Impression Techniques in Prosthodontics

A successful dental prosthesis or a restoration is mainly dependent on the accuracy of the dental impressions. An impression is an imprint produced by ‘the pressure of one thing upon or into the surface of another’ or the negative likeness. It is not technically possible or desirable to fabricate prostheses or restorations directly in the patient’s mouth. Therefore it is essential to obtain a cast or a model which must be accurate replicas of the denture bearing area or the prepared tooth/teeth in the mouth.¹

It is very important that the clinician selects an appropriate impression technique and materials to accomplish this task. The accuracy of the cast depends on the properties of the impression materials, impression techniques used and the properties of cast and die materials. Each technique and the material has its advantages and drawbacks. While an ideal material and the technique is yet to be developed it is apparent that the clinician is bound to select the most appropriate material and the technique based on evidence.^{2,3} This paper summarizes the techniques to be adopted in removable and fixed prosthodontics based on available evidence.

Complete denture prosthodontics

Making the preliminary impression

Selecting a stock tray

Preliminary impressions are made using metal or plastic stock trays which are available in different sizes (S, M, L, and XL). Maxillary tray should cover labial and buccal sulci, hard palate up to the vibrating line, maxillary tuberosity and the hamular notches. Mandibular tray should cover labial, buccal and lingual sulci and the residual ridge up to the pear shaped pad. It is desirable that the tray is slightly larger by about 5 mm.⁴

Impression Materials

The purpose of making a preliminary impression is to make a primary cast which is used for making a custom tray for the patient. Thus it is only necessary to record the outline form of the denture bearing area accurately. For this purpose an impression material which is cheap and which would provide a reasonable degree of accuracy is more than adequate. Since it is planned to record a definitive impression with the use of custom tray, degree of accuracy in terms of surface details is not a concern here. Thus it is possible to use either irreversible hydrocolloid-alginate or impression compound as preliminary impression materials when fabricating conventional complete dentures. The important thing to remember is to record the entire outline form of the denture bearing area without which a proper custom tray cannot be fabricated.

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If replacement dentures are fabricated using copy technique, lab silicone putty can be used to make a mold of the existing denture to make a template. (Figure 1)

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Figure1-Mold of the dentures made with lab putty and stock trays

Pouring the primary cast

Care must be taken to preserve or not to damage the outline form of the denture bearing area during the casting procedure if not, an accurate custom tray cannot be fabricated.

Custom tray

Before prescribing a custom tray, impression technique and the material should be decided based on the assessment findings. For ridges which are well or moderately developed, mucostatic impression technique is desirable. Details of the denture bearing area are recorded at their resting stage. It is necessary to use a mucostatic impression material such as irreversible hydrocolloid-alginate or light body silicone in order to accomplish this. (Figure 2)

Figure 2-Definitive impressions recorded with alginate in acrylic custom trays

Spacer thickness can be adjusted depending on the impression material. For irreversible hydrocolloid 2-3 mm space is desirable. If light body silicone is to be used, a close fitting tray can be fabricated.

Tray materials

It is always desirable to use a rigid material to construct the custom tray. Chemically cured acrylic or light cured acrylic is suitable for this purpose. Light cured acrylic is difficult to trim and adjust. This further highlights the importance of planning the special tray dimensions accurately as necessary for the purpose. When a border molding technique is planned, use of thermoplastic materials is not desirable to fabricate a custom tray. However considering the cost effective nature, tray compound and shellac can be used to fabricate custom trays even though they are not ideal in terms of mechanical properties.

Use of muco-compressive impression technique enables recording the details of the denture bearing area under pressure as during the function. Thus the dentures made using a cast obtained by a muco compressive impression exhibit better stability during function. This is desirable especially for highly resorbed mandibular ridges. Since the impression is recorded subjecting the tissues to loads, during function masticatory loads are distributed evenly leading to better tolerance of the denture by the patient. On the other hand if a mucostatic impression technique had been used tissues will be subjected to different amounts of pressure during function. This will lead to pain and discomfort during function.⁴

Thus, a muco-compressive impression material is recommended.

- ZnO-Euginol
- Admix-Mixture of impression compound and stick compound in 3:7 ratios.

Border Molding

Border molding enables accurate reproduction of the functional depth and width of the sulci enabling development of a peripheral seal. Since complete denture retention is dependent very much on developing a peripheral seal it is desirable to do this for all the cases whenever possible. However due to financial and time limitations it is recommended to carry out the border molding prior to definitive impressions at least in challenging cases where a retention problem is anticipated. If a border molding procedure is planned a special tray should be fabricated 2 mm short of tissue reflections. For molding the border either an incremental technique using stick compound or a one-step technique using silicone or poly ether putty can be used. Unless borders are adjusted to allow room for border molding material the benefits cannot be guaranteed.

Border molding-Incremental Technique

- Heat the green stick compound over the flame and adapt onto the tray periphery adding about 3cm at a time.
- Using Hanau torch melt green stick compound and temper it in warm water and insert into the patient's mouth.
- Perform gentle muscle trimming.
- Once the material is set, remove carefully from the patient's mouth and chill in cold water.
- Repeat the procedure right around the border in increments.
- Once the border molding is completed examine the tray for any sharp edge or rough area and correct it. Borders should exhibit smooth matt finish.
- After completing border molding, tray should be retentive and exhibit a good peripheral seal.
- Prepare the tray to secure the final impression by applying adhesive or making perforations.

One step Technique

- Prepare the tray as described above.
- Apply adhesive on the border and adapt border molding material right around the border
- Insert and carefully seat on the arch.
- Perform muscle trimming all at once.
- Once the material is set withdraw and check whether the border is smooth and rounded.
- Prepare the tray to secure the final impression by applying adhesive or making perforations.

Removable partial Dentures

Primary impressions

In order to record primary impressions, metal stock trays can be used. However in long edentulous spans it is best if the space between the tray and the mucosa can be modified using a rigid material like compound. This

enables to create an even space for the impression material. An elastic impression material will have to be used since presence of teeth creates undercuts which will lead to distortion of the impression while withdrawing. When making removable partial dentures for bounded saddles it is possible to pour the working cast using the impression obtained from a stock tray. Care should be taken to cast the impression immediately to minimize the dimensional changes.

Custom trays

Custom trays are recommended when large edentulous areas are present as in distal extension saddles. Spaced trays preferably made out of acrylic and an elastic impression material needs to be used.

E.g. Irreversible hydrocolloid-alginate

Regular Body silicone.

Border Molding has little merit since partial denture retention is dependent on mechanical factors as opposed to development of peripheral seal. However when tooth and mucosa supported dentures are fabricated border molding can be performed in distal extension saddle/s to record the functional width and depth of the sulci.

Fixed Prosthodontics

There are different techniques for making of the definitive impression in fixed prosthodontics. Commonly practiced techniques are described.

Putty-Wash Impression

This is a stock tray impression technique. There are two methods to make a putty wash impression

1. One step/ Single mix putty-wash impression
2. Two step/double mix putty wash impression.²

One step/ Single mix putty-wash impression

In this procedure both the materials (light body and putty) are used simultaneously. The putty material is loaded into the stock tray. The light body material is syringed around the tooth preparation. A full mouth impression is made using the loaded stock tray.²

Two step/double mix putty wash impression

In this procedure putty impression is made in a suitable stock tray and then the light body material is syringed over the putty impression and also over the tooth preparation. Space for the light body material is created by placing the polyethylene sheet as spacer before making putty impression or by scraping the material using a surgical blade or round bur.²

Advantages:

Metal stock trays are rigid, less susceptible to distortion and eliminates the time and cost of fabricating a custom tray.

Disadvantages:

More impression material is required and the thickness of impression material will be uneven, leading to uneven polymerization shrinkage.

Figure-3 Silicone putty and light body impression in a stock tray

Dual-Phase Impression:

Dual-Phase Impression is also called as “custom tray impression technique” or “lamine single impression technique”. The most accurate impression is usually achieved using heavy-body and light-body addition silicone in conjunction with a rigid custom tray. (Figure-4) However, these materials can also be used in a rigid stock tray. In this technique, the light body (wash type) material is laminated in a thin layer on the surface of the heavy body material and immediately positioned upon the preparation. The purpose of this lamination is to prevent the direct contact of the heavy body with the preparation surfaces, which may produce roughness of the cast surface. The heavy body material also drives the light body material into the gingival sulci preparation details without the use of a syringe, although a syringe is sometimes used for injecting light body into blind portions of the preparation.

Figure 4-Heavy and light body Poly ether impression in custom tray

Advantages:

Uniform thickness of the impression material can be achieved which minimizes the distortion due to the uneven polymerization shrinkage.

Disadvantages:

Construction of the custom tray is a time consuming procedure and the residual monomer from special tray may cause tissue irritation for some patients.

Mono-Phase Impression

The procedures for mono-phase impression are same as for the dual-phase impression except that medium-viscosity material is used both as the tray material and the syringe material. A medium viscosity (regular body) elastomeric impression material in a custom tray with 3mm spacer is used. The surface reproduction may not be as good as that of light body material in this technique. Also the medium viscosity material will show a greater amount of polymerization shrinkage than compared to that of heavy body materials because of the lesser amount of filler content.

Digital impression

With the techniques of computer-aided design and computer-aided manufacturing (CAD/CAM) being applied in the field of prosthodontics, a concept of intraoral digital impressions was put forward in the early 1980s. It has drawn comprehensive attention from dentists and has been used for dental prosthesis fabrication in a number of cases. This new digital impression technique is expected to bring about absolute digitization to the mode of prosthodontics.

CAD/CAM systems are composed of three major parts:

- a data acquisition unit, which collects the data from the region of the preparation teeth and neighboring structures and then converts them to virtual impressions (an optical impression is created at this moment directly or indirectly)
- a software for designing virtual restorations anchored in virtual impressions and setting up all the milling parameters
- A computerized milling device for manufacturing the restoration with solid blocks of the chosen restorative material.⁵

The intraoral digital impression technique aids the CAD/CAM process. As a relatively new technique, dental products fabricated with intraoral digital impressions have presented accuracy as compared with conventional impressions in both removable and fixed prosthodontics.

Conclusion

The accuracy as well as dimensional stability of an impression may be depending on the type of the material used, type of the tray selected, and the technique followed. Available evidence does not suggest superiority of one material or a technique over the other. With availability of various techniques and advancements the clinician has the freedom of choice based on evidence and clinical experience provided that those are based on sound fundamental prosthodontic principles.

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