



MODIFICATIONS IN IMPRESSION TRAYS -A REVIEW

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ABSTRACT

A Impression tray is a device use to carry,confine and control the impression material from the patient's mouth.During impression making the tray facilitate insertion and removal of impression material from the patient's mouth.Several classification have been documented to classify impression trays of which it is classified as stock and custom tray based on the manufacturing of trays . a stock tray is a preformed tray which will be available metallic and stainless steel whereas a custom tray is customized for every patient using acrylic denture material. In this journal we described modification of impression trays under the influence of several factors and conditions like flabby ridge, microstomia etc.. and methods supporting their modification.

KEYWORDS : Flabby ridge,microstomia,flat ridge,implant impression,selfcure,lightcure,stock tray,custom tray.

INTRODUCTION :

Accurate impression is fundamental to the practise of prosthodontics. Dental clinicians should make careful assessment of the tissues to be recorded in the impression , type of impression material, impression trays and the techniques to be used¹.Impression tray is a device used to carry confine and control the impression material from the patient's mouth. Based on the method of fabrication , impression trays are classified into stock tray and custom tray. Retention, stability and support are considered the most important factors for the clinical success of both removable partial denture as well as complete denture prosthesis².For the individuals with severe bone resorption or flat ridge , it is difficult to obtain retention and stability. Therefore modification on impression trays play a major role in prevention of excessive pressure and distortion on abnormal tissues².Residual ridge atrophy is defined as a wasting process in response to change in applied forces. This results in bone remodelling with changes in inner architecture and external configuration³.Modifications of impression trays were introduced based on the conditions such as flabby ridge, microstomia, restricted mouth opening, mobile tooth. The aim of this article is to review the modifications in both stock tray as well as custom tray.

Classification Based On Conditions:
Modifications Of Impression Trays

Modifications In Stock Tray:

1. Completely edentulous
2. Flabby ridge
3. Microstomia

Custom Tray:

1. Flabby Ridge
2. Restricted mouth opening

3. Microstomia
4. Implant impressions

Thermoplastic Stock Tray For Completely Edentulous Patients:

Disadvantage of the stainless steel tray is difficulty in dimensional stability. Herein Stainless steel stock trays are used as a base for primary impression. The main proposed an original technique of a thermoplastic stock tray with built in tissue stoppers and spacer design that can be adapted to patients edentulous arch, for further peripheral tracing and master impression. The main property of the thermoplastic material is its ability to be moulded with temperature. The steps involved in fabrication of thermoplastic stock tray includes⁵

1. Construct a dental stone casts from a standard size maxilla and mandibular stock tray⁴.
2. Place tissue stoppers with spacers using modelling wax on the dental cast based on the Boucher's design⁴.
3. Methyl methacrylate monomer liquid and polymer powder are mixed together and the mixture is allowed to reach dough stage⁵.
4. The mixture is placed into a mold to the desired structure of the tray⁵.
5. Then the mould is heated for sufficient time under pressure to polymerize the monomer(above 135°F)it will become soft enough so that it can be placed into patients mouth⁵.
6. Adapt the prefabricated thermoplastic tray at a temperature of 45°C to the patients edentulous arches and cool the tray in water bath at room temperature⁴.
7. Trim the trays 2mm short of the sulcus to accommodate for peripheral tracing of modelling compound⁴.
8. Follow the conventional procedure of peripheral tracing and master impression with elastomeric or zinc oxide eugenol impression paste⁴.

The uniqueness of this impression technique using this tray, is the idea to incorporate the philosophy of selective pressure technique in the prefabricated thermoplastic stock tray. This will enable the dentist to select the prefabricated trays with tray design based on examination and diagnosis of the patient's mucosal and ridge condition. The advantage of this tray is reduced appointment time and material cost compared to conventional procedure⁴.

Stock Tray For Flabby Ridge:

A highly displaceable flabby ridge may affect the recording of morphological features during impression making. The displaced flabby tissues tend to return to their original form. Prosthetic management of flabby ridge may be achieved by proper recording of affected tissues and by ensuring stable occlusal contacts.

The etiological factors for the development of flabby ridges may be caused due to factors along with atrophy and ridge resorption. Other cause for flabby ridge formation, include parafunctional habits with intensifying damaging forces on the residual ridge, combination syndrome, and nutritional deficiencies. Ill-fitting removable prostheses have also been as a risk factor for flabby ridges. This is common to the anterior maxillary arch region, which has a centripetal pattern of ridge resorption. The maxillary anterior region is weak in resisting stress. Loss of bony support with fibrous replacement in the affected maxillary anterior ridge's mucosal layer, and a highly displaceable residual ridge may be observed on clinical examination³.

Steps involved in fabrication of stock tray for flabby ridge are as follows:

1. Preliminary impression procedure :
 - a) A diagnostic impression of the edentulous arch were made with irreversible hydrocolloid.
 - b) The displaceable ridge area was demarcated with an pencil; the markings were transferred to the diagnostic impression and subsequently to the diagnostic cast.
 - c) An appropriate metal stock tray were selected, adapted, and modified for the preliminary cast, ensuring sufficient space for the impression material.
 - d) The area of the stock tray corresponding to the marked flabby ridge area on the diagnostic cast were removed, and a window were formed by using metal trimming burs.
 - e) The modified stock tray were tried in the patient's mouth; if changes required, further modifications were made.
 - f) The tray adhesive (cyanoacrylate) were applied to the intaglio surface of the modified stock tray
 - g) Condensation silicone rubber base impression material was mixed and loaded onto the stock tray, leaving the window area uncovered
 - h) The loaded stock tray were then placed in the patient's mouth, and border molding were done
 - i) The molded impression material were then allowed to set. The excess silicone impression material that flowed into the window area of the stock tray were trimmed by means of silicone burs
 - j) The impression were re-seated in the patient's mouth, and accuracy of seating were confirmed
 - k) Condensation silicone impression material were mixed and gently painted onto the flabby ridge area by means of a painting brush
 - l) The preliminary impression thus obtained was poured into Type II dental stone (Denstone).
 - m). Then final impression were made using costum tray.

Stock Tray For Microstomic Patients:

Microstomia is defined as a reduction in the size of oral aperture. It may be acquired or congenital. The most common cause for acquired microstomia is electrical, thermal, or chemical burns. The most common cause for congenital microstomia are rare genetic diseases such as

Freeman–Sheldon syndrome, otocephaly, and dystrophic epidermolysis bullosa. The most common rheumatic disease associated with microstomia is systemic sclerosis.

The clinical features include limited oral opening due to surgical treatment of orofacial cancers, cleft lips, trauma, burns, Plummer–Vinson syndrome, or scleroderma⁶.

Steps involved in fabrication of stock tray for microstomia patients are as follows:

1. In some cases the mouth opening is so limited even the smallest sock tray placement into the mouth is not feasible.
2. Calliper is used in this kind of cases to measure the arch width of the ridge. This helps in selection of impression tray corresponding to this width. Plaster is poured into the selected tray to form a matrix.
3. Impression tray were removed and reinserted on to this matrix to ensure that the tray fits on the matrix same way each time.
4. The plastic tray was cut in two sections with a disc with handle as a larger section.
5. Three building blocks were selected, one 32 mm – 8 mm – 3 mm and two 16 mm – 8 mm – 3 mm to re-approximate
6. Sectional tray as one unit. The two shorter blocks were fit together under the longer block.
7. Based on whether the patient is dentulous or edentulous, polyether or zinc oxide-Eugenol paste was used to make impressions.
8. For the larger section tray, impression of two thirds of the arch was made and the impression was removed from the mouth, allowed to set and trimmed using surgical blade
9. Petroleum jelly was spread on the cut surface and impression then place the impression back in the patients mouth to seat firmly.
10. The second tray with impression material is positioned intra orally .
11. Smaller tray section is disassembled and removed from the mouth first then followed by removal of larger section.
12. Mc Cord et al. have proposed a technique where in Impression plaster was poured onto the tissue surface of the patient's previous denture (constructed before microstomia) and a cast obtained on which special tray can be constructed.
13. Procedures have been introduced in which putty silicone was used as flexible tray washed with light Body silicone for more details.
14. The resultant preliminary casts used for diagnostic purpose and for making rigid sectional trays for final impressions
15. Dhanasomboon and Kiatsiroj used dental stone which was poured directly in to one half of the first sectional impression made, the second sectional impression which was made was later approximated with first impression section and stone was poured into the second half.
16. Stock tray is modified by trimming upto the flange lengths.
17. Baker Et al, also designed custom tray to fit precisely and incorporated a locking mechanism which could be easily separated in the mouth and could be reassembled accurately after completion of impression procedure
18. Cura et al, proposed that putty-type impression material can be manually dispensed intraorally to serve as custom trays to make diagnostic maxillary and mandibular impressions.
19. The impression putty is placed onto the denture bearing areas, then the impression material was border moulded.
20. Then the impression putty custom tray was removed after the material polymerized.
21. Impression material was loaded onto the silicone custom trays and then inserted intraorally.
22. The diagnostic impressions then removed after the impression material is fully polymerized.⁶

Custom Tray For Flabby Ridge :

Flabby ridge is an excessive movable fibrous tissue which usually affects maxillary and mandibular edentulous ridges. It usually occurs in long term denture wearers and when natural teeth oppose an edentulous ridge⁷.

Flabby ridges require special considerations during prosthetic management, particularly when natural dentations remain on the opposite side⁸.

A custom double tray using the principle of the window technique can be fabricated for this condition. The gap between the double trays allows mucostatic impressions of flabby ridge tissue to be taken in accuracy⁸.

Technique :

1. A preliminary impression should be made with alginate material using edentulous plastic stock trays.
2. Preliminary cast should be poured and then the flabby ridge area should be identified on the cast.
3. The custom double tray should be fabricated as follows :
4. The borders of the tray should be determined to be 2 mm less than the depth of the
5. The flabby ridge area should be marked on the cast.
6. A wax sheet should be applied to the cast to create a custom tray spacer with stoppers.
7. Self-cured acrylic resin tray material should be applied to cover the maxillary cast except in the area of the flabby ridge, and a horizontal handle should be inserted in the palatal vault area to act as a key for the second tray.
8. A double sheet of base plate wax should be applied at the flabby ridge area.
9. The second tray should be constructed to cover the flabby ridge area and palatal area of the first tray. It was adapted to create a keyway with the handle of the 1st tray (Key).
10. Perforations should be made on the custom double tray for mechanical retention of the impression material and to allow the escape of excess impression material.
11. The custom impression tray should be tested in the patient's mouth, and the tray flanges should be adjusted to be 2 mm shorter than the depth of the sulcus using a slow-speed motor and carbide acrylic trimming bur.
12. Border molding should be done to the first part of the tray using the elastomeric impression material (heavy body). Then, a maxillary impression was made using elastomeric impression material (light body). The light body elastomeric impression material should be mixed using dynamic mechanical mixing.
13. The impression should be evaluated carefully for defects, and any excess material on the periphery should be removed.
14. The impression should be placed again in the patient's mouth.
15. The second custom tray was applied using the key/keyway method with the first tray.
16. The light body elastomeric impression material should be injected through the gap present between the first and second trays until some excess material leaked from the holes.
17. A master cast should be poured from the master impression (by using boxing and pouring), and a record block should be fabricated for the maxillomandibular relationship record.
18. After try in and processing, the denture can be inserted intraorally and the patient can be given instruction for use and home care of the prosthesis.
19. Follow-up was done at 3 and 6 months⁸.
20. Customized prefabricated metal mesh custom tray impression technique is the another technique for flabby ridges⁹.
21. Metal mesh will acts as standard approach to create multiple escape holes in providing relief, and it will acts as

a scaffold for supporting the impression material while setting and pouring the cast⁹.

Custom Tray For Restricted Mouth Opening :

Restricted mouth opening is commonly associated with orofacial cancer surgeries, scleroderma, traumatic injuries, temporomandibular joint disorders, oral submucous fibrosis. One of the most commonly occurring pathologies associated with limited mouth opening is oral submucous fibrosis¹⁰.

Difficulties in impression making will be encountered due to reduced access to the oral cavity can be overcome by the use of sectional trays¹⁰. A sectional custom tray helps in overcoming these difficulties and facilitate in obtaining an accurate impression¹¹.

Technique :

1. Primary impression should be made with elastomeric impression using small size 0 stock tray
2. Cast should be made by pouring plaster of paris
3. The spacer should be adapted with four tissue stops and special trays should be fabricated using self cure acrylic resin.
4. Impression compound should be softened and adapted over the handle of special tray which acts as an anterior lock.
5. Special trays should be sectioned into right and left halves for both maxillary and mandibular arch.
6. Two halves should be joined with acrylic resin block with snap fit pins as posterior and anterior lock.
7. Border moulding should be carried out separately for both the halves.
8. Final impression should be made by loading with monophasic impression material for both the halves, which should be placed into patient's mouth separately.
9. Then the two halves should be joined using anterior and posterior locks
10. After the material has been set, anterior lock should be removed and the snap fit pin should be loosened.
11. Special tray should be bent and removed in single piece from the patient's mouth¹².

Custom Tray For Microstomia Patients :

Microstomia is a condition in which patient will have small sized oral aperture. It can cause both functional impairment and cosmetic problems. It acquired or congenital. Acquired microstomia can be due to burns, physical or chemical trauma, head and neck radiotherapy, injury, surgical treatment of oral cancers, or clinical manifestation of systemic diseases like scleroderma¹³.

The custom sectional tray with interlocking type handle can be used for impression making in patients with microstomia¹³. The custom sectional tray with interlocking type handle gives better stability, ease of reassembling and disassembling, easy placement¹⁴.

Technique 1:

The handle should be designed in two parts which has a male and a female unit. The male and female units should be made with wax and lego blocks. Lego blocks should be attached to it such that they correctly interlock¹³.

Both the male and female units should be duplicated in inlay wax. Then they are invested and cast in a cobalt-chromium alloy.

The mandibular tray should be fabricated in two sections. Apply separating media to the cast and adapt wax spacer over it and section in the midline. The right half of the tray should be fabricated with auto-polymerized acrylic resin and attach the male unit of the handle in the anterior region of the tray. After completion of setting reaction, apply the separating

medium along the midline of the right half of the tray. The left half of the tray should be fabricated with auto-polymerized acrylic resin. The female unit of the handle should be attached to the left half of the tray, so that it correctly interlocks with the male unit of the handle¹³.

Same procedure should be carried out for the attachment of the handle for the maxillary tray together with the posterior lock. The tray should be checked intraorally for correct extensions. Border molding should be carried out for each half of the tray with low-fusing impression compound. Secondary impressions should be made with zinc oxide eugenol impression paste. Impression paste should be loaded into the right half of the tray and it should be inserted in the patient's mouth followed by the left half of the sectional tray with the impression paste. Once the impression material has been set, separate sectional trays intraorally and reassemble them externally.

Technique 2 :

The handle functions as an anterior lock and has two parts, the male and the female unit. The male unit consists of external and an internal flange which has an interconnecting isthmus, which is 2 mm short of the inferior portion of internal flange. The internal flange should be short of the inferior portion of external flange by 2 mm. A horizontal plate should connect the superior ends of both the flanges. The female unit consists of internal recess of which the terminal ends approximate the width of isthmus. The terminal ends will appear as a slot in the medial wall. This slot will be short of the inferior portion by 4 mm. Wax patterns should be fabricated with the above-mentioned designs and then invest, de-wax, and acrylize in autopolymerizing resin. These patterns can be cast with base metal alloy¹⁴.

Fabrication Of Maxillary Tray In Two Sections:

Apply separating media to the cast and adapt a wax spacer on to it. The spacer should be sectioned along the midline. The first half of the tray should be fabricated up to midline in autopolymerizing resin.

Keep the female unit of the handle in the anterior aspect of this half of the tray and female button in the posterior aspect.

Once it has been set, apply petroleum jelly along the midline over the first half of the tray, and fabricate the second tray segment with the male unit of the handle interlocked in the female unit.

The second segment should be extended 2 mm medially over the first segment along the midline to enable proper orientation of both the segments.

In the posterior aspect of the second segment, extend the acrylic plate medially over the first segment in which the male button is placed so that it interlocks the female button in the first segment¹⁴.

Custom Tray For Implant Impressions.

The impressions taken during implant procedures using custom tray is of two types

1. Self cure custom tray
2. Light cure custom tray

Self Cure Custom Tray.

Having a reference cast, a custom tray can be constructed using self cure materials. To construct it, five steps of which one will be placed on the anterior and two steps will be placed in either side of the arch which orient the correct placed of the tray. A wax spacer of 5mm will be adapted on the reference plane of the implant reference model. Now, the implant model along with the spacer is duplicated using putty impression

poured in die stone to obtain a duplicate cast so that the uniform thickness of the spacer will be ensured.

A self cure acrylic tray will be constructed on the duplicated cast with a uniform thickness of 2mm and placed on the pressure pot for 30 minutes so as to minimize the porosities and for better adaptation¹⁵.

Light Cure Custom Tray.

The light cure trays will be constructed in a similar manner by adapting the light cure sheet to the cast according to the manufacturer's instructions. The tray will be kept in the light curing unit for 5 minutes with the tray positioned on the cast. The tray will be removed from the cast and the impression surface is cured for better adaptation. Four windows should be drilled in the trays corresponding to the implant sites to allow access to the coping screws for the open tray impression technique.

The individual self cure and light cure custom trays should be fabricated 24 hours prior to their use¹⁵.

Stock Tray For Implant Impressions.

A non perforated plastic and metal trays will be used for the completely edentulous impressions. The sample impressions were made using a single tray. Similar to the custom trays, four windows should be drilled on the tray to allow the coping screws to adapt in case of open impression technique¹⁵.

DISCUSSION:

This review of impression techniques has gathered information regarding most of the possible designs for construction of sectional trays for successful reproduction of accurate impressions in patients with limited mouth opening, completely edentulous, flabby ridge etc. Rehabilitation with conventional complete denture for microstomia patients is a challenging due to decreased perimeter of the oral cavity. Effective management of a patient with flabby ridge areas may include combination of more than one treatment modality, such as surgical removal of flabby tissue, implant-supported prosthesis, and conventional prosthodontic measures without surgical intervention. Surgical removal of flabby tissue is contraindicated where residual ridge support is meager

Custom tray with controlled minimally displacive impression technique not only can record flabby ridge and flat ridge in their differences of compressibility but also provide visual accessibility during final impression. One of the difficulties is placing trays intra orally in patients with microstomia which provides difficulties to the clinician. However, conservative treatment can be performed using modifications of the laboratory and clinical procedures. The common technique for such patients is the use of sectional impressions, instead of regular full-arch one-piece impressions.

CONCLUSION :-

The procedure of impression making, which serves as the first and foremost step of constructing every prosthesis should be performed by an experienced prosthodontist or a certified implantologist, despite of its impression technique.

The uses of both stock and custom tray has both the advantages and disadvantages. A prosthodontist should understand their properties so that they can make further modifications on the trays and make impressions which serves as the most important diagnostic tool in the career of an dentist

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