IMPRESSION FOR CROWN AND BRIDGE WORK

Impression: is a negative reproduction or likeness of an object; from which, a positive reproduction (cast) could be obtained.

Objective of taking an impression:

Because it is neither possible nor desirable to make patterns for fixed prostheses directly in the mouth, an impression of the teeth and surrounding structures is necessary to obtain a cast. This cast is then used to make a restoration in the laboratory. To obtain the cast, an elastic impression material is placed in a tray that is inserted into the patient's mouth. When the material has set, it is removed from the patient's mouth. A suitable dental stone is then poured into the "negative" impression, and a positive likeness or working cast is obtained.

Requirements of an acceptable impression:-

1. An acceptable impression must be an exact record of all aspects of the prepared tooth. This means that it must include sufficient unprepared tooth structure immediately adjacent to the margins so that the restoration could be fabricated with proper contour by the laboratory technician.
2. All teeth in the dental arch and the soft tissues immediately surrounding the prepared tooth must be reproduced in the impression. This will allow the cast to be accurately articulated and contribute to proper contouring of the planned restoration.
3. The impression must be free of air bubbles, tears, thin spots, and other imperfections that might induce inaccuracy.

Requirements of an impression material:-

1. It should be ***elastic*** after its placement in the patient's mouth so that it can be removed from the undercut areas that exist on the external tooth surfaces adjacent to the prepared tooth without distortion or fracture.

2. It should have adequate *strength* to resist breakage or tearing on removal from the patient's mouth ***(adequate tear strength)***.

3. It should have adequate ***dimensional stability*** over temperature and humidity ranges normally found in clinical or laboratory procedures for a period long enough to permit the production of a cast or die.

4. It should have adequate ***accuracy*** for the production of the fine details so that it is an exact negative reproduction of the prepared and unprepared teeth.

5. It should be ***easy to use with the minimum of equipment.***

6. It should be ***free of toxic or irritating components***.

Classification of impression materials:

1. **Non-elastic impression materials:** (e.g. Impression compound, Impression plaster, Zinc-oxide eugenol paste).

These materials are not used routinely in crown and bridge work because when they set they become rigid, so upon removal from the undercut areas they will fracture.

2. Elastic impression materials:

a. Hydrocolloids (water-based systems):
-Reversible hydrocolloids (agar impression material).
-Irreversible hydrocolloids (alginate impression material).
b. Elastomers:
-Polysulfide impression material.
-Condensation silicone impression material.
-Polyether impression material.
-Addition silicone impression material.

❖ Condensation silicone impression material:

Chemical composition: The material is supplied as a *base* and an *accelerator* in a low consistency and putty-like consistency. The base is composed of a linear silicone called *polydimethylsiloxane* and fillers (either calcium carbonate or silica). The accelerator may be a liquid that consists of stannous octoate suspension and alkyl silicate, or it may be supplied as a paste by adding a thickening agent (Fig 1).

Fig. (1) Condensation silicone impression material

Advantages:

1. It is odorless and can be pigmented to virtually any shade.
2. It has relatively short setting time in the mouth (typically 6-8 minutes).
3. It is also less affected by high operatory temperatures and humidity.
4. its dimensional stability greater than that of reversible hydrocolloid.

Disadvantages:

1. The main disadvantage of condensation silicone is its poor wetting characteristics because it is extremely hydrophobic; therefore, the prepared teeth and gingival sulci must be completely free of moisture for a defect-free impression.
2. It has dimensional instability which is due to the mode of polymerization which is of condensation type which gives off ethyl alcohol as a by-product, whose evaporation from the set material causes dimensional contraction.
3. Pouring the impression made of condensation silicone without trapping air bubbles is more difficult than with other impression materials.

❖ **<u>Addition silicone impression material (poly vinylsiloxane):</u>**

The main difference between the addition silicone and the condensation silicone is that it has much greater dimensional stability than the condensation type as its polymerization reaction does not give off any by-product.

Chemical composition:

The material is also supplied as a two-paste system (*base* and *accelerator* or *catalyst*) in extra low, low, medium, heavy, and very heavy (putty) consistencies. The base paste consists of dimethylsiloxane with vinyl terminal groups, plus fillers. The accelerator (catalyst) also contains dimethylsiloxane with vinyl terminal groups, fillers, and platinum catalyst (Fig 2).

Fig. (2) Addition silicone impression material

Advantages:

1. It has high dimensional stability.
2. The set material is less rigid than polyether.

Disadvantages:

1. Like other materials, adverse tissue responses have been reported.
2. Setting inhibition by some brands of latex gloves.

Impression Techniques

1. Single mix technique (monophase technique).
2. Double mix technique.
3. Putty-wash technique.

1. Single mix technique

Most of the time, this technique is used when we have an impression material with single viscosity (such as the medium body consistency of polyether or addition silicone impression materials). This is because both materials are pseudoplastic materials and have the capacity for shear thinning. Pseudoplastic materials demonstrate a decreased viscosity when subjected to high shear rates such as occurs during mixing and syringing. When the medium viscosity material is forced through an impression syringe, the viscosity is reduced, whereas the viscosity of the same material residing in the tray is unaffected. In this manner, such materials can be used for syringing and for trays. In this technique, after mixing the material, part of the material is loaded in the tray and the remaining part is loaded in the impression syringe. i.e., the same mix of the material is used to load the tray and the syringe (Fig.3).

Fig.(3) The same mix of the material is used to load the tray and the syringe

The impression material is injected from the impression syringe around the preparation area starting with the most critical parts such as the finishing line, then

the prepared teeth and the other teeth in the dental arch. Then the special tray loaded with the impression material is inserted inside the patient's mouth and seated over the dental arch. After complete setting of the material, the impression tray is removed from the patient's mouth.

2. Double mix technique:

This technique is usually used with materials that have two viscosities (heavy and light bodies). We mix the heavy body and the light body at the same time. The light body is loaded in the syringe, while the heavy body is loaded in the tray. We start to inject the light body on the dental arch starting with the prepared tooth, and then the tray loaded with the heavy body is inserted inside the patient's mouth and seated over the dental arch. The pressure created by the heavy body after seating of the tray will cause a direct flow of the light body into the details of the preparation including the finishing line.

3. Putty-wash technique:

This technique requires the use of a high viscosity material. We take an impression with the heavy body either before or after tooth preparation:

-Before preparation: we take a preoperative impression with the heavy body only prior to tooth preparation, and after complete setting of the heavy body we remove the impression tray from the patient's mouth and leave it aside. Then we do tooth preparation. After completion of tooth preparation, we mix the light body and load it in the syringe and inject it over the preparation area. Then we reseat the impression tray inside the patient's mouth and wait for the complete setting of the light body.

-After preparation: in this technique, after mixing of the heavy body and loading it in the tray, a spacer made of polyethylene is placed over the heavy body and the tray is inserted inside the patient's mouth. After complete setting of the heavy body, the tray is removed and the spacer is removed. The light body is then mixed and part of it is loaded in the syringe and the other part loaded in the tray over the heavy body. Then the light body is injected over the whole dental arch starting from the area of tooth preparation, and the tray is reseated inside the patient's mouth. After complete setting of the light body, the tray is removed from the patient's mouth.

This technique was developed for condensation silicones to minimize the effects of dimensional changes during polymerization. Most of the shrinkage during polymerization takes place in the putty material when the preliminary impression is made, confining final shrinkage to the thin wash portion of the impression.

Impression for post crown:

In case of post crown, we need to take an impression for the inside of the root canal. Most of the time, it is difficult to insert the impression material inside the tiny root canal, and even when it is inserted inside the canal it might tear during removal or become distorted during pouring of the impression. Therefore, the impression material needs a type of reinforcement. Such reinforcement could be obtained either by the use of a plastic post (impression post) or by using a stainless steel wire. After injection of the light body inside the root canal, the impression post or the stainless steel wire is inserted inside the canal. This will support the impression material and prevents its tearing or distortion during removal of the impression Fig (4).

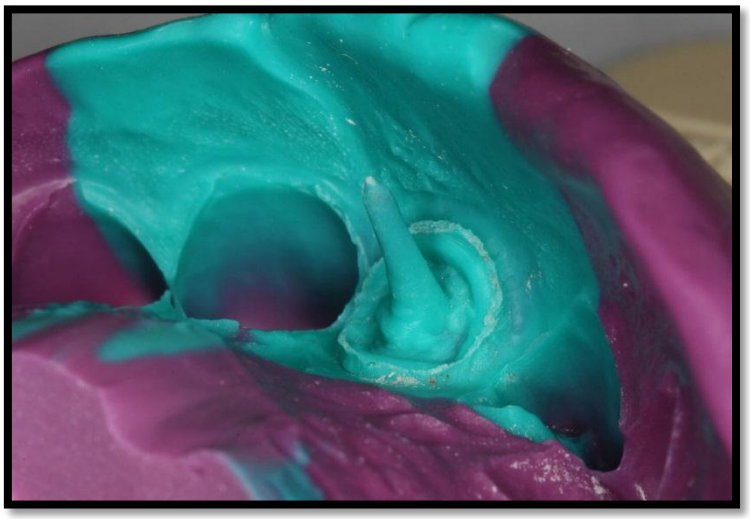

Fig.(4) An impression for the post crown with the plastic post (impression post) recording the inside of the canal.

NOTE: In general after removal of the impression from the patient's mouth, it should be inspected for the following:

1) The finishing line should be continuous all around the prepared tooth.
2) No air bubbles should be present at the area of tooth preparation.
3) The impression material should be attached well to the impression tray.

Digital impression:

It represents the most recent development in Dentistry. The basics of digital impression start with capturing an image of the prepared teeth. This system uses an intra-oral camera (scanner) to capture the desired image (optical impression). This image is then electronically transferred to a manufacturing facility which fabricates a working, articulated model. On this model, a multitude of different restorations can be designed (crowns, bridges, inlays/onlays, and veneers) with a special computer software, which is connected with a milling machine. This procedure is termed CAD-CAM (Computer Aided Designing - Computer Aided Manufacturing).

Advantages of digital impression:

1. Digital impressions eliminate the uncomfortable experience of making a physical impression
2. The image on the monitor shows you if you have captured all the needed details before sending it to the lab.
3. The accuracy of the impression allows the laboratory technician to fabricate a final restoration that has excellent marginal fit and incredibly accurate occlusion.
4. The ability to see if proper occlusal reduction has been achieved.

Fig.(5)Digital impression with CAD/CAM system