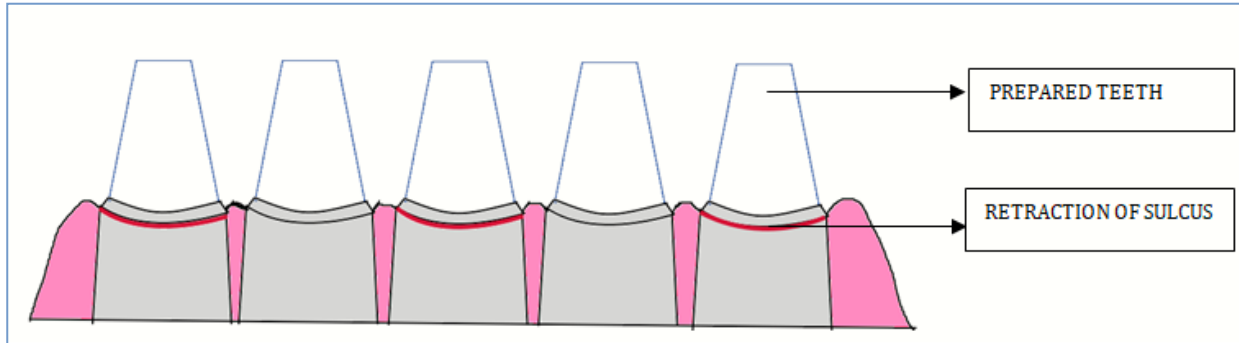


Figure 3: Retraction of alternate tooth for every other tooth technique

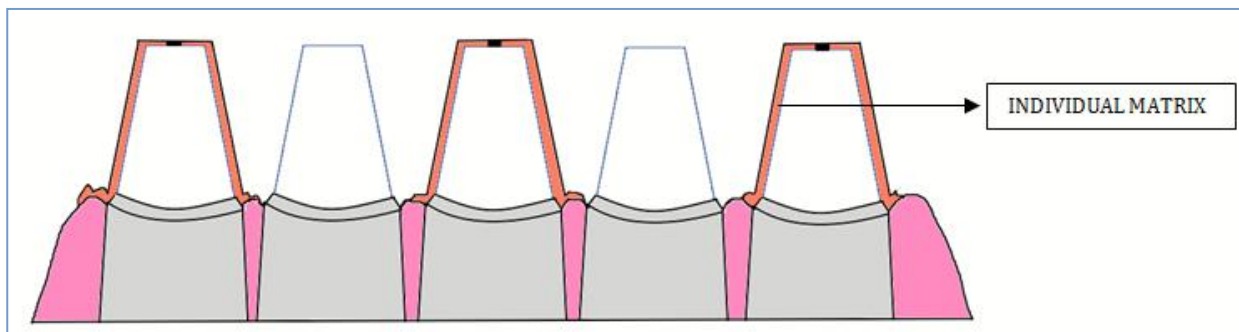


Figure 4: Individual impression of each alternate tooth

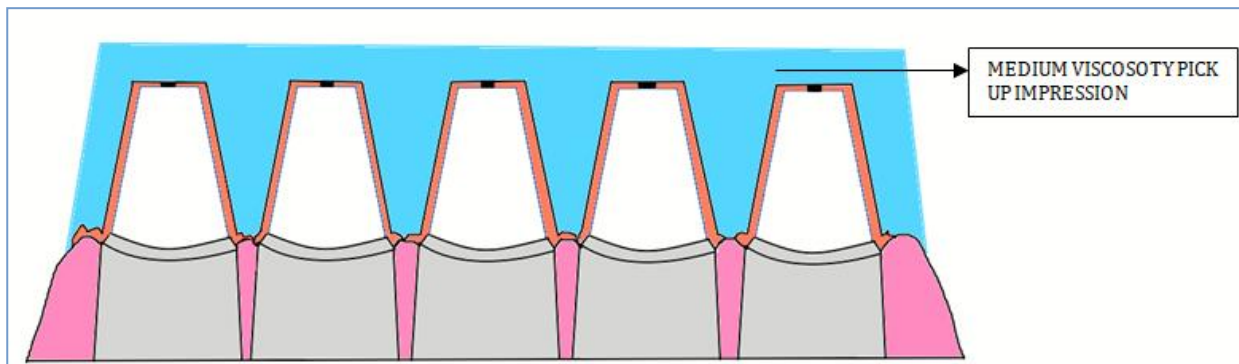


Figure 5: Definitive pick-up impression

IV. Lamination of Materials

A) Hydrocolloid Laminate Technique

Initially, gingival displacement was done with a retraction cord. Reversible hydrocolloid impression material syringed around the preparation and irreversible hydrocolloid loaded in stock tray inserted and held under pressure.¹⁹ (**Figure - 6**)

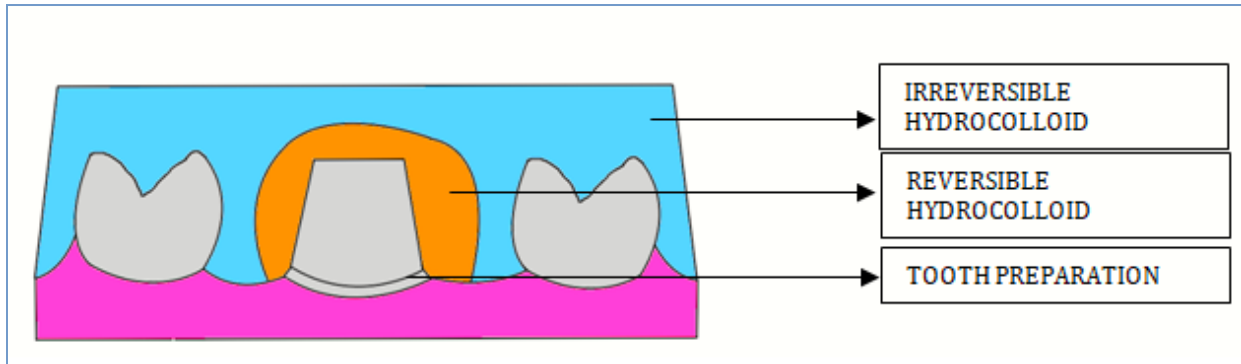


Figure 6: Hydrocolloid impression technique

Laminar Technique

Before tooth preparation, impression with dual arch tray done on preparation side. Preparation, tissue management, and retraction were done. Through a plastic tray, 2 holes were drilled on the facial aspect. The secondary impression is produced with a low-viscosity vinyl polysiloxane impression material with injection continuing during withdrawal to prevent “sucking” of some wash material from within the impression.²⁰

Advantages

- Records prepared tooth, opposing arch, and maximum intercuspation in single impression.
- Avoids waste of excessive impression material.
- Injection into an open system does not generate compressive forces that can force impression material intramucosally and cause a foreign body reaction until removed.

B) Laminate Single Impression Technique

This technique was put forward by Fusayama et al in 1974. Heavy and wash-type impression materials were dispensed at the same time. A thin layer of wash type laminated over the surface of heavy type. The loaded tray immediately impressed on the preparation.

The purpose of this lamination is to prevent the direct contact of the heavy type with the preparation, which roughens the stone surface.²¹ (Figure - 7)

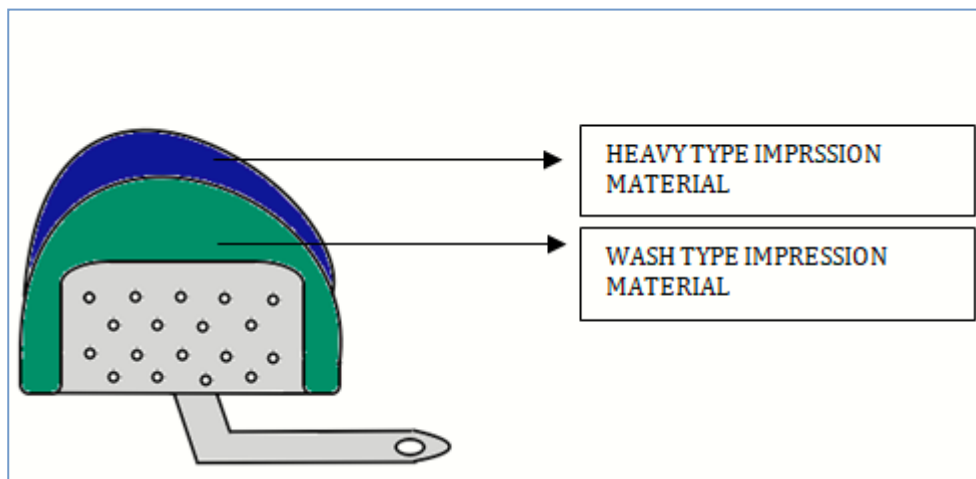


Figure 7: Laminate impression technique



V. Digital Impression Technique

Digital impression making is an innovative approach with more ease and comfort. It helps in capturing the record more precisely and faster than the conventional method. CEREC, Lava C.O.S. system, iTero, E4D, and TRIOS are a few of the systems used in intraoral digital system.²² CAD-CAM technology includes 3 main parts: data acquisition, data processing, and manufacturing unit. In this method, with the help of intra-oral scanners impression is made followed by the fabrication of a virtual 3D model without using impression materials and pouring of cast.²³ The main drawback with this system lies in its cost. The setup and maintenance of a digital system are expensive with a steep learning curve.

Discussion

This review describes various types of impression techniques used for making an impression of tooth-supported fixed dental prosthesis. Different techniques used different types of material for recording prepared finish lines precisely. In the putty wash technique, margins are recorded by light body elastomeric impression material; MIS and every other tooth technique use heavy body material for displacing sulcus and recording margins; a technique that used vacuum adapted splints for forming a matrix, sulcus was recorded by mixing equal parts of regular and light body rubber base impression material; in hydrocolloid laminate technique, critical areas are recorded by reversible hydrocolloid material.

Spacer thickness for making the two-step putty wash technique also influences the accuracy of impression material. Nissan et al found that 1-2mm of the thickness of spacer for wash material provides the most accurate dies with the two-step putty wash technique.²⁴ Various studies have reported better results with the two-step putty wash technique than with one step putty wash technique.²⁵⁻³¹ Putty wash technique has several limitations like putty cannot reproduce fine details at 25microns level or less; putty impression displaces most of the light body to the periphery of the tray while making wash impression, recording the finish lines in putty consistency⁸; Surface contamination of the putty may influence the adhesion with wash impression.¹³

In fixed prosthodontics stock trays are used extensively and the importance of the control of bulk is ignored. Fabrication of custom tray provides even thickness of material with close adaptation, thereby reducing the wastage of material and increasing the accuracy.³²

A study conducted by Hung et al found that the accuracy mainly depends on the type of material rather than the technique used.³³ various studies have shown better marginal accuracy with digital impressions compared to conventional ones. Intraoral scanning eliminates tray selection, material dispensing, material setting, material disinfection, impression packaging and shipping, gypsum pouring, die sectioning and trimming, and articulation and mounting. An error in any of these steps can lead to an inadequate fit of the prosthesis.³⁴

Conclusion

The dimensional stability and ability to record margin details precisely depends on the type of material used, atraumatic retraction technique, and type of tray selected. The clinician should select the best-suited material and technique for the particular situation. With recent advances, intraoral digital scanners gave promising results.

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