Sectional Impression Tray and Sectional Denture for a Microstomia Patient

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Abstract

Microstomia presents a unique challenge to the patient. Patients with microstomia who must wear removable dental prostheses often face the difficulty of being unable to insert or remove the prosthesis because of the constricted opening of the oral cavity. A completely edentulous patient, who developed microstomia along with Raynaud's phenomenon induced by scleroderma, is presented. This clinical report describes a quick and easy method for fabrication of a sectional custom impression tray connected by press button and a sectional complete denture retained by magnets. A sectional denture that provides ease in placement and removal can be successfully used in clinical practice for treatment of microstomia patients.

Microstomia is defined as an abnormally small oral orifice.[1] A limited oral opening can be caused by surgical treatment of orofacial cancers,[2] head and neck radiation,[3,4] reconstructive lip surgery,[2] burns,[5] trauma,[6] microinvasion of muscles of mastication,[7] temporomandibular joint (TMJ) dysfunction syndrome,[8] and genetic disorders.[9-12]

Scleroderma is a connective tissue disease of the skin, joints, and sometimes internal organs. Facial skin and oral mucosa become thin and taut, and wrinkles disappear, resulting in a mask-like appearance and a reduced oral opening. Decreased salivary flow and limited tongue movement from fibrosis often lead to difficulty in swallowing.[13] Hand deformities (Raynaud's phenomenon), along with loss of tactile sensation, make denture insertion and removal difficult.[14]

Various treatment modalities include surgery,[15,16] dynamic opening devices called microstomia orthoses,[17-20] and modification of denture design.[21-35] The insertion of a standard complete arch stock impression tray may be impossible if there is a severely limited oral opening. Management includes flexible modified stock trays and sectional trays.[25,32,36-41]

Sectional and collapsible dentures have been described for these patients. A review of the literature shows that different mechanisms for connecting sectional dentures include cast Co-Cr hinges,[23,28,29] swing-lock attachments,[22,30] stud attachments,[31] orthodontic expansion screws,[41] pins,[25] bolts, telescope system,[22] rods,[38] clasps,[23,24] cast locking recesses,[24] and magnets.[27,32,33]

The purpose of this article is to describe the clinical management of an edentulous patient with microstomia induced by scleroderma. This technique uses a simple, economical, and non-time-consuming design for construction of a sectional impression tray connected by a press button and a sectional denture retained by magnets.

Clinical background

A 65-year-old edentulous woman with microstomia induced by scleroderma presented to the Department of Prosthodontics at MNR Dental College and Hospital, Andhra Pradesh, India. The patient presented with hand deformities along with loss of tactile sensation. An oral examination revealed a small oral aperture measuring 20 to 25 mm. Maxillary and mandibular ridges were large and well-formed. Various treatment options were discussed. Since the patient did not agree to surgical enlargement of the oral aperture, the decision was made to fabricate a sectional complete denture.

Impression procedures

Limited oral access made it impossible to make primary impressions using a stock impression tray. Hence, it was planned to make preliminary impressions using a flexible tray. A flexible tray was prepared by manually dispensing silicone putty impression material (Express, 3M ESPE, St. Paul, MN) intraorally. The impression putty was soft during initial insertion. Once placed intraorally, it was carefully positioned onto denture-bearing areas and molded to appropriate contour using functional and manual manipulation. The impression was then

Figure 1 Sectional custom tray with press button.

Figure 2 Mandibular denture in the stone index.

made with light body poly(vinyl siloxane) impression material, (Express), which duplicated the details to obtain a primary impression. These were then stabilized in a non-displacing mix of dental stone (Kala Stone, KalaBhai Karson Pvt. Ltd, Mumbai, India) prior to pouring them in dental plaster (Everest, Panade Industries Pvt. Ltd, Nippani, India) to obtain the primary cast.

Custom impression trays were fabricated with autopolymerizing acrylic resin (DPI RR Cold Cure, Dental Products of India Ltd, Mumbai, India) and tried in the patient's mouth. It was noted that a maxillary tray could be introduced in the patient's mouth with some amount of difficulty; however, a mandibular custom tray could not be placed. Therefore, it was planned to section a mandibular impression tray into two halves to insert into the mouth. Press buttons (Snap Fasteners, K.S. Exports, Delhi, India) were fixed to the handle of the sectional custom tray so the tray could be exactly reassembled (Fig 1). Border molding was alternatively made for the right and left halves of the sectional tray. Following this procedure, Zinc Oxide Eugenol (ZOE) impression paste (DPI impression paste, Dental Products of India Ltd) was used to make the definitive impression. The impression paste was placed in the right half of the tray, which was inserted initially. After the impression material set, the left half of the sectional tray with impression paste was inserted. After the impression was completed, the sectional trays were separated intraorally and reassembled externally. The impression was boxed and poured using ADA type 4 dental stone (Kalrock, Kalabhai Karson Pvt. Ltd.). The conventional method was used to make the maxillary impression. Jaw relations and teeth setting were completed with a sectional impression tray using the press button.

Denture design and fabrication

The denture was processed in a single piece using heat-polymerized acrylic resin (DPI Heat Cure, Dental Products of India Ltd.) with a conventional compression molding technique according to manufacturer's instructions. The denture was then deflasked, trimmed, and polished.

The patient could insert the maxillary denture; however, the mandibular denture could not be inserted in the mouth. Hence, a mandibular sectional denture was designed in two pieces with a locking mechanism using magnets.

Prior to sectioning the denture, a stone index was prepared by investing the occlusal and polished surface of the denture in dental stone (Kala Stone) for a correct alignment of sectioned segments (Fig 2). The reduced height and thickness of the denture base in the anterior region precluded the use of any attachments in the anterior region. Hence, the denture design incorporated sectioning in the molar region in step-design fashion.

Stainless steel encased iron-neodymium-boron button magnets (Rare Earth Magnet, Permag Products Pvt. Ltd., Pune, India) with a 5-mm circumference were placed on the horizontal cut section to provide resistance to vertical dislodgement. Hollow cavities were made on the horizontal intaglio cut surface of two sections. Magnets were placed in these cavities using autopolymerized acrylic resin, taking care to align poles properly to allow strong attractive force between the two sections. Magnets were flush with their corresponding horizontal surface. The process of attaching magnets was carried out in a stone index (Fig 3). The two sections could be connected intraorally, providing a rigid connection due to a strong attractive force (Fig 4).

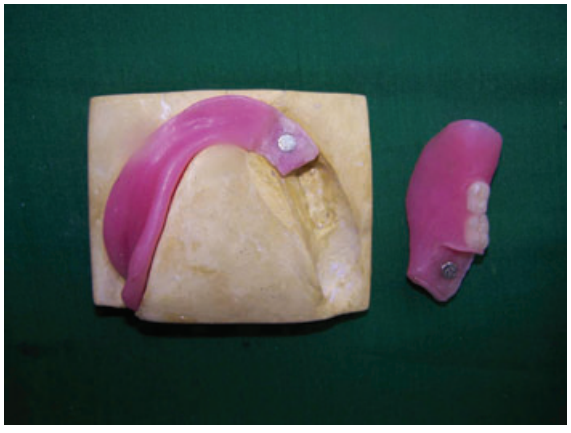

Figure 3 Mandibular denture sectioned in step design with attached magnets.

Figure 4 Aligned mandibular denture.

Delivery of dentures

The patient was provided with instructions for cleaning, inserting, and removing the prosthesis. The patient was instructed to deliver first the left section into the mouth followed by an insertion of the right section of the denture. Once inserted into the mouth, they snap in a proper position on account of a magnetic force.

The patient initially complained of problems inserting the denture, which resulted in tissue irritation during the 1-week recall period. The patient was advised to practice insertion and removal of the denture in front of a mirror. Once she became accustomed to attaching the sectioned segments, it was noted that the irritated areas healed. The patient was recalled every month for a period of 1 year. The patient adjusted well, with marked improvement in the masticatory function. It was also noted that the attractive force of the magnets continued to be adequate during recall visits for a period of 1 year.

Discussion

Prosthodontic management of microstomia patients has been frequently reported in the literature. Starting from selection of the primary impression tray to insertion of dentures presents a clinical challenge.

In the treatment described, a semi-rigid silicone putty impression material was used as an impression tray for preliminary impressions. It served to ease dispensing intraorally because of its soft consistency. Hence, there was no need for stock impression tray modification.

A custom impression mandibular tray was sectioned in two halves, allowing the functional impression to be made despite difficulties associated with microstomia. The advantage of such a custom tray is that it can be removed as two separate segments and assembled externally with a press button. Hence, rigid nonelastic impression material was used. Both elastomeric and nonelastomeric impression materials have been used in a similar procedure.[25-28] Press buttons are economical and easily available, simplifying the laboratory technique.

Several sectional and collapsible dentures have been presented in the literature. Use of acrylic beveled dovetail hinges,[23,28,29] locks, clasps,[23,24] rods,[38] cast-locking recesses,[24] swing-lock attachments,[14] and pin attachments[25] has been described for assembling segments of sectional dentures; however, these prostheses had no structural durability and could not maintain uniform retention and stability during the masticatory function.

The use of magnets for retention is a popular method. There are few reports about sectional dentures using dental magnetic attachments. Matsumura and Kawasaki used a dental magnetic attachment for a sectional removable of partial denture for a patient with a severe undercut secondary to ablative tumor surgery.[33] Iron-neodymium-boron magnets are high energy, small-dimension magnets, which not only have the property of magneto crystalline anisotrophy, but also have high coercivity. Recent developments include improved corrosion resistance of such magnets using laser welding and encapsulation with titanium, stainless steel, or palladium. Iron-neodyium-boron magnets encased in steel were used for fabrication of sectional dentures. The advantage lies in their small size and strong attractive force, which allows their placement in the prosthesis without being obtrusive in the mouth. Advantages also include ease of placement, cleaning, and automatic reseating. The patient presented with hand deformities, along with loss of tactile sensation; hence, magnetic retention was the best option.

Recently, studies on magnets have concentrated on cast iron platinum keepers for sectional dentures;[27,32] however, this system is found to be more time consuming. Hence, a simple design, which provided a quick and easy method to make a sectional denture, was planned. The denture was fabricated in two components with a step-design pattern. This provided resistance to denture deflection during chewing that minimized the possibility of breakage. Also, the closed magnetic field system provided a higher retentive force and decreased the magnetic field effects in the oral cavity.

During the follow-up period, the patient reported neither dislodgment of the denture during chewing nor aspiration of the smaller section of the denture. The sectional denture design takes care of a lateral displacement by incorporation of high-energy magnets in a mutually parallel position with a 0° gap. A strong attractive force of magnets prevented the aspiration of the smaller section, even when a mortise design within the horizontal sections of the denture base was not included; however if this situation occurs in the future, a technique to further stabilize the sectional denture without compromising insertion/removal would be considered. An applicable technique would be the use of vertical dovetail (4 × 3 mm) on one of the horizontal surfaces of the sectional denture and acrylic extension from the other surface.

Follow-up appointments revealed that the retentive qualities were stable with time, and there was no compromise in durability. The stable assembly of two sections of dentures provided optimum esthetics and function.

Future prospects

Sectional dentures fabricated with a press button can be successfully used during routine clinical practice, provided they

are corrosion resistant and that patients have good manual dexterity.

Summary and conclusion

This clinical report describes the fabrication of an economical, quick, and easy method for fabrication of a sectional custom tray and sectional complete denture retained by magnets for a microstomia patient. Although patients with microstomia presenting for prosthetic rehabilitation pose a challenge to the clinician, they can be conservatively managed by modifying clinical and laboratory procedures; however, in these modifications, care should be taken to avoid compromising the basic principles of providing optimum function and esthetics to the patient. The sectional denture was convenient for the patient in terms of insertion, withdrawal, and function.

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