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Customised Flask for Maxillofacial Prosthesis- A Novel Approach

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Conflicts of Interest - Nil

Abstract: Processing wax pattern to fabricate obturators for a large-sized maxillary resection by employing compression molding technique through a conventional flask is a difficult task. To overcome this, a customized flask has been introduced which could accommodate large wax patterns and allow polymerization of the acrylic resin by following conventional flasking and packing techniques. It is a straightforward approach and an economical way to process the prosthesis.

Keywords *– Flasking, interim Obturator, PVC pipe, maxillary defect, acrylization*

Introductiona

Maxillary defects of congenital, traumatic, or oncologic origin can be rehabilitated through the use of a maxillary obturator prosthesis. An intraoral prosthesis such as an obturator is defined 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]. This custom-made prosthesis replaces the missing structures of the maxilla, occludes oro-antral communications, prevents oronasal regurgitation, and assists the patient in deglutition and speech production. [2,3] Based on the phases of rehabilitation, the obturator can be surgical, interim, or definitive.

Depending on the extent and location of the defect, various methods have been reported in the past for processing maxillary obturators[4-7]. A smaller-sized defect can easily be reconstructed surgically subject to favorable tissue response. Large maxillary defects are often associated with the loss of hard tissues and soft tissues including bone and teeth complicated with overlying soft tissue collapse. In such situations, the prosthetic obturators help to a great extent as they not only replace the defect portion but also provide masticatory and speech functions by replacing the teeth and natural anatomical form of the missing structures. Obturator bulb extensions planned for a large-sized defect can be solid, open hollow or closed hollow type. Several materials such as heat cure resin, cold cure resin, light cure resin and sometime even metal have been used to fabricate obturators[8]. A challenging endeavor in the fabrication of an obturator is the acrylization of a large volume maxillary defect, due to the restricted size of the compression molding flasks.

This article presents simple, economical and modified technique for construction of a huge open bulb interim obturator using PolyVinylChloride (pvc) pipe and its accessories for patients with large-sized maxillary defects.

Case Report

A 68-year-old male patient was referred to the department of Prosthodontics, for the rehabilitation of a palatal defect. Patient underwent surgery for cancer almost 20 years back which led to the removal of part of maxilla and associated structures. Surgery led to disfigured face and problems with mastication and speech.(Fig 1) The prosthesis used by the patient earlier was made taking support of remaining teeth and defect in TATA memorial cancer hospital, Mumbai, India. Patient came to department complaining of loosening of prosthesis due to loss of few remaining teeth. On examination, restricted mouth opening was noticed and there was a huge defect with thin band of soft tissue in posterior region with two teeth remaining. As a definitive prosthesis, implant supported definitive prosthesis was planned for the patient. This case report describes about the fabrication of an interim prosthesis processed using a customised flask.

Primary impression was made using irreversible hydrocollide (Algitex, DPI, INDIA) with modified stock metal tray (Fig. 2). Primary cast was poured using type 2 gypsum product (Neelkanth Dentco, INDIA) (Fig. 3). Customised tray was made to make final impression. Impression compound was used to record the defect. Final impression was made using rubber base impression material (3M ESPE Monophase, India) (Fig. 4). Final impression was poured in type 4 gypsum product(Kalrock, India) using two-pour technique to get access to the intaglio surface of the defect (Fig 5). Record bases were made using self-cure auto polymerising resin (stallon, DPI, INDIA). Wax rims were made using modelling wax(Hindustan, INDIA) to record jaw relationships (Fig 6). Jaw relation with both upper and lower casts were mounted on mean value articulator. Teeth arrangement was done and try in procedure was done in patient.

1. After the evaluation of a trial prosthesis in the patient, the prosthesis was sealed to the master cast for flaking procedure.
2. To reduce the weight of the prosthesis, an open bulb obturator design was planned.
3. A large size Poly Vinyl Chloride (PVC) pipe and the lid on the pipe for the closure (7 inches x 5 inches) have been used as a flask instead of the conventional flask. (Fig 7)
4. Escape vents were made on the lid for the excess investment material to flush out. (Fig 8)
5. The first pour was done using plaster of paris (Type II gypsum product) in the ratio of 40g/100ml and the master cast with a sealed wax pattern was secured in it. (Fig 9)
6. Separating media was applied and the second pour was carried out using a combination of dental stone and plaster of paris.
7. Dewaxing was completed by placing the PVC pipe into a water bath of 100^0C for 10 minutes and the retrieved flask was dried. (Fig 10)
8. For the fabrication of the interim obturator, heat cure acrylic resin was mixed and packed into the flask.
9. Openings were made on the upper compartment of the flask to aid in the orientation of the upper and lower flasks. (Fig 11)
10. Post bench curing for 1 hour, acrylisation was carried out in an acrylizer for 8 hours at 74^0C.
11. The final denture was retrieved from the flask and was finished and polished. (Fig 12)

Intraoral adjustments were made and the retention for interim obturator was obtained through clasps. The patient was educated about the usage of the prosthesis, and he was satisfied with the improved speech and function. (Fig 13)

Discussion

The degree of obturator extension into the defect varies according to the configuration of defect, character of its lining tissue and functional requirements for stabilisation support and retention of prosthesis. Usually, open bulb type of obturator is planned to reduce weight of the prosthesis, easily cleansable and easy to insert in limited mouth opening[9].

There are many methods available to fabricate open and closed hollow bulb obturators. The reduced weight of both the type of prosthesis makes them more readily acceptable to the patients. The open bulb obturator is easier to fabricate and adjust; thus, it is constructed more frequently than the close hollow obturator. However, it is difficult to polish and clean the open hollow bulb obturator which may lead to accumulation of food and nasal secretions inside the hollow part. This in turn leads to malodour, an increase in weight and chance of infection[10].

Conventionally, brass flasks have been used to process the acrylic resin denture bases through the compression molding technique.[11] A temperature-controlled water bath allows the polymerization of acrylic resin when the packed flasks are placed in it for a specified duration. However, these flasks cannot be used for the fabrication of an obturator or any other large intraoral prosthesis as they do not fit into it. Alternative methods have been suggested in the past[12.13] but, they are either expensive or the availability to acquire the material is restricted.

To overcome the above-mentioned obstacles, a novel approach has been suggested to flask any prosthesis for large-sized defects. The use of PVC pipe as a flask is an inexpensive way to fabricate the obturator. It was observed that the processed denture had clinically acceptable properties, did not show any porosities, and was easy to trim and polish.

The poly vinyl chloride pipe is thermoplastic and can withstand an average temperature of 95^0C. They are available in various diameters and lengths. Two pipes are joined with connectors, or one pipe will be slightly wider than other which will be joined using adhesives. These pipes can be closed one end with pvc lids which has slightly bigger diameter using adhesives. Here all these were used to fabricate suitable size flask. Disadvantage of pvc pipes is, it may undergo distortion above certain temperatures. This can be avoided since there is set investment material which can sustain higher temperatures and it'll maintain dimension stability of pvc pipes at higher temperatures by supporting it. According to dimension of master cast and waxed up obturator on it, suitable sized pvc pipe and other accessories were selected. There should be enough space between pvc pipe and master cast with waxed up denture for the investment material to flow. Pvc pipe was cut according to height of master cast with waxed up obturator. Upper compartment was selected with a wider diameter end. Lower compartment was selected with a pipe of uniform diameter. Both ends were closed with slightly bigger diameter pvc lids using adhesives. Small holes were made on both lids for escape of excess investment material also it gives retention between pvc pipe and investment material. Openings were made where there was an interface between the first and second pour. Since there is no orientation slots like brass flask. Indexing were made in first and second pour meets. These indexes were made in such a way it was seen through openings made in pvc pipes. So that both compartments were oriented in correct positioned repeatedly while opening and closing also during packing.

Since patient had undergone the surgery and radiation therapy, there was restricted mouth opening. During the procedure care was taken to place impression trays and other record bases. Due to the restricted mouth opening, the obturator could not be extended to complete depth of the defect. Further, to achieve more retentive and stable obturator which improves patient's quality of life we have planned for two zygomatic implants on defect side with attachments.

Different types of retentive aids such as magnets, snap on(friction type) attachments, acrylic buttons, retentive clips, and implants are used for the conventional obturator prosthesis. The use of implant is a new advancement in maxillofacial prosthodontics. They effectively improve the retention of the prosthesis without the help of other appliances. However, cost, health of the patient and bone qualities are some of the factors which limit the use of implants.[3,9]

The technique described in this article is cost-effective and does not require any expensive lab equipment. Hence, it is a simple, straightforward approach to process obturators for large-sized defects.

Conclusion

To restore the patient's lost esthetics and functional activities with the help of an obturator, the clinician must impart the best of his knowledge with the available materials and techniques. The use of PVC pipe as described in this article is an inexpensive, simple way to fabricate an obturator for large volume maxillary defects. This technique can be used by clinicians as an alternative approach for processing obturators/ intraoral prostheses of a large volume maxillary defect.

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Figures

Fig 1 - Pre-operative frontal and lateral profile

Fig 2 - Primary Impression made in irreversible hydrocolloid

Fig 3 - Primary cast poured in plaster of paris

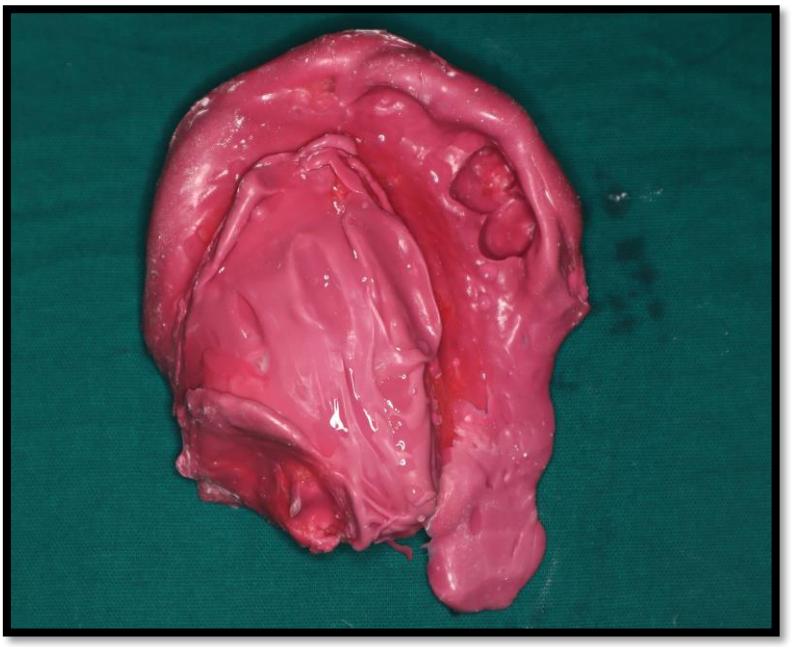

Fig 4 - Final Impression

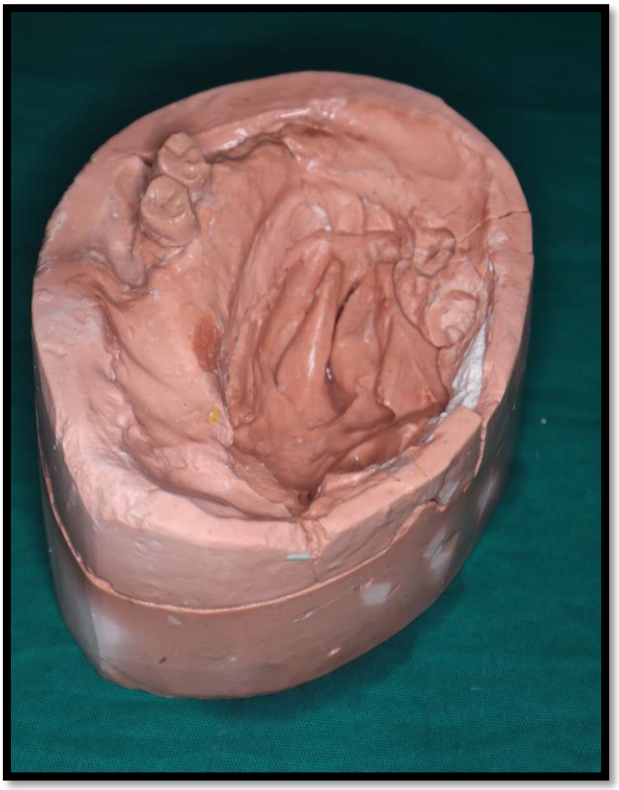

Fig 5 - Master cast poured in die stone.

Fig 6 - Jaw Relation Recorded

Fig 7 – PVC Pipe (7 inches*5 inches)

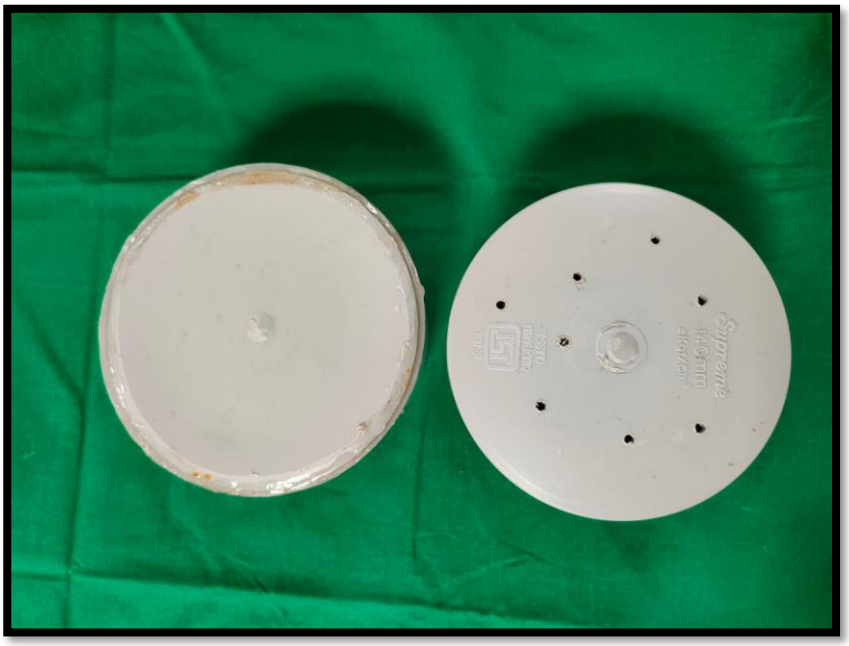

Fig 8 – Escape vents made on the lid

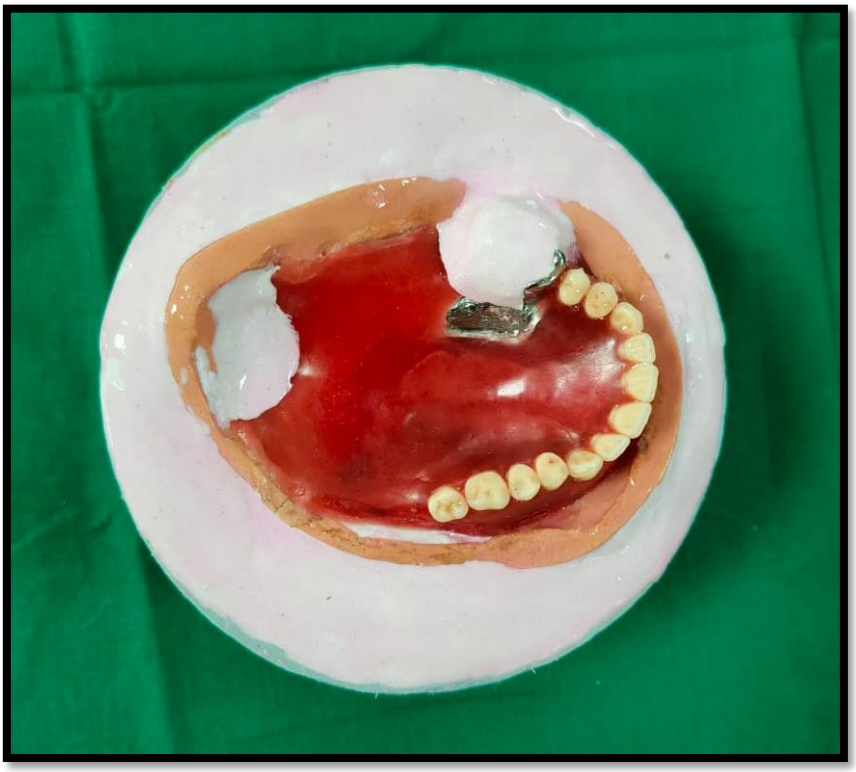

Fig 9 - the first pour was done using plaster of paris

Fig 10 – Post dewaxing

Fig 11 – Hydraulic press used to compress the flask and promote flash

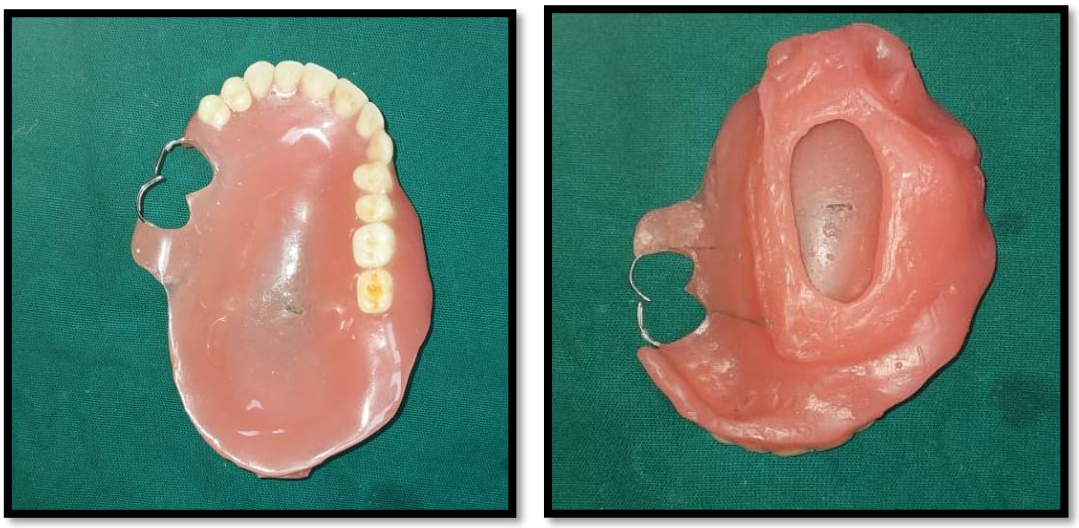

Fig 12 – Interim obturator after finishing and polishing.

Fig 13 – Post Operative front view