

Review Article

Restricted Mouth Opening - Impressions making

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Abstract: Prosthodontics starts with a good impression and a good impression always leads to a good prosthesis. An adequate mouth opening is mandatory for a good impression making. Restricted mouth opening is a relatively common dental condition that has a variety of causes such as Oral Submucous Fibrosis (OSMF), Microstomia (Surgically induced), Trismus, Haematoma formation following an inferior dental nerve block. The purpose of this paper is to describe the clinical management of a patient with microstomia, trismus, OSMF, etc. It deals mainly with fabrication of flexible trays, sectional trays, sectional dentures, sectional prosthesis and various other impression techniques that can be adopted for patients with restricted mouth opening in an attempt to restore the functions and esthetics of such patients.

Keywords: Complete denture, oral submucous fibrous, Impression.

INTRODUCTION

Fabrication of complete and partial dentures prosthesis require a detailed impression of the tissues and record of appropriate anatomic landmarks so an accurate diagnostic impression and diagnostic cast can be obtained, which is essential for the development of custom tray and final impressions. Even though stock trays come in various sizes and shapes, insertion of stock trays may not be possible in patients with limited oral opening. The total height of stock impression tray is approximately 1-1.5 cm, a laboratory modification stock acrylic impression tray may reduce its size and ease of insertion in oral cavity.

The purpose of this paper is to describe the clinical management of a patient with microstomia, trismus, OSMF, etc. It deals mainly with fabrication of flexible trays, sectional trays, sectional dentures, sectional prosthesis and various other impression techniques that can be adopted for patients with restricted mouth opening in an attempt to restore the functions and esthetics of such patients[1].

TYPE OF TRAYS:

A. A Sectional Stock Tray for Preliminary Impressions:

This can be used in patients with microstomia or constricted mouth opening. This system allows many combinations of right and left tray sizes and forms to be assembled into a well-fitted anatomically-

confirming tray in spite of individual anatomic discrepancies.

Quality diagnostic casts are critical for treatment planning. A stock tray fitted to the individual dental arch is usually adequate for this purpose. However, individual variables, such as the size of an existing dental arch, position of remaining teeth, and discrepancies in residual ridges caused by resorption, may cause difficulty in making an acceptable preliminary impression with a conventional stock tray. Additionally, it can be problematic to make an impression with a complete arch stock tray for patients with a constricted oral opening.

Recommended techniques for making preliminary impressions for patients with natural dentitions or constricted oral openings have included use of stock impression trays of each half of the mouth for sectional impressions with heavy and light body silicone impression materials, and flexible impression trays made with silicone putty[2]. Use of modeling plastic impression compound has been described for making sectional impressions of edentulous arches.

The mechanisms for connecting sectional custom trays have included hinges, plastic building blocks, orthodontic expansion screws, or locking levers. Individual trays, except for the horizontal locking system, were connected only at the handle.

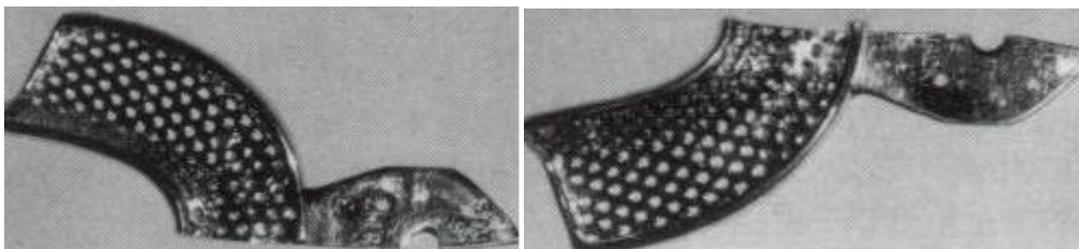


Fig. Mandibular Sectional Stock Tray

Use of sectional trays for making final impressions has resulted in problems during fabrication and placement of the prostheses. One problem encountered was impression deformation when the connecting strength of the midline joint was not adequate. Elastic impression materials (polyether, polyvinylsiloxane) are self-adherent and require intraoral mechanical separation when used in sectional placement. These materials are contraindicated when separate placement and removal is required, as for patients with microstomia. [3] However, dissimilar materials are non adherent, therefore separate halves of polyether and polyvinylsiloxane impression materials may be successfully inserted and removed. Irreversible hydrocolloid material is non adherent when one half arch tray is inserted and allowed to set and then the other half is inserted intraorally. After setting, both the halves are removed separately. This system is not yet commercially available.

Procedure

In case of complete denture cases

Select 5 sizes each of commercially available complete arch trays for the natural dentition, completely edentulous, and partially edentulous situations. Then, provide 4 dowel-plug-holes within close dimensions and a screw joint for a rigid connection. Make 4 holes in the handle of the tray with a precision drill and a hand reamer. Prepare a locking nut and screw. They were cut with a tap and dies after a stainless steel rod was shaped by use of a precision metal cutter. Provide 4 plugs (2.0 mm diameter) in the locking nut with electric arc welding performed at a precision machinery factory. After this each tray is divided into 2 halves, along the midline, by cutting with a wire cutting electric discharge machine, and manufacture 15 half arches in right and left versions. Then, select a right and left tray for each individual dental arch and position the 2 halves together; put the dowel plug on the head screw and place into the dowel hole of the handles with the screw tightened. Then, make the preliminary impression conventionally with irreversible hydrocolloid by use of the sectional stock tray.

First insert the first half of the tray with impression material in the mouth. After removing the impression from the mouth, cut the joint surface so that it is smooth along the midline. Then replace the first half of the impression in the same position in the arch. Petroleum jelly can be used as a separating medium to

separate the two halves. Insert the second half containing the hydrocolloid material so that it fits with the first half. Connect them rigidly with the screw lock system. Remove the 2 half impressions separately after unscrewing the handle because they are not adhered and reassemble the right and left impressions again with the handle and the discs outside the mouth. Pour dental stone into the impression conventionally. Remove the screw and withdraw the impression tray separately from the master cast, allowing easy removal of the anatomically confounding sections[4].

In case of removable partial denture formation

This procedure describes an alternative to the stock impression tray and discuss the procedures necessary for fabricating a removable partial denture (RPD) for a patient with restricted mouth opening.

A stock tray can be modified to make a satisfactory preliminary impression. Trimming the flange lengths and adding compound as necessary are often helpful. If a 1-piece tray cannot be used, then the stock tray may be cut in half and the halves approximated to form the preliminary cast. Practicality is the key to the successful preliminary impression procedure. The practitioner must make a preliminary impression that is accurate enough to fabricate the modified custom tray to be used for the final impression. Once the diagnostic cast has been surveyed and the mouth preparation completed to accommodate the desired design, the custom tray can be fabricated.

B. Custom Tray:

Essential landmarks required for the successful fabrication of a prosthesis must be identified. In a patient with restricted mouth opening, it is difficult to obtain the "perfect" impression that captures all possible anatomic details.

Priorities must be established according to the restorative and reconstructive needs of the individual patient.

It is more difficult to insert the tray than to remove it from the mouth. When the tray is placed in the mouth, the operator usually stretches one corner, making the oral opening still smaller. During removal, the orbicularis oris can be stretched beyond the limit of the patient's normal function. In this situation, the muscle's sphincteric shape allows the operator additional maneuverability.

The length of the flanges should be designed conservatively. In the laboratory, the tray is usually placed and removed from the cast in a vertical motion. In a mouth with limited opening, a more horizontal motion must be used. The clinical realities of the patient's limitations must be recognized during the design of the tray. [5] Because the tray is not used unloaded, flange length is increased when the impression material is introduced into the tray and the impression is made. The 2-piece tray should be designed so that it fits precisely and separates easily in the mouth. Any locking mechanism that serves to aid reassembling but limits separation should be avoided.

Procedure

Make a preliminary irreversible hydrocolloid impression by sectioning a stock disposable plastic tray, and inserting and removing it in sections. Pour cast in improved stone. Design the custom tray so that it fits precisely, and incorporates a locking mechanism that separates easily in the mouth and resembles accurately after the impression procedure is completed.

Outline landmarks essential to the design of the removable partial denture on the cast for coverage by the tray material. Use undercut blockout for all involved areas of the cast at this time. Incorporate space for the impression material and cutouts for occlusal/ incisal stops only for the first tray section at this time, with termination at the midline. Fabricate half of the custom tray using light-cured tray material on the duplicate cast. Align the handle and the labial, buccal and lingual segment edges in 1 plane at the midline to match easily with the second half. Place a knob on the inside of the handle that will later fit into an opening on the handle of the second tray half.

Make the horizontal locking component separately, then attach it. Lubricate the hinge opening of the horizontal latch, fill it with tray material, and join the added tray material to the superior surface of first tray half to form a nailhead to secure the horizontal locking component. To ensure proper hinge movement, manipulate the latch back and forth around the new material. Cure the resin for 2 minutes, and again check the locking component for mobility, at which point curing is completed[6].

After the first segment is completed, polish and lubricate (a precise fit is required). Wax spacer and stops are now placed for the final tray section. The second handle has a hole on its medial surface. No attempt is made to secure the locking mechanism at this point. The 2 halves should fit together and function as 1 unit with no visible space or movement.

Complete the horizontal locking mechanism. Lubricate the hooked area of the locking mechanism and fit the halves together. Add resin material to the

hook area and cure for 2 minutes. The locking mechanism must disengage at completion. Complete curing (The tray can now be used as a single unit or two individual halves).

Final Impression:

A medium or light viscosity elastomeric impression material is used to minimize errors due to manipulation distortion after setting. Make an impression with the first half of the tray. After removing it from the patient's mouth, trim the impression material so that it is flush with the medial edge of the tray.

For the parts of the impression tray or material that will contact the second half tray, lubricate them and reinsert the tray in the mouth. Load the second tray half with impression material and insert in the mouth. Squeeze together the 2 tray parts at the handle. After ensuring precise fit, engage the horizontal locking component and allow the impression material to set.

Unlock the tray and remove the parts individually. Resemble the tray outside the mouth; sticky wax or modeling plastic may be placed across the external tray component joints to stabilize the tray assembly.

Pour the cast in improved stone, confirm the removable partial denture (RPD) design and send to the laboratory for RPD fabrication[7].

C. Preliminary Impression in Patients with Microstomia:

Preliminary impression technique for edentulous patients with microstomia, stock impression trays can be modified to make sectional impressions for both right and left sides of the maxillary arch. The cast poured with the first impression is positioned in the second impression, which is then poured to make the diagnostic cast.

D. Technique for Making Flexible Impression Trays for Microstomic Patients:

A procedure for making a diagnostic cast with a non-rigid tray, using silicon putty impression material that can be inserted and molded in the mouth before it sets is described. The flexible nature of the silicon tray allows it to be easily inserted and removed.

The Materials used are Irreversible hydrocolloids, Reversible hydrocolloids, Elastomeric impression materials, Border Molding materials such as modeling plastic, vinyl polysiloxane and polyether. Elastomeric materials have advantage over impression compound, they include Ease of manipulation, Accurate placement onto the borders, Elimination of multiple insertion and removal of the border molded impression tray, Superior accuracy and elimination of H₂O bath.

This procedure describes making of a diagnostic cast with a nonrigid tray. The material consists of silicone putty that can be inserted and molded in the mouth before it sets. Because of its flexible nature, the silicone tray can be easily inserted and removed.

Technique

Mix putty material in a sufficient amount to cover all important anatomic regions of the arch. Add sufficient accelerator to reduce the setting time of the material to 1 minute. Plate the material into the patient's mouth and adapt to hard and soft tissues. Allow the material to set and quickly remove from the mouth. Fill the tray with injectable silicone material and repeat the procedure to obtain a more detailed impression. Stabilize the impression by placing it into a non-displacing mix of dental stone before it is boxed and poured. Evaluate the final product for suitability as a diagnostic cast and for making custom sectional trays for a final impression[8].

TYPES OF PROSTHESIS

(A). Mandibular Swinglock Complete Dentures for Patients with Microstomia:

Collapsible mandibular swing lock dentures is one of the treatment modality for patients with restricted mouth opening. This prosthesis incorporates a cast cobalt chromium framework with a lingual hinge and a conventional labial swing lock. This combination allows the prosthesis to be collapsible while maintaining structural durability. Advantages include ease of insertion and removal while providing maximum coverage for support, retention and stability.

The cause and severity of microstomia can influence the clinical approach to treatment. Different treatment methods have been suggested, including the fabrication of 2-piece complete dentures. This procedure describes the incorporation of acrylic resin dovetails to orient and secure a sectioned mandibular complete denture.

Procedure:

The mandibular ridge was divided into 3 segments for preliminary impressions. The right and left segments extended from the corresponding canine prominence to the retromolar area; the anterior segment covered the ridge from the right to left canine prominences. Modeling plastic impression compound shaped to correspond to the segments was used to obtain the segmental impressions, which were poured in plaster of Paris. Custom autopolymerizing acrylic trays were fabricated. Their handles, made of 1-mm stainless steel wire, were manipulated to permit placement and stabilization of each tray on the corresponding segment within the available space.

Before the impressions were made, the segments were evaluated for extension and adaptation, and the proximal ends of the lateral sections were

evaluated for interferences with the middle segment tray. Any interference was corrected before additional steps were performed. Modeling plastic impression compound was used to correct the relation of the tray borders to the peripheral tissues and vestibular depth. Light-bodied vinyl polysiloxane was used to make the final impression after the patient rinsed mouth with a sodium bicarbonate solution to reduce the effect of the mucin on the impression. The 3 tray sections were placed in the mouth, and soft modeling compound was used to index and stabilize the segments.

After the impressions were made, the modeling compound was chilled and removed. The impression tray segments then were removed and reassembled, fixed together (with the modeling compound index), boxed, and poured in stone. On the resulting cast, 2 individual sectional trays were fabricated with autopolymerizing acrylic resin, and new zinc-oxide eugenol impressions were made to correct any defects in the previous impression. The 2 sections were stabilized and indexed in the patient's mouth with modeling plastic impression compound. On the final working cast, 2 layers of wax were adapted to each side of the arch up to the midline, where they were separated from each other by 2mm. The cast was flaked, wax was eliminated, and the cast was packed with acrylic resin and polymerized with heat activation (heat cured bases). The 2 denture bases were recovered, finished, and evaluated intraorally for retention, stability and adaptation. Pressure-indicating paste was used to detect any over- or underextension of the borders[9].

Jaw relation records were obtained and transferred to a simple hinge articulator with the use of occlusion rims oriented to the established vertical dimension of occlusion, the anatomic occlusal plane, and the patient's centric relation. The artificial teeth were arranged with the use of remaining maxillary teeth and the anatomical landmarks of the mandibular residual ridge. The try-in sectional denture was evaluated to verify jaw relations and tooth arrangement.

To attach the 2 segments, horizontal dovetails were prepared on the labial and lingual sides of the segments. For additional retention, 2 pins were inserted into 2 prepared holes in the top segment, which held the 4 anterior teeth. During try-in, the patient found this assembly method difficult to handle. To simplify insertion and stabilization, vertical dovetails (4 x 3 mm) were prepared on the labial and lingual surfaces of the denture segments. They were grooved on the recipient denture section (matrix) to permit vertical insertion movement only. The two parts were reassembled, and the matrix was waxed, flaked, and processed with 0.02mm thick plastic separator. The completed denture was finished and polished as 1 unit to prevent possible distortion of the resin.

The denture was inserted, and pressure-disclosing paste was used to refine the tissue surface. To facilitate the disengagement of the 2-denture segments, a notch was prepared on the matrix. The patient expressed her satisfaction with this method of placement. Routine postinsertion instruction are given.

B) Treatment of an edentulous patient with surgically induced microstomia:

It describes about the fabrication of sectional mandibular denture dovetails are created in the denture base to orient and secure the prosthesis.

A Sectional Complete Denture for Patient with Microstomia:

It describe about sectional maxillary complete dentures, for a patient with surgically induced microstomia. It consists two studied (left and right) sections with a joining acrylic resin overlay to solidly connect the four studs. This technique restores esthetics but restricted tongue space.



Fig. Patient with limited mouth opening

Procedure:

Plaster was poured into the tissue surface of the patient's maxillary denture to obtain a cast on which sectional trays could be made. (If the dentures contain tissue surface undercuts, a denture duplication technique using elastomeric impression materials may be used to obtain a mold of the fitting surface.

A maxillary sectional impression tray was made and a master cast was poured from the assembled final impression. A duplicate cast was relieved over the incisive papilla and palatal raphe with 1.5 mm tinfoil (corresponding to the junctional area of the sectional tray). The maxillary occlusion rim and try-in were accomplished conventionally, except that they were sectioned in the midline.

The completed sectional denture was designed in two halves; with the left side fitting into a beveled recess in the right side to give a more accurate location. Both halves were joined rigidly by a stainless steel post that inserted into three tubes within the complete denture palate. The post, which was removable, was attached to the right maxillary incisor, which served

both as a tooth and as a handle for the post. The technique was as follows.

The right side of the denture contained a recess to accommodate an extension of the left side. The right side was flaked and packed first. Before this was done, the left half of the wax try-in was removed and two sections of stainless steel tubing (1 mm internal diameter) was positioned in the waxwork of the right side of the try-in, aligned with 1 mm stainless steel wire that passed through the center of the right central incisor tooth space. To ensure the stability of these tubes during wax removal and processing, two stainless steel wires were soldered at right angles to each of the tubes. These wires would be embedded in plaster during processing, thus ensuring that the tubes did not move during flasking. After deflasking and finishing of the right side, the soldered stainless steel wires were cut off. The polished semidenture was replaced on the master cast and duplicated by using reversible hydrocolloid.

A dental stone cast was poured and the left side of the denture was waxed up on this cast. Therefore it was flaked packed, and finished. When both halves of the denture were assembled, a channel was removed from the projection of the left section of the denture and stainless steel tubing 1 mm in internal diameter was positioned so that it was in line with the two tubes of the right section as determined by the anteriorly inserted post[10].

The socket of the right central incisor was relieved with 0.001 inch tin foil. The stainless steel post had an anterior retentive loop to provide retention for the central incisor, which was attached with tooth-colored autopolymerizing acrylic resin. The tinfoil was removed after curing.

A Prosthesis to Control Microstomia:

Among the problems associated with rehabilitation of severe facial trauma are inadequate tissue for wound closure and contraction of scar tissue. Microstomia is a common residual of oral and perioral scarring. To reduce the severity of microstomia, a device is described for applying pressure bilaterally to the commissures.

Technique

In a warm water bath, temper two half-inch wide doubled thickness of hard base plate was until pliable. Contour one end of each strip of wax to fit each commissure with a half-inch extension into the vestibule. Contour the remaining strip to the face and neck extending it beneath the ear to engage orthodontic headgear. When the wax strips have hardened, remove them and fit the metal lugs of the headgear to the distal ends of the wax strips, using the holes of the headgear to position the lugs. Process the wax in a denture flask, using clear acrylic resin. The lugs will be transferred to the resin during the procedure. Polish the processed

retractor. Connect the retractor to the neck band. Gradually increase tension by advancing the attachment to the initial lugs as needed to increase opening[11].

CONCLUSION

Restricted opening of the mouth is a relatively common dental condition that has a variety of causes (namely trismus, OSMF, microstomia etc). The rehabilitation of such patients presents a challenge for the dentist and more so for the Prosthodontist. Recording of primary and final impressions, the design of the dentures, registration procedures, and even the simple tasks of insertion and removal of the prosthesis may be complicated immensely. This presentation demonstrates various techniques and methods that can be utilized to rehabilitate such patients. The use of sectional trays, flexible trays, sectional complete and partial dentures etc can overcome many of the apparent clinical difficulties.

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