

Fabrication of Closed Hollow Bulb Obturator: A Trouble-Free and Facile Method

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Abstract

Maxillofacial defects are often the outcome of surgeries performed to remove benign or malignant tumours of the oral structures. Surgical procedure often connects the mouth with nasal cavity and/or maxillary sinus. Esthetics, speech, mastication and deglutition is badly affected after such procedures. An obturator obstructs the communicating cavities along with restoration of missing structures. An obturator should be efficiently fabricated so that it is lightweight and involves all the available supporting oral structures. This clinical case elaborates an easy technique to fabricate a closed hollow bulb obturator

in total maxillectomy patient by using the lost salt technique. This technique can easily regulate the thickness of bulb’s wall and thus reduce its weight. Also, the process can be completed in a short period of time without requiring any extra armamentarium.

Keywords : Total maxillectomy, hollow bulb obturator, lost salt technique, maxillary defect, carcinoma

Introduction

The most frequent intraoral defects are found in maxilla. These defects are usually seen as an communication with maxillary sinus. They can be grouped as congenital defects and post-surgical acquired defects due to oral

neoplasms. Post-surgical acquired maxillary defects affects mastication, causes fluid leakage into nasal cavity and hypernasal speech.¹

A maxillary obturator is a prosthesis which is required to repair such maxillary defects. An obturator (Latin: *obturare*, to stop up) allows closure of the defect or an opening within the maxilla caused due to partial/total removal of the maxilla.¹ An obturator restores masticatory function, improves speech, deglutition and cosmetics in patients having maxillary defects.^{2,3,4}

The primary function of an obturator is blockade of the defect which breaks the continuum of oral cavity with maxillary sinus and nose. This allows for adequate deglutition and occlusion, provides sufficient support to the orbital contents which helps in preventing enophthalmos and diplopia. It also accurately supports the soft tissues of the midfacial region to improve facial esthetics.⁵ Swallowing function and phonetics is improved after obtaining a pressure-proof fit of the obturator bulb against the mucosa and any tissue graft, if placed. A successful prosthetic design for an obturator maximizes its support, stability and retention by utilizing the remaining palate and teeth. In some situations prosthetic rehabilitation can be very difficult. Here the large size of defect greatly affects the stability of the prosthesis.⁶⁻⁸

An obturator is indicated in the following situations: (1) as a template which is used during surgery; (2) a temporary prosthesis post-surgery; (3) when patient demands esthetics post-surgery; (4) to work as alternate treatment due to high expense of surgery; and (5) situations (age of patient, extensive size of defect, etc) where surgery cannot be performed.⁹

The obturator often become heavy and hence are hollowed out in the defect portion to scale back its weight as a standard practice. Wu and Schaaf designed various solid and hollow obturator prostheses as per Aramany's

classification and comparatively evaluated them for weight reduction. They revealed that hollow obturator prostheses exhibited significant weight reduction up to 33% counting on the defect size.¹⁰

There are many methods described for fabrication of hollow bulb obturator. This can be achieved by either incorporation of various highly dissolvable materials during the packing of heat cure acrylic resin or fabricating prosthesis in different parts, hollowing it out and sealing them together or performing multiple flasking procedures. This article describes fabrication of definitive closed hollow bulb obturator in total maxillectomy patient using lost salt technique to fabricate the prosthesis as a single unit having uniform thickness of wall around the hollow cavity with maximum reduction in weight of the prosthesis.

Case Report 1

A 52 years old male patient reported to department of Prosthodontics and crown and bridge, Government Dental College and Hospital, Mumbai with a chief complaint of difficulty in chewing food, speech and unaesthetic appearance of face. Patient's history revealed a habit of tobacco chewing since last 12 years. He was diagnosed with squamous cell carcinoma which was confirmed by biopsy 2 years ago. Carcinoma involved the entire right maxillary buccal region extending towards the hard palate. Patient was operated for right total maxillectomy 1 year ago which involved removal of all teeth from left central incisor to right 3rd molar along with accompanying areas of hard and soft palate.

On examination, slight depression was visible on the right side of the face giving an unpleasant appearance [Figure 01]. Patient had a huge intraoral defect which involved right maxillary alveolar region, portion of hard and soft palate on right side extending towards midline and a portion of upper lip on right side. The defect was

determined to be Aramany class IV.¹¹ The defect was unilateral. It was surrounded by midline of hard palate medially, by buccal mucosa on laterally and soft palate posteriorly (Fig. 1). The operated side was completely healed and teeth present were 22, 23 and 24.

Treatment plan included fabrication of a closed hollow bulb obturator replacing the right maxillary quadrant along with teeth.

Clinical and lab procedure

- Oroantral communication was blocked with cotton balls wrapped in a gauze piece roughly approximating the size of defect. Primary impressions of both arches were made with irreversible hydrocolloid material (Chromatex; DPI). These impressions were poured with dental stone (type III gypsum product) (Kalstone; Kalabhai Karson Private Limited).
- The primary maxillary cast was obtained. Modelling wax (Modelling wax; MAARC, Maarc dental) was used to block out all the undercuts.
- Spacer wax (2mm) was adapted on hard palate region which is present in the area left to the midline and special tray was fabricated.
- Special tray was adjusted in patient's mouth. Border moulding was done with the help of low fusing impression compound (DPI Pinnacle tracing sticks; DPI) to exactly record the borders and walls of the defect.
- Light-body condensation silicone material (Oranwash L – light; Zetaplus; Zhermack) was used to make the final impression. (Fig. 2)
- The final impression was reverse beaded, boxed and poured with die stone (type IV gypsum product) (Kalrock; Kalabhai Karson Private Limited).
- After obtaining the master cast, denture base was fabricated using cold cure acrylic resin (DPI RR Cold cure; DPI) and wax rims was prepared using modelling wax in the region of missing teeth.
- Jaw relation was recorded with modelling wax and teeth set was selected. This jaw relation was transferred to articulator.
- Teeth were arranged and a try-in was done to verify esthetics and phonetics.
- After verification of try-in, continuous clasp were made on teeth 22, 23 and 24.
- Waxed up prosthesis was sealed to master cast and master cast was demounted from the articulator.
- Appropriate size metal flask was selected and the master cast containing waxed up denture was flaked with dental plaster (type II gypsum product) (Kaldent; Kalabhai Karson Private Limited) and dewaxed by the traditional method.
- Appropriate amount of table salt wrapped in a thin cellophane sheet as per the size of defect was kept ready before packing (Fig. 3).
- Heat cure acrylic resin (DPI Heat cure; DPI) was manipulated. Approximately 2 mm thin acrylic resin sheet was properly adapted to the defect wall. Then wrapped table salt was placed in the defect. Remaining acrylic resin was placed on the counterflask surface.
- The flask-counterflask assembly was ensured for proper closure, kept under bench press and then bench cured for half hour. The assembly was then transferred to metal clamp which was kept for 24 hours at room temperature before curing.
- Then the assembly was placed in acrylizer and cured as per manufacturer's recommendation.
- The cured prosthesis was deflasked and finished.
- Then two holes were prepared on palatal surface of the prosthesis just above the defect penetrating in the area of hollow space. A syringe loaded with hot water was injected through one hole to flush the salt and

cellophane sheet through the other hole. This process was repeated several times until all salt crystals were completely eliminated.

- The interior of the bulb was dried thoroughly, followed by sealing of the two holes with autopolymerising resin.
- Finishing and polishing of the prosthesis was done. It was then placed in a flask filled with water to check for any leakage into hollow space.
- The prosthesis was delivered to the patient (Fig. 4,5). Patient was thoroughly educated and instructed about oral hygiene. Regular follow up visits were appointed as required.

Case Report 2

A 32 years old male patient reported to department of Prosthodontics and crown and bridge, Government Dental College and Hospital, Mumbai with a chief complaint of difficulty in chewing food and swallowing fluids. Patient had a habit of chewing tobacco. His medical history revealed diagnosis of squamous cell carcinoma in upper right posterior region 4 years back, for which the patient received chemotherapy and radiotherapy. Then he had a recurrence of squamous cell carcinoma 1 ½ year back for which he underwent right total maxillectomy and right hemi-mandibulectomy.

On examination, there was huge depression on right side of face with presence of post-operative scar and taut tissues on lower half of the face (Fig. 6). Patient had feeding issues and hence was fed via Ryle's tube. Intraoral examination revealed large right maxillary defect extending from canine to 3rd molar region and involving portion of hard palate and soft palate on right side of midline. Missing teeth were 13, 14, 15, 16, 17 and 18. This maxillary defect was determined to be Aramany class I.¹¹ Only left posterior edentulous segment of mandible

was present after mandibular surgical excision. The operated side was completely healed.

Treatment plan included fabrication of a closed hollow bulb obturator replacing the missing teeth of right quadrant for esthetic reason in a similar method described in case report 1 (Fig. 7).

Discussion

Post-maxillectomy patient should be physically and mentally prepared so that he/she could comfortably receive an obturator. Until the operated site is completely healed, a definitive obturator shouldn't be advised to the patient. The absence of support from maxillary bone causes the obturator to be displaced in a superior direction during mastication. It can also drop down due to absence of occlusal contacts. These movements can be variable depending on many other factors like the size of the defect, undercuts associated with remaining oral structures, number and position of the remaining teeth, etc. Retention, stability and support should be carefully addressed.⁴

A hollow bulb obturator offers certain advantages : (1) The light weight of the prosthesis improves its retention. (2) The patient experiences comfort and ease of wearing the prosthesis due its reduced weight. (3) The light weight of the hollow bulb obturator doesn't increase the self-consciousness of wearing a denture. (4) The light weight prosthesis does not cause excessive atrophy and physiologic changes in muscle balance. (5) The reduced pressure to the surrounding tissues helps in deglutition.⁹

Several methods and materials have been described in literature to fabricate a lightweight, closed hollow obturator. Incorporation of materials like sugar and ice during packing, grinding out the inside of the bulb, fixing the lid on uppermost border are some of the methods to make the hollow prostheses.¹²⁻¹⁵ Separate processing of

two halves and then attaching them with an autopolymerising resin is also described in literature.^{16,17}

The technique described in this article is a relatively easy and convenient method to fabricate a hollow bulb obturator. It has few advantages over other techniques : (1) obturator can be fabricated as one unit using heat cure acrylic resin which makes it strong and durable compared to those prostheses fabricated with autopolymerising resin entirely; (2) as fine salt crystals wrapped in a cellophane sheet is used, defect of any internal dimension can be easily mimicked; (3) a wall of uniform thickness is created around the hollow space, thus helping in maximum reduction of weight of the prosthesis (Fig. 8); (4) there is less post-fabrication effort to empty the fine salt crystals contained in the hollow space; (5) as it is fabricated as a single unit, post-fabrication hollowing and fusing of separated parts of the prosthesis is eliminated.

However, proper recording of borders and extent of the defect while making the final impression is equally important to get maximum retention and stability for the prosthesis along with weight reduction of the prosthesis. This will greatly enhances physiological behaviour and functioning of oral tissues.

Also, occlusion should be adjusted, as it helps in appropriate seating of the prosthesis, thus stabilising it. Occlusion is the foremost important aspect of stability. A proper occlusal scheme provides optimum distribution of all the occlusal forces in both centric and eccentric jaw positions. Appropriate determination of an occlusal scheme, removal of all premature contacts and generalized placement of stabilizing components contributes sufficiently to stress reduction by lateral forces.^{18,19}

Conclusion

It is not easy to improve the basic living of total maxillectomy patients when compared to those with conventional prosthesis. A team of skilful and

knowledgeable specialists should be advocated to efficiently treat such patients. Properly fabricated closed hollow bulb obturator to restore acquired defects impeccably furnishes patient's social, emotional and functional needs. This gives a boost to their life as it was before.

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Legend Figure



Fig. 1: Intraoral view of maxilla

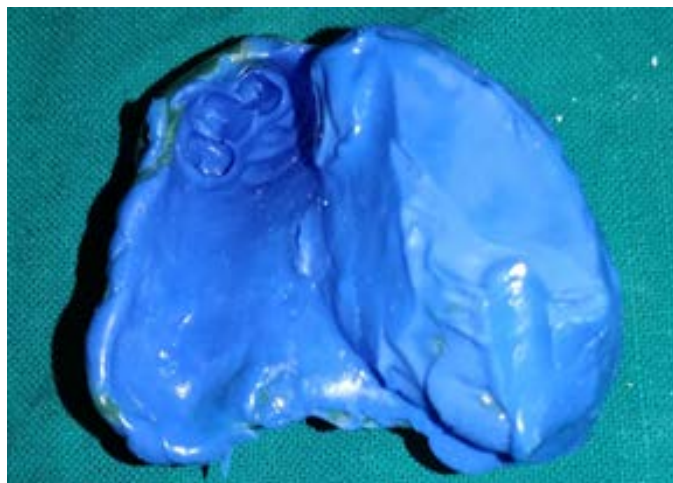


Fig. 2: Final impression



Fig. 3: Packing with table salt wrapped in thin cellophane sheet



Fig. 4: Prosthesis delivered to patient



Fig. 5: Pre-operative and post-operative view



Fig. 6: Extraoral view of patient (Case 2)



Fig. 7: Prosthesis delivered to patient

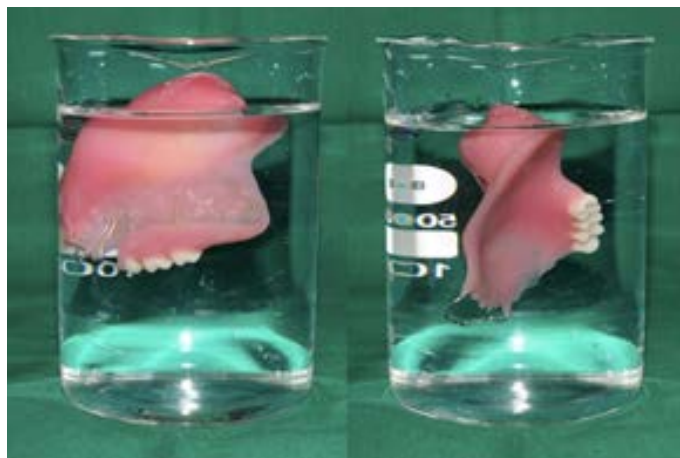


Fig. 8: Hollow bulb obturator of both cases floating on water