

Simplified impression technique and foldable denture fabrication for a patient with microstomia

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Abstract

Background: Constricted opening of the oral aperture may linger any dental treatment. The adequate mouth opening is very much necessary for any procedure related to prosthodontics. The restricted opening may lead to difficulty in recording the accurate impressions, designing of the dentures and even the ordinary tasks of insertion and removal of the prosthesis. As the absolute height of the stock impression tray is approximately 1–1.5 cm, the impression tray and final prosthesis to be use in microstomia patient has to be laboratory modified. **Aim:** The aim of this case presentation is to rehabilitate an edentulous patient with severely reduced mouth opening with three-piece sectional denture to make prosthesis foldable during removal. **Methodology:** A sectioned custom tray was made to achieve accessibility of intraoral structure, and the hinged maxillary denture with intraoral magnet was fabricated to ensure comfortable insertion of the complete denture prosthesis. **Conclusion:** The sectional hinge denture with adjunct use of intraoral magnet can be comfortably inserted and removed by patient with restricted mouth opening. It is cost effective and comfortable approach for rehabilitation of microstomia patient. **Clinical Significance:** Impression technique chosen was very comfortable for the patient. As complete denture prosthesis was fabricated in three parts, insertion and removal of the prosthesis was easy.

Keywords: Hinge denture, impression technique, intraoral magnet, reduced mouth opening, sectional denture

Introduction

Prosthetic rehabilitation of completely edentulous maxillary and the mandibular arch starts with a good impression which leads to a good prosthesis. The adequate mouth opening is immensely necessary for any procedure related to prosthodontics. From impression making to denture installation, every step including use of just simple bite fork for orientation jaw relation also requires adequate mouth opening and is contingent on the patient's ability to open the mouth. Microstomia patient usually presents with reduce vestibular depth along with stiff musculature which further complicate the rehabilitation procedure and stability of the final prosthesis.^[1] Microstomia can obstruct any rehabilitative procedure inside the oral cavity. Limited mouth opening (microstomia) can be due to various causes such as congenital and acquired abnormalities.^[1,2] Among the congenital causes, it can be due to Freeman-Sheldon syndrome, Hallermann-Streiff syndrome, scleroderma, and CREST syndrome. Burn injuries, post-operative contracture after burn injuries/surgery due to neoplasm, oral submucous fibrosis, and temporomandibular joint problems represent the

various acquired causes of microstomia. In the past, there had been many attempts to overcome reduced mouth opening such as elective surgeries, mouth opening devices, and other invasive procedures.^[2]

These surgical approaches are not indicated for all patients due to limited healing process due to age and scar formation after surgery.^[1] The aim of this case presentation is to rehabilitate a completely edentulous patient present with severely reduced mouth opening prosthetically by redesigning conventional removable prosthesis in a novel, simple, and cost-effective way.

Case Presentation

A 55-year-old patient referred to the department of prosthodontics of the university, Varanasi, India, with a chief complaint of inability to masticate the food due to loss of teeth. On examination, the patient was completely edentulous in both maxillary and mandibular arches and had a limited mouth opening of 15–20 mm. Lower lips were taunted and inelastic with reduced vestibular depth. The patient had a medical history of radiotherapy 2-year

back due to squamous cell carcinoma of the tongue. Due to a very small oral opening after healing, the patient was unable to insert his maxillary denture. The patient was categorized in Class IV rendering to the prosthetic diagnostic index criteria.^[3] The patient had no other systemic diseases that could affect the hard and soft tissue of denture foundation area [Figure 1a]. Treatment plan was hinged denture prosthesis for the maxillary arches.

Treatment

1. The preliminary impression of the maxillary and the mandibular arch was made in thermoplastic impression tray which was kept short in posterior dam area due to limited accessibility (Libral Pvt. Ltd.). High fusing impression compound (impression compound, Kerr Ltd.) was used to make preliminary impression by applying figure adaptation in posterior region till material set in mouth.
2. Custom tray design was modified to make a sectional impression. The custom tray with spacer was fabricated with self-cure polymerizing polymethyl methacrylate (PMMA) resin (Rapid Repair, Pyrex International, India). During polymerization of

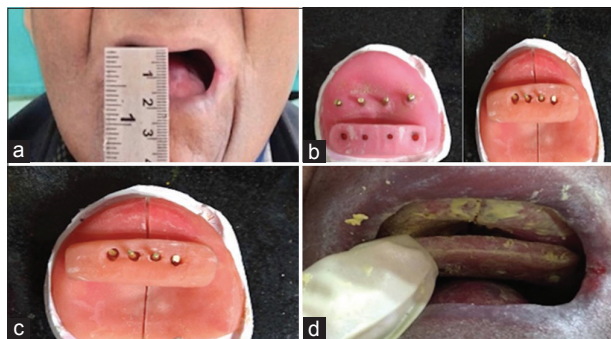


Figure 1: (a) Extraoral view with limited mouth opening; (b) custom tray with different size dowel pin and acrylic resin block; (c) custom tray after sectioning in the midline; (d) both sides of the custom tray stabilized in patient mouth by acrylic bar

self-resin, four dowel pins were used. All four dowel pins were tapered in shape and had a diameter of 2.5 mm and length 10 mm and 15 mm, respectively. Two short dowel pins of 10 mm length were placed close to the midline and the long dowel pins were placed over the alveolar ridge area. To align pin parallel to each other, a dental surveyor was used to mark the position of dowel pins on the custom tray. All dowel pins were kept parallel to each other and steadily firm to the foundation till polymethyl methacrylate polymerization completed [Figure 1b].

3. Petrolatum jelly was applied on the external surface of the modified custom tray with dowel pin and an acrylic resin block of size 4 cm × 1 cm was prepared from the auto polymerizing PMMA resin. To make it snugly fit onto the dowel pins of custom tray, four drill holes were made into the acrylic block parallel to the position of dowel pins.
4. The custom tray was modified for the sectional impression technique by cutting the tray in two halves with the help of the metallic disc (952.900.140; Komet, Gebr. Lemgo, Germany). Function of acrylic block was to align and position the two halves of custom tray after sectioning of the custom tray [Figure 1c].
5. The right half of the tray was first inserted in the patient's mouth and border molding was done with type I stick compound (DPI Pinnacle) after completion of border molding of the right half, the same procedure was done for the left half of the upper arch. Zinc oxide eugenol was taken as a final wash impression material and acrylic resin block used to join both the portions of the tray during impression by placing it into the holes over the dowel pins [Figure 1d].
6. Record bases were made with self-cure polymerizing resin and sectioned with the help of a cutting disk. Two parts of the record base were joined with a stainless steel hinge (the hinge was taken from a stainless steel wristwatch) to make the record base foldable from the midline [Figure 2a].
7. The anterior portion of the record base was fabricated separately over the hinged record base. Wax rim was fabricated over the record base, and jaw relation was recorded. For

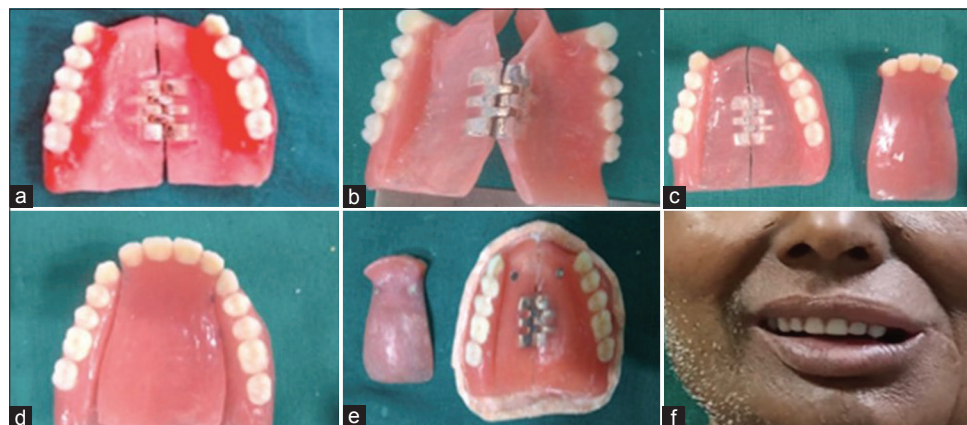


Figure 2: (a) Trial denture without anterior segment; (b) foldable hinged prosthesis; (c) separate anterior and posterior portion; (d) anterior portion covering midline gap; (e) Nd-Fe-Pt magnet attached to join two portions; (f) Final prosthesis

lower arch, record base was fabricated as a single unit because adequate space was available to place record base from one retromolar area to another.

8. For maxillary sectional denture, after placement of teeth was over, a putty index was made. The anterior portion was eliminated from the temporary denture base and a duplicate cast was made of this denture trial base. On duplicate cast, anterior teeth portion was placed to perform separate polymerization of this portion. Try-in was done for both the upper and lower arch.
9. Sectional record base was processed with heat cure the polymerizing resin. Moreover, the anterior part containing anterior teeth was separately processed. The anterior portion of the record base was attached to the main record base using magnets two pairs of a magnet (1.5 mm in cross section) and posterior acrylic undercut [Figure 2b-e].
10. During denture installation, the patient was illustrated and taught about insertion and removal of the prosthesis in sections. Post-installation instruction was given. The patient was advice to increase the frequency of water intake to avoid symptom of dry mouth, regular gum massage, and tongue training exercise to improve stability of prosthesis.
11. The patient found it easy to place the denture inside the mouth because of the foldable nature of the denture. The periodic recall was scheduled after 1 week, 1 month, 3 months, and 6 months to check any complaints regarding the denture and denture cleansing [Figure 2f].

Outcome and Follow-up

This procedure was very much economic to the patient as the patient was satisfied during the installation of the denture. Due to limited mouth opening in microstomia patients, conventional impression procedure and conventional fabrication of complete denture are very much difficult to perform. Therefore, additional labor and appointments are needed in these cases to fabricate sectional complete denture. Despite all the shortcomings of various techniques to fabricate this type of dentures, these sectional dentures can provide patients with an opportunity to enjoy the quality of life if periodic recall and follow-up are carefully maintained. The patient was immensely satisfied with the prosthesis.

Discussion

Microstomia can be seen commonly in many parts of India and Southeast Asia due to vast use of the areca nut and tobacco products which is one of the most common causes of oral submucous fibrosis.

Section impression technique can overcome the problems pertaining to reduced oral aperture. However, the sectional impression tray made by the interlocking device in the tray itself can lead to a few difficulties during placement hence requires many rehearsal before the final impression recording procedure

starts. Luebke first described handling a sectional tray to obtain an impression with the help of metal pins joining acrylic resin tray.^[4]

The technique used in the present case to obtain sectional impression was advocated by Bachhav and Aras.^[5] This technique is relatively easy and predictable as no overimpression is needed and correct placement can be ensured by the resin bar. Zinc oxide eugenol was chosen for a secondary impression due to its flow tendency. To fabricate the sectional denture, a hinge was used in the mid-portion of the palatal surface of complete denture and anterior portion of maxillary denture made separately which was attached to the denture base with the help of magnetic attachments.

Wahle *et al.* first used a swing lock made of cast chromium to fabricate a denture in microstomia patients.^[6] This design system had advantages of structural durability of prosthesis which was compromised in other designs. Reling and rebasing was also possible with the prosthesis but 2 times processing of denture base made this design expensive. Jivanescu *et al.* fabricated a flexible denture sectioned with a disk.^[7] As this denture was given for interim period due to some adverse properties flexible denture, but the patient accommodated well and was not given any definite designed prosthesis. Acrylic resin connections in the form of dovetail first applied by Al Hadi *et al.* to make it a sectional denture.^[8] In this designing, maxillary denture was cast partial three-piece design and mandibular in one piece. Sectional collapsed dentures with Co-Cr-Mo alloy and a sectional denture with a midline lingual hinge were also made beforehand by Geckili *et al.* and Yenisi *et al.*, respectively.^[9]

In the present case, designing of a sectional denture was done as three-piece design. Placement of hinge joint in the midline and sectioning denture into two parts in the midline was done carefully to ensure maximum hinge movement.^[10,11] The key was used to unfold or fold the denture for ease of the patient. As the anterior portion as the third part of the prosthesis was fabricated separately which extended till the posterior border, stability of denture was not hampered much due to the presence of the hinge in the midline. Use of magnetic attachments aids in the accurate approximation of two parts.^[12]

In literature, different attachment systems such as pins, lego, and bolt have been use for connecting two sectional portions with few problems. Suzuki *et al.* have used single foldable denture which leads to problem in opening and closing in mouth due to limited mouth opening.^[13] Application of these techniques depends on the feasibility and degree of mouth opening in these patients.^[14,15]

Limitations of the design

Precise placemat of hinge in the midline is needed if placed higher it may interference with tongue. The presence of hinge in the prosthesis design may compromise stability to some extent from impression side. Undercut should be made carefully in the two-piece denture joined by hinge, for the retention of the third anterior portion. As there is always a high chance of

compromising the structural durability of two-part denture during undercut preparation. To enhance the stability, tooth arrangement should be done as possible on ridge crest to avoid lever forces and improve stability and modified posterior tooth form with lingualized occlusal scheme should be use.

Conclusion

This case methodology describes a cost effective, simple method to rehabilitate patient with restricted mouth opening. Sectional three-piece design of complete denture provides advantage of esthetic and comfort as intact labial flange and palatal midline. The use of various die pins, midline hinge, and Nd-Fe-B intraoral magnetic attachments for making successful impressions and sectional prosthesis has been described. When conventional removable prosthesis treatment modalities cannot be used, redesigning of denture prosthesis by the use of magnets and hinge for microstomia is one of the viable options to rehabilitate.

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