Technique - Hollow partial denture with hollow bulb obturator, a novel technique for rehabilitation of post-maxillectomy defect

TECHNIQUE

Hollow partial denture with hollow bulb Obturator, a novel technique for rehabilitation of post-maxillectomy defect

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Abstract

Rehabilitation of hemimaxillectomy patients can be challenging. The obturator is a prosthesis commonly used as an effective means for rehabilitating hemimaxillectomy patients. The size and location of the defect usually influences the extent of impairment and difficulty in prosthetic rehabilitation. Retention, stability, and support are the three major factors that a prosthodontist has to deal with when a patient is rehabilitated with the obturator. The increased weight of the prosthesis when closing large defects is often a concern to its retention. Light-weight obturators are thus warranted in such clinical situations. This article describes a novel technique of prosthetic rehabilitation of a large post-maxillectomy defect by using hollow partial denture along with a hollow bulb obturator.
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Introduction

Intraoral defects in the maxilla occur due to trauma, pathological changes, radiation, burns, or surgical intervention. The size of these defects can vary from small to large, and they may include portions of the hard and soft palate, alveolar ridges, and floor of the nasal cavity. Defects in the maxilla can result in hypernasal speech, fluid leakage into the nasal cavity, and impaired masticatory function. The major objectives of the rehabilitation a maxillectomy patient are restoration of the functions of mastication, deglutition, and speech and normal orofacial appearance. An obturator is defined as a prosthesis used to close congenital or acquired tissue opening, primarily of the hard palate and or contiguous alveolar structures. Lack of retention, stability, and support are the common problems encountered in patients undergoing rehabilitation with maxillary obturators. The size of the defect, number of remaining teeth, amount of remaining bony structures, and the ability of the patient to adapt to the prosthesis are few factors that affect the prognosis of the treatment. The bulb of the obturator must be extended far enough into the defect so as to seal it and engage small undercuts, thereby increasing its stability and retention.

Weight and gravitational force act as dislodging factors for the maxillary obturator. Hollowing out of the obturator bulb and the denture not only reduces the weight of the prosthesis but also prevents undue pressure on tissue undercuts. In this article, we describe a novel fabrication technique of rehabilitating an acquired maxillary defect using a hollow bulb obturator incorporated on a hollow partial denture and present a case managed using this technique.

Case report

A 45-year-old man visited the Department of Prosthodontics, Government Dental College, Kottayam, for the rehabilitation of a 2-year-old maxillary defect after partial hemimaxillectomy due to adenoidcystic carcinoma of the left maxilla. Intraoral examination revealed an Aramany’s Class IV maxillectomy defect on the left side (Figure 1).
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Figure 1: Maxillectomy defect

The palatal defect showed complete healing with a band of scar tissue on the lateral margin. The patient had difficulty in mastication, speech, and nasal discharge. The lateral band of scar tissue and limited tissue undercuts were the only available sources of retention in the tissue-fitting side of the prosthesis. Hence, the overall weight of the prosthesis had to be reduced to improve retention and stability. The prosthesis was thus planned as a hollow bulb obturator\(^2\) attached to a removable partial denture where the teeth-bearing area was hollowed out by using a novel fabrication technique.

**Impression Procedure**

A cotton pack coated with petroleum jelly was placed in the defect to prevent entry of the impression material into the nasal cavity. An impression of the palatal defect was made using a stock tray with putty vinylpolysiloxane impression material. The impression was relined with light body material to record maximum details of the defect (Figure 2). The impression was transferred to type III dental stone. The master cast was duplicated, and a permanent denture base was fabricated from the master cast (Figure 3).

Figure 2: Impression of the defect  Figure 3: Master cast

**Fabrication technique of hollow bulb obturator**

The master cast was waxed up with retentive clasps on the appropriate teeth, and the permanent base along with the superior surface of obturator bulb was fabricated in heat-activated polymethylmethacrylate resin (Figure 4). A tablespoon of salt was placed
over the defect in the obturator, and the normal palatal contour was reconstructed over it by using autopolymerizing polymethylmethacrylate resin (Figure 5-6). A small hole was drilled over this to allow the salt to escape under a stream of water. This helped in hollowing out the obturator and thus reducing its weight. The hole was then closed using autopolymerizing polymethylmethacrylate resin (Figure 4-6).

![Figure 4](image1.png)  ![Figure 5](image2.png)  ![Figure 6](image3.png)

**Figure 4** Investing the wax up for fabrication of permanent base; 5: Salt placed over the defect area of the obturator; 6: Salt-filled area closed with autopolymerizing resin

The permanent base was fitted in the patient to check for retention, stability, nasal discharge, and comfort. The base was then replaced on the duplicated cast and a wax-bite rim fabricated over it. After assessing jaw relation, articulation, and teeth arrangement (Figure 7), the cast was again fitted in the patient’s mouth.

**Fabrication of hollow partial denture**

Two split dental flasks with interchangeable top halves were used to fabricate the hollow denture. After trial insertion, the waxed partial denture was invested in the first flask with a dental plaster, the wax was boiled out, and the two halves of the flask were separated out [Figure 8-10].
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A wax shim consisting of 2 layers of the base plate wax was then applied over the denture teeth area of the flask [Figure 11], ensuring that the lid of the flask containing the invested definitive cast and the processed record base closed completely with the wax shim in place. The wax shim was thinned down in areas of such interferences. The processed record base in the top half of the flask was set aside for use in the later part of the procedure. The bottom half of the first flask containing the denture teeth with the wax shim in place was then topped and flaked using the lid of the second flask. After dewaxing, separating media was applied, and heat-activated polymethylmethacrylate resin was packed and processed (Figure 12). Thus, 2 halves, *i.e.*, the processed record base with obturator bulb and the other half containing denture teeth, which were then fused together (Figure 13).

Figure 11: Wax shim applied over the denture teeth; 12: Dewaxing; 13: Hollowed base with teeth and permanent base
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Notches were made along the borders of the 2 halves to be fused (Figure 14). Any excess acrylic resin on the inner surface of the half containing the denture teeth that would constrict the hollow cavity was reduced. Care was taken to avoid uneven reduction of the acrylic resin by estimating the acrylic resin thickness by using a Boley gauge (Figure 15). The two parts were then fused with autopolymerizing polymethylmethacrylate resin by laboratory remount (this eliminated errors in the orientation of the 2 parts) (Figure 16). To ensure complete seal, the denture was allowed to float in a bowl of water (Figure 17).

It was then finished and polished. The final prosthesis was inserted [Figure 18] to evaluate for extension occlusion, speech, and necessary adjustments were made. There was considerable improvement in speech, deglutition, and aesthetics. On review, the patient reported that he was very satisfied with the function and comfort of the prosthesis (Fig 19, 20, 21).
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**DISCUSSION**

Obturator designs for partial and total maxillectomy defects include open and closed hollow obturators, inflatable obturators, and two-piece hollow obturator prosthesis. Undesirable weight of palatal obturators for postoperative maxillary defects is a common problem in maxillofacial prosthetics. Functional demands of speech, mastication, and deglutition require that the obturator seal the defect to prevent loss of air and fluids through the nose. To accomplish this, the obturator is usually extended superiorly into the nasal cavity, resulting in a heavy prosthesis. Discomfort, loss of retention, and frictional contact with friable tissues surrounding the defect are often the consequences.

Wu and Schaaf showed that depending on the size of the defect, hollowing the obturator for partial maxillectomy patients significantly reduced the weight of the obturator by 6.55% to 33.06%. A hollow bulb obturator along with a hollowed-out denture considerably reduces the weight of the prosthesis and offers the following advantages: (1) increased retention and thus improved physiologic functions, such as deglutition; (2) improved patient comfort and efficiency; (3) decreased pressure on the surrounding tissues; (4) good regeneration of tissues; (5) reduced chances of excessive atrophy and physiologic changes in the muscle balance; and (6) improved self-confidence of the patient.

**Conclusion**

One of the primary objectives of the rehabilitation of maxillary defect by using the obturator is the recreation of the partition between the oral and nasal cavities. Successful replacement of such a partition

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**Figure 18**: Final prosthesis; **19**: Try-in for final adjustments; **20**: Before treatment; **21**: After Treatment
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improves deglutition and enhances speech intelligibility. Restoration of aesthetics is achieved by the replacement of the missing teeth. We presented a case of rehabilitation of partial maxillectomy by using a definitive hollow bulb obturator with hollow partial denture. We also discussed a novel, economical and time-saving technique of fabricating hollow bulb obturator with hollow partial denture for achieving considerable reduction in the total weight of the prosthesis. This definitive obturator helped improve the quality of the life of the patient.

**References**


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