Lost Salt Technique for Fabrication of Closed Hollow Bulb Obturator in Maxillectomy: A Case Report

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ABSTRACT

Maxillectomy defects can result in oroantral communication leading to difficulty in swallowing, deglutition, impaired speech and not to mention the resultant facial disfigurement. Prosthetic rehabilitation of such defects is often challenging due to the extent of the defect area along with the absence of adequate retention caused by the size and weight of the prosthesis. To fabricate a lightweight prosthesis, an open hollow obturator or a closed hollow obturator is usually chosen. This case report describes a simple and one step fabrication of a closed hollow bulb obturator using the traditional lost salt technique in a patient with maxillectomy.

Key words: Maxillectomy; Maxillofacial prosthesis; Mucormycosis

INTRODUCTION

Maxillectomy is the removal of part or all of the maxillae[1] and is usually performed in acquired lesions like squamous cell carcinoma and mucormycosis. It is often extensive as it spares little hard and soft tissues in the oral cavity.[2] Following maxillectomy, rehabilitation can be done either by reconstructive surgery or prosthetic rehabilitation. Reconstructive surgery using grafts and tissue regeneration requires additional surgery, is expensive and necessitates several visits. Prosthetic rehabilitation can be a suitable alternative approach which provides the patient with new confidence to rejoin social life.[3] Maxillary obturator prosthesis is a frequent treatment option for these patients.[4]

Conflict of Interest: None

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The glossary of prosthodontic terms defines an obturator as "a maxillofacial prosthesis used to close a congenital or acquired tissue opening, primarily of the hard palate and/or contiguous alveolar/soft tissue structures".[1] Based on the phases of treatment, obturators can be classified as surgical, interim and definitive obturator. Based on the extent of the defect, obturators may be either soft palate obturator, pharyngeal obturator and hard palate obturators. Definitive obturators can be either closed hollow bulb obturator or open hollow bulb obturator.[5]

Both open and closed hollow obturators are lightweight and are readily tolerated by the patient while effectively extending into the defect.[6] The bulb portion of the obturator which accommodates the defect area often increases the weight of the prosthesis and exerts a dislodging effect on the obturator.[7] So, the bulb portion is usually hollowed out by various methods to decrease the weight of the prosthesis. By decreasing the weight of the prosthesis, retention and stability of the prosthesis can be increased.

There are various methods available to fabricate the hollow bulb portion of the prosthesis.[8] This paper presents a simplified and one step technique for fabrication of closed hollow bulb obturator using traditional lost salt technique.

CASE REPORT

A 35-year-old male patient was referred to the Department of Prosthodontics from the Department of Ear, Nose and Throat (ENT) for the fabrication of surgical obturator as the patient was scheduled for surgery. History revealed that he had type 2 diabetes mellitus and was under medication for 1.5 months. He was an alcoholic, smoker and betel nut chewer for approximately 10 years.

On intraoral examination, there was grade 3 mobility of teeth from maxillary right canine to the left third molar, multiple abscess with pus discharge, redness and swelling in the gingiva in maxillary arch and swelling over the hard palate (Fig 1).

His lab investigation showed that HbA1C was 10.49%, serology for HIV, HCV and SARS-COV2 infection were negative. The radiographic impression was likely invasive fungal sinusitis on the left side and clinical radiographic diagnosis was mucormycosis of left maxillary sinus. Surgical procedure planned by the concerned department was left infrastructure maxillectomy with debridement of necrotic tissue under general anesthesia.

Primary impression was made with irreversible hydrocolloid impression (Algitex, India) and casts were poured with dental stone (Kalstone, Kalabhai Karson Pvt. Ltd, India) (Fig 2). Initially surgeons had planned on extracting all teeth, so the maxillary cast obtained was modified according to surgeon's guidelines. All the teeth were trimmed from the cast and smoothened with acrylic burs. Separating media (cold mould seal, DPI, India) was applied and surgical obturator was fabricated with auto polymerizing resin (self-cure acrylic repair material, Dentsply India Pvt. Ltd., India). After the material set, it was trimmed to adequate thickness, smoothened and polished (Fig 3). Later during surgery, teeth 15,16,17 and 18 were spared and the modification were made to the obturator accordingly. Insertion was done immediately after surgery by the surgeons of the concerned department and follow-up was done after 24 hours of surgery.

Patient reported after 4 months following maxillectomy for the fabrication of definitive obturator. The tissue bed was examined and definitive obturator was planned (Fig 4). Diagnostic casts were obtained for the required mouth preparation (Fig 5). Rest seats were prepared in teeth 15 and 17 after surveying (Fig 6) and final impression was made with light bodied addition silicone (elite HD+, Zhermack, Italy) and picked up with putty consistency addition silicone (elite HD+, Zhermack, Italy) (Fig 7). The impression along with design was transferred to dental laboratory for the fabrication of cast metal framework (Fig 8). Subsequent steps of maxillomandibular relation, articulation, try-in were performed in a conventional method.

At the step after dewaxing, following techniques were implemented to fabricate hollow bulb obturator. First, undercuts were blocked out and separating media (cold mould seal, DPI, India) was applied on the depth of the defect, then auto-polymerizing resin (self-cure acrylic repair material, Dentsply India Pvt. Ltd., India) was placed on the depth of the defect of master cast which would be the roof of the bulb in final prosthesis (Fig 9). After the material set, it was carefully removed from the cast, trimmed to the thickness of 2 mm and placed back into the defect area. For the fabrication of the hollow part of the denture, the bulb portion of the prosthesis was filled with approximately 10grams of table salt and then covered with heat cure acrylic

resin (Trevalon Denture Material, Dentsply India Pvt. Ltd., India). Trial closure was done, excess material removed and then processed (Fig 10). Conventional curing cycle was employed to cure the resin. After processing, three small openings were made on the walls of the prosthesis with acrylic removing bur and the salt inside the prosthesis was eliminated through the openings created by injecting water from one hole and removing dissolved salt from the other (Fig 11). The openings were then sealed with auto polymerizing resin. The final prosthesis was finished, polished and delivered to the patient (Fig 12). The post insertion maintenance instructions were given to the patient and patient was kept in follow-up after 24 hours, 3 months and 6 months.

Figure 1: *Preoperative photograph*

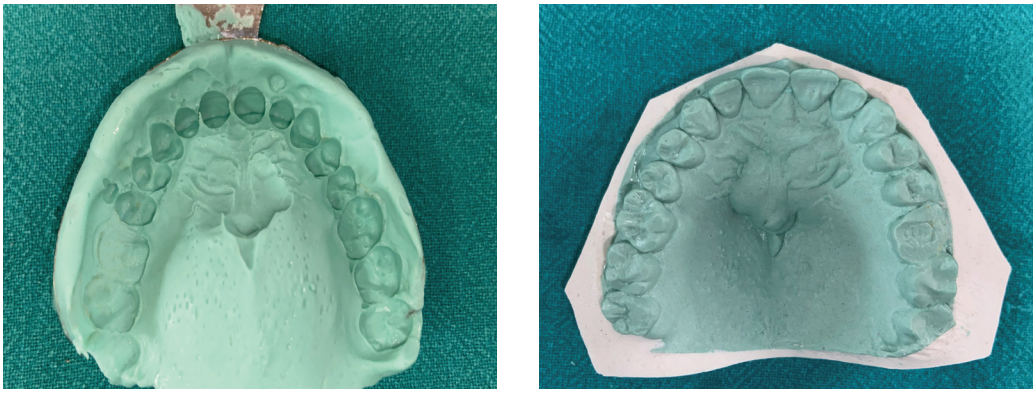

Figure 2: *Preoperative impression and cast*

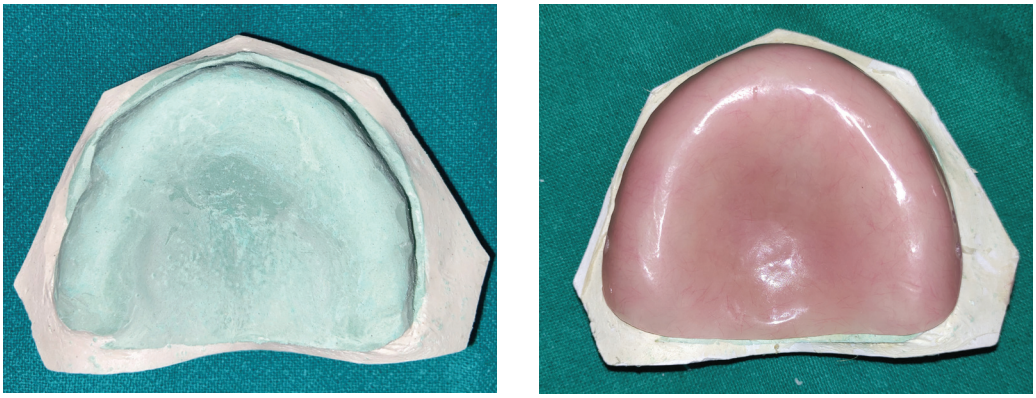

Figure 3: *Fabrication of surgical obturator before surgery.*

Figure 4: *Extent of the intraoral defect after 4 months post maxillectomy*

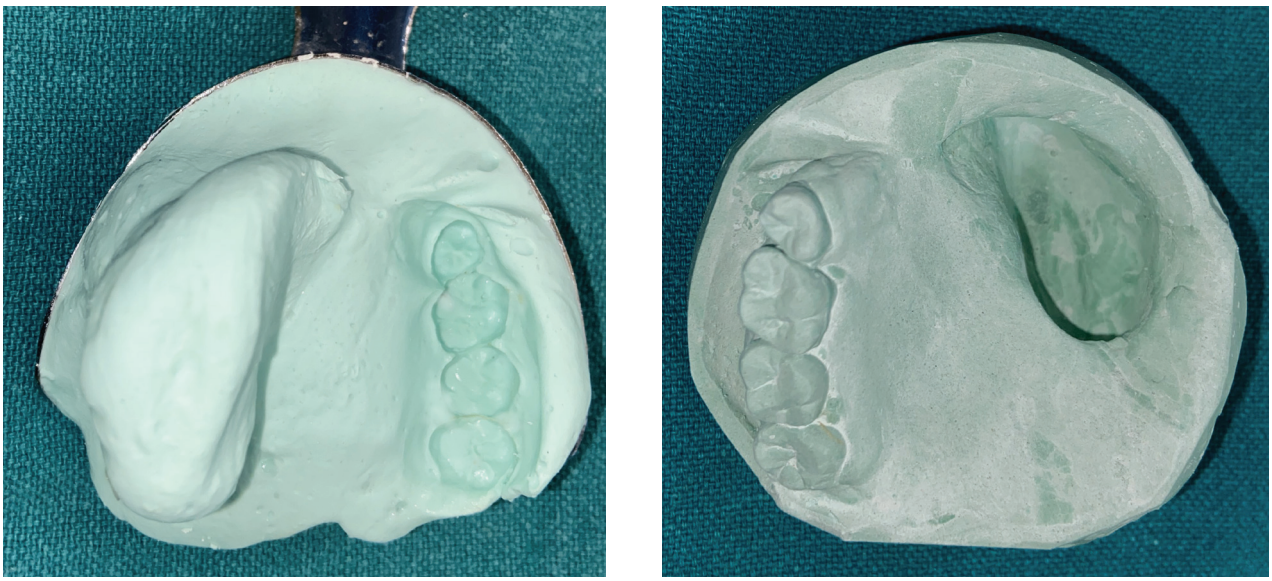

Figure 5: *Diagnostic impression and cast*

Figure 6: *Rest seat preparation*

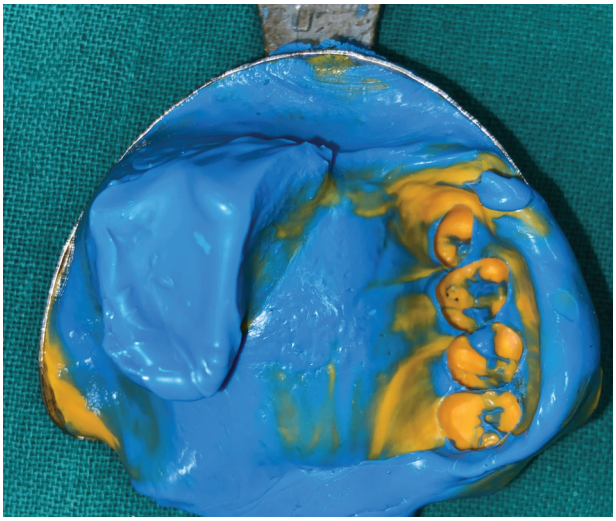

Figure 7: *Final impression.*

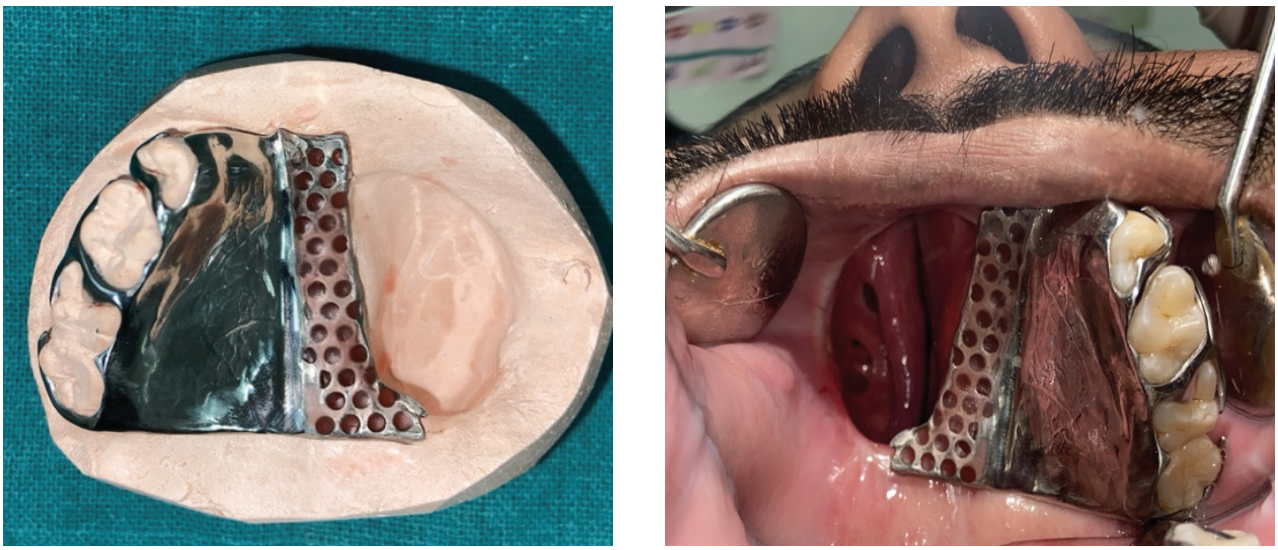

Figure 8: *Metal framework and try-in*

Figure 9: *Placement of auto-polymerizing resin on the depth of the defect after dewaxing*

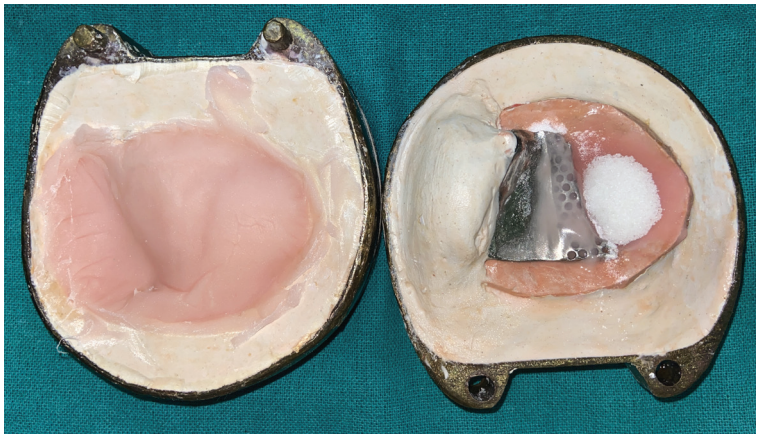

Figure 10: *Placement of salt inside the bulb portion and packing with heat cure acrylic.*

Figure 11: *Dissolving salt through the holes*

Figure 12: *Final prosthesis delivery*

DISCUSSION

The weight of the maxillary obturator can be significantly reduced by hollowing out the bulb portion.[9] The bulb portion of the obturator can be solid, open hollow or closed hollow. Both open hollow and closed bulb obturators are lightweight and has the advantage of reduced weight and improved speech. Open hollow bulb obturators accumulate mucous and fluid leading to bad odor. On the other hand, closed hollow bulb obturators do not pool moisture and accumulations of any type, while still extending adequately into the defect and providing more retention and support.[7] A hollow maxillary obturator may reduce the weight of the prosthesis by up to 33%, depending upon the size of the maxillary defect.[10] Wu and Schaff

showed that hollowing the obturator for partial maxillectomy patients significantly decrease the weight of the obturator from 6.55% to 33.06% depending on the size of the defect.[9]

Several methods have been described in the literature to overcome the difficulty with the fabrication of the hollow portion of the obturator.[7] One of the classical methods for hollowing an obturator is grinding out the interior portion of a solid bulb after processing and fabrication of the lid portion separately but it is hard to control the thickness of the obturator and is also time consuming.[11] Processing the two halves of the obturator separately followed by joining them with auto-polymerizing resin has also been described in the literature but the sealed area presents as a site for water leakage, promoting bacterial growth and discoloration.[12] Two-step processing technique using preformed plastic shapes, plaster matrix, resin shim and a polyurethane foam are also described in the literature.[4] Various materials such as salt, sugar, ice, polyurethane foam and sponges have been used as a medium inside the bulb to support its hollow portion during processing.[7]

In our set-up, salt was utilized which is readily available and cheap. Separate lid fabrication and subsequent luting of the lid to the prosthesis were avoided thereby reducing laboratory time. Thus, convenience, time, and cost savings are advantages of the one- time processing method followed in this article. A metal framework obturator was planned for this patient since it offered several advantages, including its durability and ability to conduct heat, allowing normal stimulation of the supporting structure.[13] One of the disadvantages of this technique could be the use of auto polymerizing resin which has poor mechanical properties compared to heat cure acrylic resin resulting in discoloration, possibility of leakage into hollow extension in the future, and roof of the bulb may be weaker making it prone to fracture.[8]

CONCLUSION

Maxillary obturators are still considered to be more affordable and easier option than surgical reconstruction for most patients since they are less invasive. Prosthodontists play a significant role in the successful rehabilitation of patients treated with maxillectomy. A thorough understanding of the patient's needs and extensive expertise is critical in effectively rehabilitating such cases.

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