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Dual flask technique for fabrication of two-piece hollow bulb obturator in a microstomia patient: A neoteric approach

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Abstract

Tumor resections or traumatic injuries necessitating maxillectomy will often result in defects that create a communication between the oral and nasal cavities accompanied by difficulty in deglutition, speech, and an unaesthetic appearance. It also affects psychological status of the patient. Fibrosis and post surgical contracture of tissues restricts mouth opening in patients who had undergone maxillectomy and radiotherapy. Fabrication of a two-piece obturator prosthesis is beneficial in such cases. presents the fabrication of a two piece hollow bulb obturator using sectional impressions and dual flask technique in a completely edentulous hemi maxillectomy patient with microstomia.

Keywords: Microstomia, dual flask technique, magnet retained obturator, hollow bulb obturator

Introduction

Tumor resections or traumatic injuries necessitating maxillectomy will often result in defects that create a communication between the oral and nasal cavities accompanied by difficulty in deglutition, speech, and an unaesthetic appearance^[1, 2]. It also affects psychological status of the patient. The primary goals of prosthetic rehabilitation are separation of the oral cavity from the sino nasal cavities and closure of the maxillary defect^[3]. For a successful rehabilitation, an accurate impression of the maxillary arch and the defect portion is required, which necessitates adequate mouth opening for removal.^[4] Fibrosis and post surgical contracture of tissues restricts mouth opening in patients who had undergone maxillectomy and radiotherapy^[4]. Various types of obturators can be used to close the maxillary defects, such as solid bulb obturator, open hollow bulb obturator, closed hollow bulb obturator or a two-piece obturator.^[5] For patients with reduced mouth opening, especially after radiotherapy treatment a two-piece obturator is commonly prescribed^[5].

This case report presents the fabrication of a two piece hollow bulb obturator using sectional impressions and dual flask technique in a completely edentulous hemi maxillectomy patient with microstomia.

Case Report

A 61 year old completely edentulous male patient was referred from the Regional Cancer Centre, Thiruvananthapuram, to the Department of Prosthodontics, Government Dental College, Thiruvananthapuram, for prosthetic rehabilitation of a maxillectomy defect. The chief complaint of the patient was nasal regurgitation of fluids along with difficulty in speech and mastication. The patient had a medical history of squamous cell carcinoma which was treated by hemi maxillectomy (Aramany class I, Cordeiro & Santamaria, Type II)^[6] on the right side 3 months back followed by radiotherapy. Extra oral examination exhibited sunken appearance on right side of face due to hemi maxillectomy. Post surgical scar formation and radiotherapy had severely restricted the mouth opening of the patient (Fig - 1). A distance of 18mm was measured between the edentulous ridges at premolar region on left side. The distance was assessed using divider and it was measured using a measuring scale.

On intra oral examination, it was found that the defect was extending medially from the right buccal mucosa to the midpalatine region and anteriorly from the canine region to the posterior extent of the hard palate, involving some part of the soft palate (Fig - 2). Patient was trained to do stretching exercises for increasing his mouth opening by tongue blade therapy which includes, gradual stacking of popsicle sticks between the ridges and then gradually gliding additional sticks into the mouth to push the mouth open. Patient was instructed to do the recommended stretching exercises thrice daily and recalled at monthly intervals to check for the improvement. Since the mouth opening was increased to only 25 mm even after 3 months of stretching exercises, the decision to fabricate maxillary two piece definitive obturator and mandibular complete denture was made.

Procedure

- Preliminary impression of the defect area was made using green stick compound (DPI) and impression compound in a ratio of 7:3 (admix technique described by McCord and Tyson), followed by complete maxillary and mandibular arch impressions with impression compound using stock tray and the primary casts were generated.
- Since the vertical mouth opening of the patient was not adequate to record the defect portion accurately, a sectional tray was used for the maxillary arch and a regular tray for mandibular arch.

Special tray fabrication for maxillary arch

After blocking the undercuts, a special tray was designed for the maxillary arch with right and left sections that can be detached and then rejoined together in the correct original position. The locking mechanism was provided both anteriorly and posteriorly for proper alignment of the tray. Anteriorly locking mechanism was given in the handle region with die pins (Pro-Fix, Renfert) attached to the tray handle which interlocks with corresponding holes in the other section of the special tray handle. The die pins were also placed posteriorly over the tuberosity region symmetrically and parallel to the midline in order to prevent posterior separation of the tray. An acrylic resin block that can slid tightly on the pins was made with a 5-6mm cross-section after coating the acrylic resin trays with petroleum jelly, (Fig - 3).

Secondary impression

The extension and accuracy of the special tray was checked in the patient's mouth followed by border moulding. After border moulding using green stick compound (DPI), light body impression material was loaded in both the sections and inserted into the patient's mouth. After placement, the two halves of the tray were stabilized using acrylic resin block and the material was allowed to set. After the impression material has set, the resin block was detached from the pins, and the two halves of the tray were removed separately by sectioning the impression material. The two sections were rejoined after removing from the mouth by means of interlocking die pins and the resin block and master cast was generated. (Fig - 4, 5).

For the mandibular arch, custom tray fabrication and final impression procedures were carried out in a conventional manner. After obtaining the master casts, jaw relation procedures were carried out using wax occlusal rims on temporary denture bases and teeth were arranged with only light occlusal contacts on defect side and maximum intercuspation was given on the normal side. Try-in of the

dentures was done.

Processing

Dual flask technique was adapted for processing of a two piece obturator prosthesis. Waxed denture was invested in a flask (Fig - 6) and dewaxing was done for 10 minutes following which the first counter (cope 1) was kept aside. A 2mm thickness of baseplate wax was adapted over the master cast in the bulb portion, and invested using the second counter (cope 2) followed by dewaxing. Thus two counterparts are obtained with one master cast for processing the denture and the bulb portion separately (Fig - 7). After blocking the defect area with putty addition silicone material (3M ESPE), maxillary denture is fabricated by packing conventional heat cure acrylic resin using first counterpart having teeth. After processing the denture is retrieved. For processing the bulb portion, the blockout material was removed from the master cast and packing was done using second counterpart after which it was hollowed out using lost salt technique (Fig - 8). Magnetic attachments were used to retain the two pieces because of ease of use. Commercially available closed field, permanent, rare earth neodymium-iron-boron, magnets (Ambika Corporation, New Delhi, India) were used. One magnet was attached to the lid portion of the hollow bulb with self cure acrylic resin and the opposite was attached on the tissue side of the denture (Fig - 9). For correct positioning of magnets, bulb portion with the magnet was inserted in patient's mouth and an impression was made with thin mix of alginate (Zelgan Alginate, Dentsply) placed on the tissue side of the denture. This helps in correct orientation of the two sections of the obturator prosthesis. The mandibular complete denture was processed in a conventional manner. After finishing and polishing, the final prosthesis was inserted and evaluated for proper speech, comfort, and retention (Fig - 10). Occlusal interferences were corrected and post insertion instructions were given to the patient. During the follow up appointments, oral hygiene was greatly improved and the patient was found to be happy with the esthetics, speech, function and retention of the prosthesis.

Discussion

For completely edentulous patients, because of inadequate denture-bearing area, lack of cross-arch stabilization, and lack of structures for denture retention, maxillectomy procedure usually results in poor prosthetic prognosis [7]. In this case report, the technique for making a special tray in two sections with interlocking mechanism to record the final impression has been described for patients with reduced mouth opening. Good neuromotor coordination and an adequate mouth opening is required for insertion and removal of obturator that was used to rehabilitate maxillectomy defects [8]. Hence for easy insertion and removal by the patient and also to keep the weight of the obturator to the minimum, a two piece closed hollow bulb obturator was fabricated. Magnetic attachments due to their small size and strong attractive forces were used to retain obturator to denture base [9]. As silicone obturator is susceptible to fungal infections and also deforms during mastication, an acrylic obturator was used in this case. Depending upon the size of the maxillary defect, a hollow maxillary obturator fabricated in acrylic resin may reduce the weight of the prosthesis by up to 33% [10]. A dual flask technique is used in this case report which does not require duplication of the master cast thereby minimizing the possible errors and maintaining the accuracy.



Fig 1: Preoperative frontal view



Fig 2: Intraoral view of the defect



Fig 3: Special tray fabrication



Fig 4: Final impression of maxilla



Fig 5: Special tray reassembled



Fig 6: Investing the waxed denture



Fig 7: One master cast with two counterparts obtained



Fig 8: Processed Bulb prosthesis



Fig 9: Magnets embedded in the prosthesis



Fig 10: Frontal view of the patient

Conclusion

In patients with maxillary defects, surgical procedures alone cannot provide satisfactory cosmetic and functional rehabilitation. Physical as well as psychological rehabilitation is required through a multidisciplinary approach in such patients. This case report describes the fabrication of a two piece hollow bulb obturator prosthesis using sectional impressions and dual flask technique in a completely edentulous hemi maxillectomy patient with microstomia. Both function and esthetics have improved that caused a favorable change in the general health and quality of life of the patient.

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