Impression materials and techniques for cobalt-chromium RPD

Impression:
A negative likeness or copy in reverse of the surface of an object; an imprint of the teeth and adjacent structures for use in dentistry.
Primary impression:
A negative likeness made for the purpose of diagnosis, treatment planning, or the fabrication of a tray.
Secondary, final or definitive impression:
An imprint that records the entire functional denture bearing area to ensure maximum support, retention and stability for the denture during use.

Techniques for Taking Impression

Impressions can also be described as mucostatic or mucocompressive, being defined both by the impression material used and the type of impression tray used (i.e. spaced or closely adapted). Mucostatic means that the impression is taken with the mucosa in its normal resting position. These impressions will generally lead to a denture which has a good fit during rest, but during chewing, the denture will tend to pivot around incompressible areas (e.g. torus palatinus) and dig into compressible areas. Mucocompressive means that the impression is taken when the mucosa is subject to compression. These impressions will generally lead to a denture that is most stable during function but not at rest. Dentures are at rest most of the time, so it could be argued that mucostatic impressions make better dentures, however in reality it is likely that tissue adaption to the presence of either a denture made with a mucostatic or a mucocompressive technique make little difference between the two in the long term. Another type of impression technique is selective pressure technique in which stress bearing areas are compressed and stress relief areas are relived such that both the advantages of mucostatic and mucocompressive techniques are achieved.

Special techniques

- "Wash impression"- this is a very thin layer of low viscosity impression material which is used to record fine details. Usually it is the second stage, where the runny impression material is used after an initial impression taken with a more viscous material.
- Two phase one stage: the putty and low body weight impression materials are inserted to the mouth at once.

- Two phase two stage: first the putty is sets in the moth than low body weigh material is added on the top of ready impression and inserted to the mouth to get the final accurate impression
- Functional impression (also known as secondary impression)
- Neutral zone impression
- Window technique
- Altered cast technique
- Applegate technique

Impression material

Impression materials can be considered as follows:

1- Rigid

- Plaster of Paris (Impression Plaster)
- Impression compound
- Zinc-Oxide Eugenol plaster
- Impression Waxes

2- Elastic

- **Hydrocolloid**

Hydrocolloids are further classed as reversible or irreversible.

- ✓ Reversible - Agar
- ✓ Irreversible - Alginate

- **Elastomeric**

Examples of elastomeric impression materials include

- ✓ Polysulfides
- ✓ Polyethers
- ✓ Silicon are further classed as additional silicone, and condensation silicone

Irreversible hydrocolloid (Alginate)

1. Irreversible hydrocolloids are used for making diagnostic casts, orthodontic treatment casts, and master casts for removable partial denture.
2. Dimensionally unstable, it can be used in presence of moisture (hydrophilic).
3. A pleasant taste and odor; and are nontoxic, no staining.
4. These material have allow strength provide less surface details than other material

Important precautions to be observed in the handling of hydrocolloid impressions:

1. Impression should not be exposed to air because some dehydration will inevitably occur and result in shrinkage.
2. Impression should not be immersed in water or disinfectants, because some imbibitions will inevitably result, with an accompanying expansion.
3. Impression should be protected from dehydration by placing it in a humid atmosphere or wrapping it in a damp paper towel until a cast can be poured. To prevent volume change, this should be done within 15 minutes after removal of the impression from the mouth
4. Exudates from hydrocolloid have a retarding effect on the chemical reaction of gypsum products and results in a chalky cast surface. This can be prevented by pouring the cast immediately or by first immersing the impression in a solution of accelerator, if an accelerator is not included in the formula.
5. Gelation reaction takes place next to the tissues and any movement of the tray during setting will result in internal stresses that will cause impression distortion.

Steps in impression making

a. Position of patient & dentist (Dentist should stand & patient should sit upright)
b. Tray selection
c. Mixing the material & loading into the tray
d. Impression making & removal
e. Inspecting, cleaning & disinfecting the impression

- Occlusal plane should be parallel to the floor
- MAXILLARY IMPRESSION- dentist should stand at the right rear of the patient
- MANDIBULAR IMPRESSION- dentist should stand at the right front of the patient

Impression tray selection

Stock trays for dentulous & partially edentulous arches are of different types: Rimlock trays, perforated metal trays, Plastic disposable trays, non-perforated tray with adhesive

The step-by-step procedure and important points to observe in the making of a hydrocolloid impression are as follows:

1. Select a suitable, sterilized, perforated or rim-lock impression tray that is large enough to provide a 2- 4 to -mm thickness of the impression material between the teeth and tissues and the tray.
2. Build up the palatal portion of the maxillary impression tray with wax or modeling plastic to ensure even distribution of the impression material and to prevent the material from slumping away from the palatal surface. At this time, it is also helpful to pack the palate with gauze that has been sprayed with a topical anesthetic. This will serve to anesthetize the minor salivary glands and mucous glands of the palate and thus prevent secretions as a response to smell or taste or to the physical presence of the impression material. If gelation occurs next to the tissues while the deeper portion is still fluid, a distorted impression of the palate may result, which cannot be detected in the finished impression. This may result in the major connector of the finished casting not being in contact with the underlying tissues. The maxillary tray frequently has to be extended posteriorly to include the tuberosities and the vibrating line region of the palate. Such an extension also aids in correctly orienting the tray in the patient's mouth when the impression is made.

3. The lingual flange of the mandibular tray may need to be lengthened with wax in the retromylohyoid area or to be extended posteriorly, but it rarely ever needs to be lengthened elsewhere. Wax may need to be added inside the distolingual flange to prevent the tissues of the floor of the mouth from rising inside the tray.

4. Place the patient in an upright position, with the arch to be impressed nearly parallel to the floor.

5. When irreversible hydrocolloid is used, place the measured amount of water (at 70°F) in a clean, dry, rubber mixing bowl (600-mL capacity). Add the correct

measure of powder. Spatula move rapidly against the side of the bowl with a short, stiff spatula. This should be accomplished in less than 1 minute. The patient should rinse his or her mouth with cool water to eliminate excess saliva while the impression material is being mixed and the tray is being loaded.

6. In placing the material in the tray, avoid entrapping air. Have the first layer of material lock through the perforations of the tray or rim-lock to prevent any possible dislodgment after gelation.

7. After loading the tray, remove the gauze with the topical anesthetic and quickly place (rub) some of the impression material on any critical areas using your finger (areas such as rest preparations and abutment teeth). If a maxillary impression is being made, place the material in the highest aspect of the palate and over the rugae.

8. Use a mouth mirror or index finger to retract the cheek on the side away from you as the tray is rotated into the mouth from the near side.

9. Seat the tray first on the side away from you, next on the anterior area, while reflecting the lip, and then on the near side, with the mouth mirror or finger for cheek retraction. Finally, make sure that the lip is draping naturally over the tray.

10. Be careful not to seat the tray too deeply, leaving room for a thickness of material over the occlusal and incisal surfaces.

11. Hold the tray immobile for 3 minutes with light finger pressure over the left and right premolar areas. To avoid internal stresses in the finished impression, do not allow the tray to move during gelation. Any movement of the tray during gelation will produce an inaccurate impression. If, for example, you allow the patient or the assistant to hold the tray in position at any time during the impression procedure, some movement of the tray will be inevitable during the transfer and the impression will probably be inaccurate. Do not remove the impression from the mouth until the impression material has completely set.

12. After releasing the surface tension, remove the impression quickly in line with the long axis of the teeth to avoid tearing or other distortion.

13. Rinse the impression free of saliva with slurry water, or dust it with plaster, and rinse gently; then examine it critically. Spray the impression thoroughly with a suitable disinfectant and cover it immediately with a damp paper towel. A cast should be poured immediately into a disinfected hydrocolloid impression to avoid dimensional changes and syneresis. Circumstances often necessitate some delay, but this time lapse should be kept to a minimum. A delay of 15minutes will satisfy the disinfection requirements and should not be deleterious if the impression is kept in a humid atmosphere

Step-by-step procedure for making a stone cast from a hydrocolloid impression

The step-by-step procedure for making a stone cast from the_impression is as follows:

1. A more abrasive-resistant type IV stone should be used to form removable partial denture casts. Have the measured dental stone at hand, along with the designated quantity of room temperature water, as recommended by the manufacturer. A clean 600-mL rubber mixing bowl, a stiff spatula, and a vibrator complete the preparations. A No. 7 spatula also should be within reach.

2. First, pour the measure of water into the mixing bowl and then add the measure of stone. Spatulate thoroughly for 1 minute, remembering that a weak and porous stone cast may result from insufficient spatulation. Mechanical spatulation under vacuum is preferred. After any spatulation other than in a vacuum, place the mixing bowl on the vibrator and knead the material to permit the escape of any trapped air.

3. After removing the impression from the damp towel, gently shake out surplus moisture and hold the impression over the vibrator, impression side up, with only the handle of the tray contacting the vibrator. The impression material must not be placed in contact with the vibrator because of possible distortion of the impression.

4. With a small spatula, add the first cast material to the distal area away from you. Allow this first material to be vibrated around the arch from tooth to tooth toward the anterior part of the impression. Continue to add small increments of material at this same distal area, with each portion of added stone pushing the mass ahead of it. This avoids the entrapment of air. The weight of the material causes any excess water to be pushed around the arch and to be expelled ultimately at the opposite

end of the impression. Discard this fluid material. When the impressions of all teeth have been filled, continue to add artificial stone in larger portions until the impression is completely filled.

5. The filled impression should be placed so that its weight does not distort the hydocolloid impression material. The base of the cast can be completed with the same mix of stone. The base of the cast should be 16 to 18 mm at its thinnest portion and should be extended beyond the borders of the impression so that buccal, labial, and lingual borders will be recorded correctly in the finished cast. A distorted cast may result from an inverted impression.

6. As soon as the cast material has developed sufficient body, trim the excess from the sides of the cast. Wrap the impression and cast in a wet paper towel, or place it in a humidor, until the initial set of the stone has taken place. The impression is thus prevented from losing water by evaporation, which might deprive the cast material of sufficient water for crystallization. Chalky cast surfaces around the teeth are often the result of the hydrocolloid's acting as a sponge and robbing the cast material of its necessary water for crystallization.

7. After the cast and impression have been in the humid atmosphere for 30 minutes, separate the impression from the cast. Thirty minutes is sufficient for initial setting. Any stone that interferes with separation from the tray must be trimmed away with a knife.

8. Clean the impression tray immediately while the used impression material is still elastic.

9. Trimming of the cast should be deferred until final setting has occurred. The sides of the cast then may be trimmed to be parallel, and any blebs or defects resulting from air bubbles in the impression may be removed. Master casts and other working casts are ordinarily trimmed only to remove excess stone.

Possible causes of an inaccurate and/or a weak cast of a dental arch

The possible causes of an inaccurate cast are as follows:

1. Distortion of the hydrocolloid impression (a) by use of an impression tray that is not rigid; (b) by partial dislodgment from the tray; (c) by shrinkage caused by

dehydration;(d) by expansion caused by imbibition (this will be toward the teeth and will result in an undersized rather than oversized cast); and (e) by attempting to pour the cast with stone that has already begun to set.

2. A ratio of water to powder that is too high. Although this may not cause volumetric changes in the size of the cast, it will result in a weak cast.

3. Improper mixing. This also results in a weak cast or one with a chalky surface.

4. Trapping of air, either in the mix or in pouring, because of insufficient vibration.

5. Soft or chalky cast surface that results from the retarding action of the hydrocolloid or the absorption of necessary water for crystallization by the dehydrating hydrocolloid.

6. Premature separation of the cast from the impression.

7. Failure to separate the cast from the impression for an extended period.

Technique used for individual impression trays:-

1. Outline the extent of the tray on the cast with a pencil. The tray must include all teeth and tissues that will be involved in the removable partial denture.

2. Adapt one layer of baseplate wax over the tissue surfaces and two layers over the teeth of the cast to serve as a spacer for impression material. The wax spacer should be trimmed 2 to 3 mm short of the outline drawn on the diagnostic cast. Wax covering the posterior palatal seal area should be removed so that intimate contact of the tray and tissue in this region may serve as an aid in correctly orienting the tray when the impression is made. Expose portions of the incisal edges of the central incisors to serve as anterior stops when placing the tray in the mouth. Bevel the wax so that the completed tray will have a guiding incline that will help position the tray on the anterior stop. Other cast undercuts should be blocked out with wax or modeling compound.

Adapt an additional layer of baseplate wax over the teeth if the impression is to be made in irreversible hydrocolloid. This step is not necessary if the choice of impression material is a rubber-base or silicone type of material.

3. Paint the exposed surfaces of the cast that may be contacted by the light polymerized resin tray material with a model release agent (separating medium) to facilitate separation of the polymerized tray from the cast.

4. Remove the visible light cure tray material from the light-proof pouch and carefully cut the desired length with a knife or scalpel. Adapt the visible light cure material to the cast and trim it with a knife. Be sure not to thin the material over the teeth or the posterior border area.

5. Attach a handle by molding excess visible light cure material into the desired shape and blend it into the tray material in the cast. With some materials, a paper clip or similar wire may be shaped and used to reinforce the handle. Alternatively, some manufacturers make prefabricated metal custom tray handles that may be easily adapted. Place the cast with the adapted tray in the light polymerizing and process according to the manufacturer's directions usually a maximum of 1 minute.

7. Remove the cast from the unit and gently remove the tray from the cast. Peel the softened wax out of the tray while the wax is still warm.

8. Paint the entire impression tray with the manufacturer's air barrier coating material and return the tray to the unit turnstile for additional polymerizing, tissue side up.

9. When the polymerizing cycle is completed, remove the tray from the unit and clean it with a brush and water.

10. Perfect the borders of the tray with rotary instruments (vulcanite burs, acrylic-resin trimmers, etc.), and slightly polish the external surface of the tray.

11. Place perforations (No. 8 bur size) in the visible light cure resin tray at 5-mm intervals, with the exception of the alveolar groove areas, if an irreversible hydrocolloid impression material is to be used.

12. The finished tray must be sanitized and tried in the mouth so that any necessary corrections to the tray can be accomplished before the impression is made.

Secondary impression (same as that for diagnostic impression).

In this procedure paint or inject impression material in critical areas:

- Rest preparation
- Hard palate
- Peripheral extensions