Sectional Impressions and Simplified Folding Complete Denture for Severe Microstomia

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Abstract

A patient presenting with severe microstomia (PDI Class IV) was unable to insert a maxillary complete denture. Sectional final impressions were made using two impression materials and an interlocking custom tray. A folding record base was used for maxillomandibular relationship records. A novel folding maxillary denture with a custom hinge and plunger attachment to lock the denture in the open position was fabricated. The patient was able to insert the collapsed denture, open it intraorally, and enjoy successful masticatory function.

Microstomia describes the condition of an abnormally small oral orifice, although the intraoral structures may be of normal size. This condition challenges both the dentist and the patient. A variety of causes, including scleroderma, burns, radiotherapy, cleft lip, maxillofacial trauma, or surgical treatment of orofacial neoplasms, may lead to microstomia.[1,2] Many of these situations are accompanied by alterations of the soft tissues of the face, including thickening of the labial and buccal tissues, further complicating access to the oral cavity. The sequelae of microstomia can be severe and include reduced oral intake, speech pathology, impaired oral hygiene ability, and difficult insertion and removal of dental prostheses.

For the fully or partially edentulous patient, numerous special clinical techniques have been developed to overcome the challenge of accessing the oral cavity. Modified impression techniques include the use of sectional impression trays, modified stock trays, and flexible impression trays.[3–9] Similarly, removable complete and partial dentures have employed sectional[10–14] and collapsible designs[9,15–18] with varying strategies to retain the denture in an unfolded position. Examples include the insertion of pins,[12,19] the use of a locking tool,[18] latching a swing-lock assembly,[11], and locking the denture segments with magnets[16,20,21] or attachments.[22] Also, flexible denture materials may be employed to ease insertion of prosthetics.[23] This clinical report will present the prosthetic management of a microstomia patient using a simple folding design and a plunger attachment.

Clinical report

A 63-year-old white male was referred for fabrication of new upper and lower complete dentures. His lower lip had been removed for treatment of a squamous cell carcinoma, and his lip was reconstructed using a radial forearm flap 3 years prior to prosthodontic treatment. After healing, the patient was unable to insert his maxillary denture due to a very small oral opening. The patient had no other medical complications affecting his dental treatment.

The patient presented with complete edentulism of the mandible and maxilla with resorbed ridges and severe microstomia. The maximum oral opening was approximately 20 mm in height and 35 mm in width (Fig 1), with tight and inflexible labial tissues. With effort, the patient could manipulate a mandibular denture into his mouth but could not insert the maxillary denture. The severity of his microstomia led to a Class IV assessment using the Prosthodontic Diagnostic Index.[24] The treatment plan included the fabrication of complete mandibular and maxillary dentures; the maxillary denture would fold using a simple hinge design to ease patient insertion and a plunger lock to hold the denture open in the mouth.

The maxillary preliminary impression was made using a modified stock tray (GC America, Alsip, IL) with the flanges removed and irreversible hydrocolloid (Jeltrate; Dentsply International, York, PA). The mandibular preliminary irreversible hydrocolloid impression was made with a stock tray sectioned along the midline. The segments of the sectioned tray were

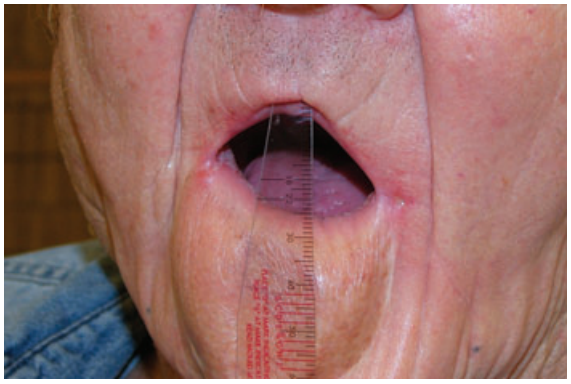

Figure 1 Patient shown with severe limitation of oral aperture.

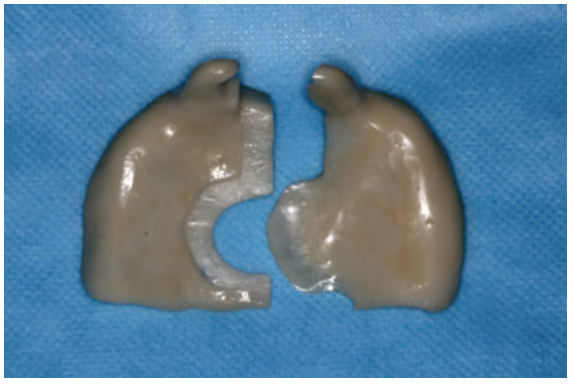

Figure 2 Design of interlocking sectional impression trays.

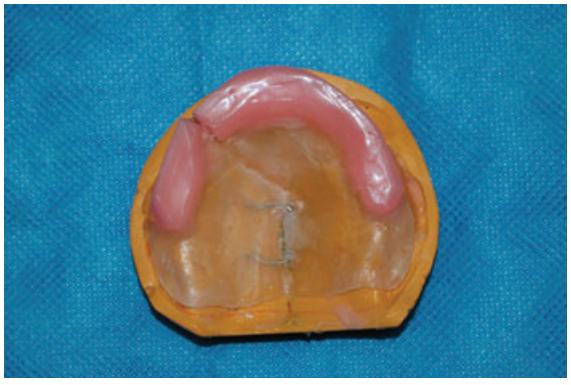

Figure 3 Folding maxillary record base with wrought wire hinge.

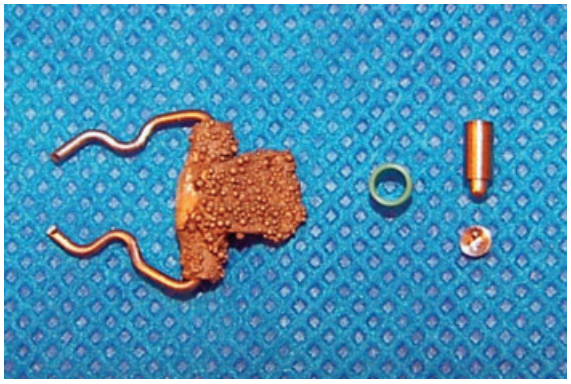

Figure 4 Final custom hinge (left) and plunger attachment (right).

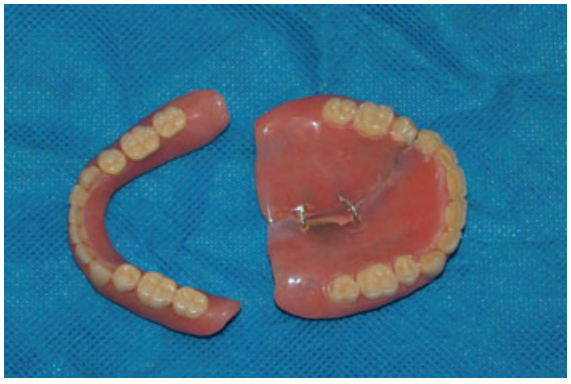

Figure 5 Maxillary denture in fully opened position after deflasking.

Figure 6 The denture is collapsed to ease insertion.

indexed with poly(vinyl) siloxane putty and further stabilized after removal with autopolymerizing resin (Coe Tray Plastic; GC America).

The final impressions were made with sectioned acrylic resin custom impression trays with interlocking handles to intraorally relate the left and right sides. The first tray segment was border molded with modeling plastic impression compound. The remaining segment was seated by interlocking the handle and tray body before shaping the border areas. A sectional impression method was employed in which the first-half of the arch was impressed with addition reaction silicone (Aquasil Ultra Monophase; Dentsply International). After setting, it was removed, trimmed, and returned to the mouth. The remaining portion of the edentulous arch was impressed with irreversible hydrocolloid (Jeltrate) by seating the second tray segment until the tray handle was fully interlocked for proper alignment. The final impressions (Fig 2) were boxed and poured with Type III dental stone (Microstone; Whip Mix, Louisville, KY).

A maxillary record base was then fabricated on the master cast using a folding design. This was accomplished by incorporating a simple hinge into the record base. The hinge was composed of a segment of 18-gauge straight stainless steel wrought

wire placed inside a 10-gauge hollow sprue and bent to form a hinge pin. The maxillary record base was made in two segments using clear autopolymerizing acrylic resin (Splint Resin; Great Lakes, Tonawanda, NY), with the larger segment covering approximately two-thirds of the master cast and including the hinge cylinder. After trimming, it was coated with separating medium, and the remaining portion of the record base was fabricated to include the hinge pin. A wax occlusion rim was added to the record base to allow the hinging action (Fig 3). A conventional mandibular record base was also fabricated.

The record bases were seated intraorally, maxillomandibular relationship records were recorded with Aluwax (Aluwax Dental Products Co., Grand Rapids, MI), and the casts were mounted on a semiadjustable articulator (Model 2240; Whip Mix). Artificial teeth were selected and arranged, and trial placement was accomplished. After patient acceptance, final festooning and flasking of the dentures were completed.

The final hinge assembly was fabricated for the maxillary denture using a similar design to that of the record base. The pattern for the hinge cylinder was formed using a hollow 12-gauge sprue (approximately 6 mm in length), which was contoured with Sprue Wax (Kerr, Romulus, MI), then covered with coarse retention beads (Veneer-Lock; George Taub Products & Fusion Co., Jersey City, NJ). The pattern was embedded with a hygroscopic investment material (Beauty Cast; Whip Mix) and cast in Type III gold alloy (Midigold 50; Ivoclar-Vivadent, Schaan, Liechtenstein). During casting, a segment of 18-gauge wrought wire was left in the cylinder as a temporary hinge pin. After casting, a new pin was fabricated and shaped for retention. The final simple hinge is shown in Figure 4.

To keep the denture in the unfolded position in the mouth, a denture lock mechanism was formed using a plunger attachment (Hannes Anchor; Attachments International, San Mateo, CA) (Fig 4). The attachment was positioned between the canine and premolar to engage after unfolding in the mouth. Prior to split-packing with heat-polymerizing acrylic resin (Lucitone 199 Denture Base Resin; Dentsply International) the ends of the hinge cylinder were covered with block-out material and positioned on the cast. The hinge was also positioned, and a cellophane sheet was trimmed and folded to form the seam border between the two segments that remained during processing. The mandibular master cast was packed and trimmed by conventional methods. The dentures were processed, deflasked, and prepared for delivery with conventional methods.

The dentures were delivered, and postdelivery instructions were given regarding the use and care of the prostheses. The patient could insert the collapsed prosthesis and unfold it inside his oral cavity, and he was extremely happy with the outcome. The patient was placed on regular recall, and a good prognosis for the prosthesis was expected. When the maxillary denture is opened, the plunger attachment locked it into position (Fig 5). The collapsed denture allows for insertion through the small oral aperture (Fig 6).

Discussion

Sectional impressions overcome the small oral aperture for patients with microstomia. Although the interlocking tray handles accurately relate the right and left segments of the tray, the handle must be fabricated with minimal thickness to manipulate the segments intraorally. The insertion and movement to interlock the tray segments should be rehearsed in the mouth prior to the impression procedure.

Two impression materials were used for this maxillary sectional impression. The first sectional impression was made with addition reaction silicone, which allowed reinsertion and did not require an immediate pouring of dental stone. With taut tissue, limited access, and a lack of cross-arch stability of the impression tray, placement of the tray without over-seating was very difficult. The second sectional impression was made using irreversible hydrocolloid. Although irreversible hydrocolloid is not usually recommended as a final impression material for a complete denture, elastomeric impression materials were deemed unacceptable in this situation. Once set, the segments could not be separated through the limited oral aperture without significant pain and discomfort to the patient. Ohkubo recommended use of irreversible hydrocolloid for the second tray segment, as it is nonadherent to addition reaction silicone or polyether.[9] Although polyether is also nonadherent to addition reaction silicone,[25] irreversible hydrocolloid is easily removed from the sectional tray without disturbing the modeling plastic compound. This aspect was advantageous, as the second sectional impression had to be repeated multiple times before a satisfactory result was obtained due to difficulty of insertion and seating. Once both sections of the impression were rejoined outside the mouth, minor discrepancies at the seam were filled with impression wax.

The folding denture was designed to allow for easy locking and separation of the prosthesis. Many designs use a key design to maintain the unfolded position.[16,20] The incorporation of a plunger attachment simplifies the prosthetic design, minimally impacts the contour of the denture surface, and provides excellent stability of the prosthesis in the mouth. The finish line closed completely to prevent food impaction, although liquids were able to seep into the gap, increasing the potential for staining.

Summary

It is very difficult to treat patients with severe reduction of the oral aperture. In this clinical report, the technique for impressions and fabrication of a folding maxillary removable complete denture with a custom palatal hinge for a patient with microstomia has been described. The patient could successfully insert, remove, and function with the dentures.

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