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RESEARCH ARTICLE

AN INNOVATIVE TECHNIQUE FOR ACRYLISATION TO FABRICATE HOLLOW BULB OBTURATOR USING CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE

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Abstract

The goal of prosthodontics is the rehabilitation of missing oral and extra-oral structures with the restoration of normal function of chewing, speech, swallowing, appearance, etc. Malignancies are common in the oral region and are treated through surgical intervention. Surgical intervention creates anatomic defect which forms communication among the oral cavity, nasal cavity, and maxillary sinus. In such cases, it is very difficult for the patient to perform various normal functions like mastication, swallowing, speaking, etc. Prosthodontic rehabilitation with an obturator prosthesis restores the missing structures and acts as a barrier between the communications among the various cavities. The main problem with the rehabilitation of defects difficulty involving in the processing of bulky prosthesis. Different techniques have been described in the literature using cardboard boxes,custom-made flasks or no flask at all which are having their own drawbacks affecting the dimensional stability of the prosthesis. This case report describes a simplified, inexpensive and easy method of processing an obturator for the rehabilitation of a maxillary defect using chlorinated polyvinyl chloride (CPVC) pipes.

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Introduction:-

Probably the most common of all intraoral defects are in the maxilla, in the form of an opening into the antrum and nasopharynx. Defects in the maxilla may be divided into these defects resulting from congenital malformations and the acquired defects resulting from surgery for oral neoplasms. The opening produced may be quite small or it may include any portion of the hard and soft palate, the alveolar ridges, and the floor of the nasal cavity (Chalian et al., 1971)[1].

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”. On the basis of extent of involvement of the defects, this prosthesis may differ in shape and size. Ideally, this prosthesis

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should be constructed easily, be lightweight, provide better retention, support, and stability, and be functionally acceptable to the patient. The obturator prosthesis plays a very important role in the functional recovery of postmaxillectomy patients[2].

For definitive palatal obturators, the undesirable weight of the prosthesis becomes a challenge as it affects the retention, stability, and support of this maxillofacial prosthesis. unacceptable oroantral or oronasal seal[3]. To fabricate a lightweight prosthesis, an open hollow obturator is usually chosen which is more readily acceptable to the patients. The open hollow bulb obturator is easier to fabricate and adjust; thus it is constructed more frequently than the closed hollow obturator[5,6].

The highlights of present case report wereto use innovative technique for acrylization of hollow bulb obturator using CPVC Pipes.

Case Report:

A 67-year-old male patient was referred from the department of oral and maxillofacial surgery to the department of Prosthodontics for prosthetic rehabilitation of a post-maxillectomy with bilateral defect case after surgical removal of maxilla due to mucormycosis. The patient complaints of difficulty in chewing, nasal regurgitation of fluids, compromised esthetics, disharmony, and difficulty in speech with nasal twang in his voice. Extraoral examination revealed collapsed mid face. Intraorally, healthy post-maxillectomy defect on the right and left side of maxillary edentulous area and completelyedentulous area in mandibular arch was seen (Fig.1). A hollow bulb obturator using polyvinyl siloxane with glycerine soap was planned for the prosthetic rehabilitation of this patient.

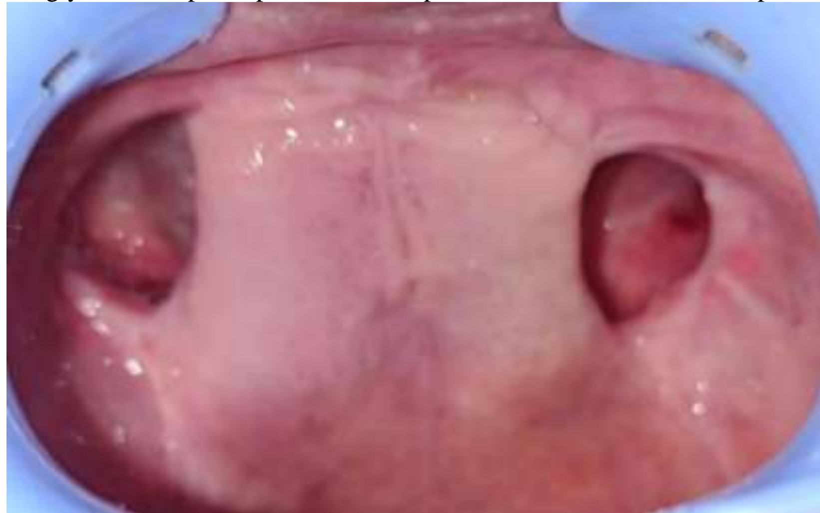

Fig.1:- Intraoral defect area.

Procedure:

Fabrication of Obturator

The removable partial denture with obturator was made according to the procedure recommended by Zarb et al. and Taylor[4].

Beforemaking the impression in the patient, the site of the defect area, excluding the retentive undercut regions, was carefully isolated with gauze coated with petroleum jelly to prevent the impression material from being locked into the undercuts after the material was set.A preliminary impression was made using irreversible hydrocolloid (ALGITEX) for maxilla and impression compound for mandible(Fig.2).

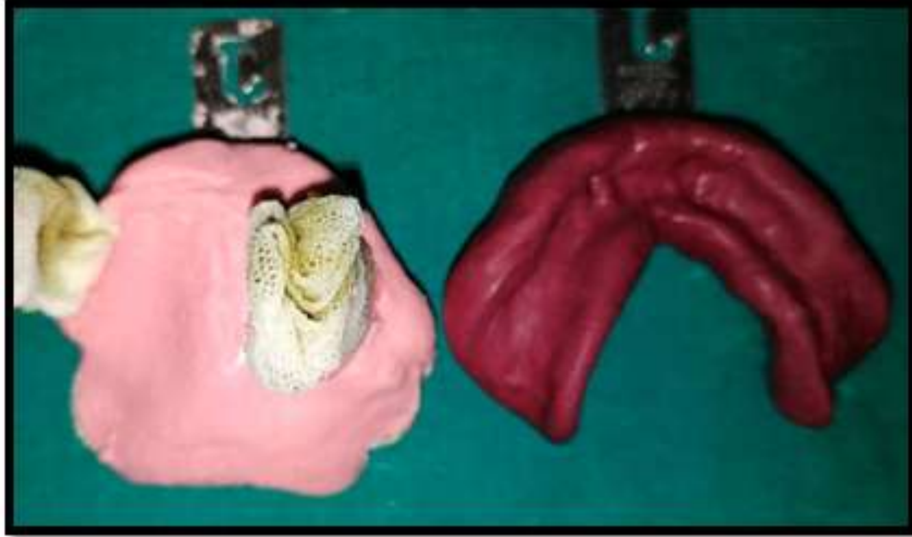

Fig.2:- A preliminary impression.

A custom tray (Fig.3) was fabricated using autopolymerizing acrylic resin (self-cure acrylic repair material, DPI India Pvt. Ltd., India), on the preliminary cast and the extent of the defect was recorded using an elastomeric putty material followed by border moulding using low fusing impression compound (DPI Pinnacle, tracing stick, Dental Products of India, Mumbai).Final impression (Fig.3) was made with low viscosity addition silicone impression material (PRIME AcuSil, Prime product) as shown and the master cast was fabricated using die stone (Goldstone, goldstone Pvt. Ltd., India).

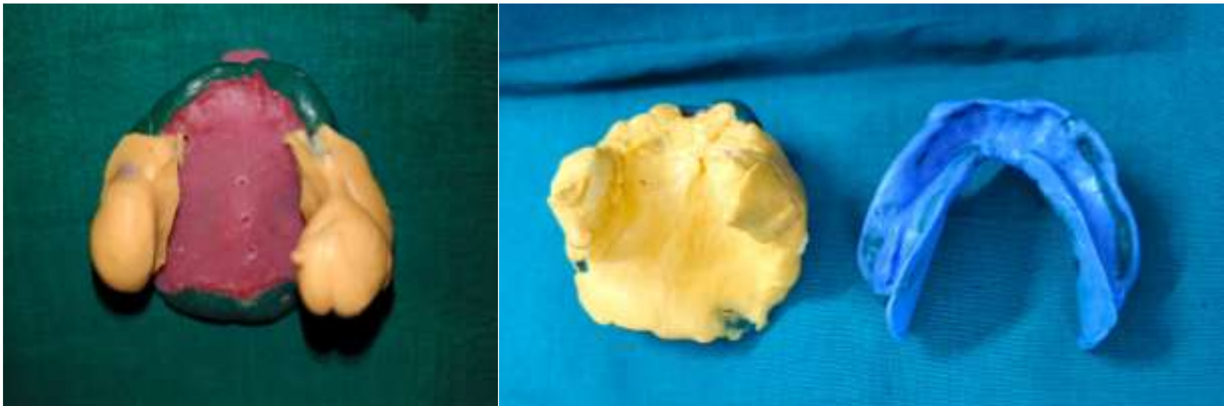

Fig.3:- Final impression.

After the master cast (Fig.4) had been obtained, undesirable undercuts present in the defect were blocked out in wax. Denture base was fabricated and occlusal rims were made. Jaw relation record was obtained and trial denture fitting was carried out.

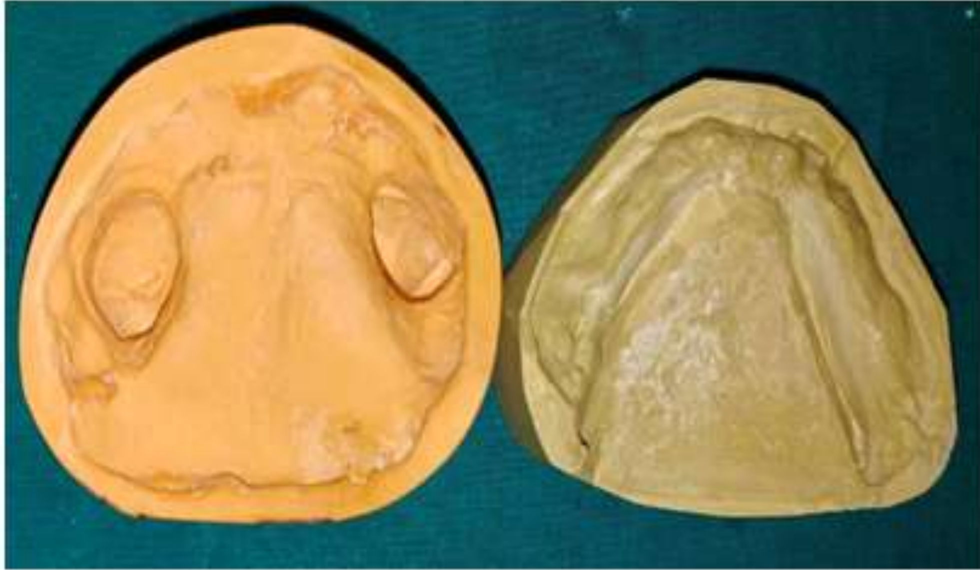

Fig. 4:- Master casts.

After validation of the teeth try-in, the wax model was sealed to the cast at its borders with molten wax. A cavity was created in the wax that fills the defect area using a hot wax knife in such a way that the cavity-wall must be free of undercuts. For processing, depth of the defect wastoo deep so that it causes difficulties in the processingusing conventional flasks. Due to unavailability of the bigger flasks, we used other method. So CPVC pipes were selected in this.

CPVC pipes stands for chlorinated polyvinyl chloride. It is a thermoplastic which is produced by chlorination of PVC resin. Various additives are also introduced in to the resin in order to make the material more receptive to processing[7].

These pipes can sustain high temperature of 150°C without degradation[7]. 2 CPVC Pipes with 5-inch and4-inch diameter which can fit into each other along with lids. 3 rectangular shape vents were drilled in the outer pipe for easy retrievability of flasks. Drill holes in the pipes to pour the investing stone through and to secure the dental stone in place in CPVC pipe. The hole serves as knockout holes when the case is no longer active (Fig.5).Lower half of the PVC pipe compartment is poured with plaster, and the cast placed in it. Separating medium applied over the land area after the setting of first pour in the lower compartment. Upper compartment was placed above the lower compartment. Plaster and dental stone was mixed and poured for good details as well as for better strength in the upper compartment (Fig.6). Tightened the PVC pipe with mechanical press(Fig.7).

Fig.5:- Flasking of maxillary trial denture in CPVC pipe.

Fig.6:- Excess material from holes.

Fig. 7:- CPVC pipe with mechanical press.

After that, the PVC pipe is placed in boiling water for 15 min to soften the wax. Dewaxing was done as per conventional procedure. Detergents were also used to remove impurities. Separating medium was applied with brush to the dewaxed mould space prior to packing the acrylic resin, excluding teeth (Fig.8).

Fig.8:- Dewaxing.

Elastomeric impression material was placed in the defect region to create opening in the obturator (Fig.9). The heat-cured acrylic resin was mixed to a kneadable dough according to the manufacturer's instructions and placed one layer of heat cure acrylic resin and glycerine soap over the alveolar ridge part. Sufficient resin should be used to ensure complete filling of the mould space (Fig.10). The two halves of the PVC pipes are pressed with mechanical press, slowly so that the dough spread out to fill the mould space. Any excess resin will flow out between two halves of the pipe.

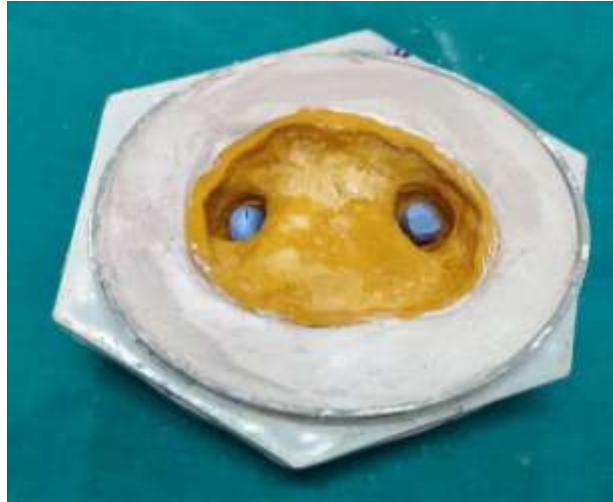

Fig.9:- Elastomeric impression material was placed in the defect region.

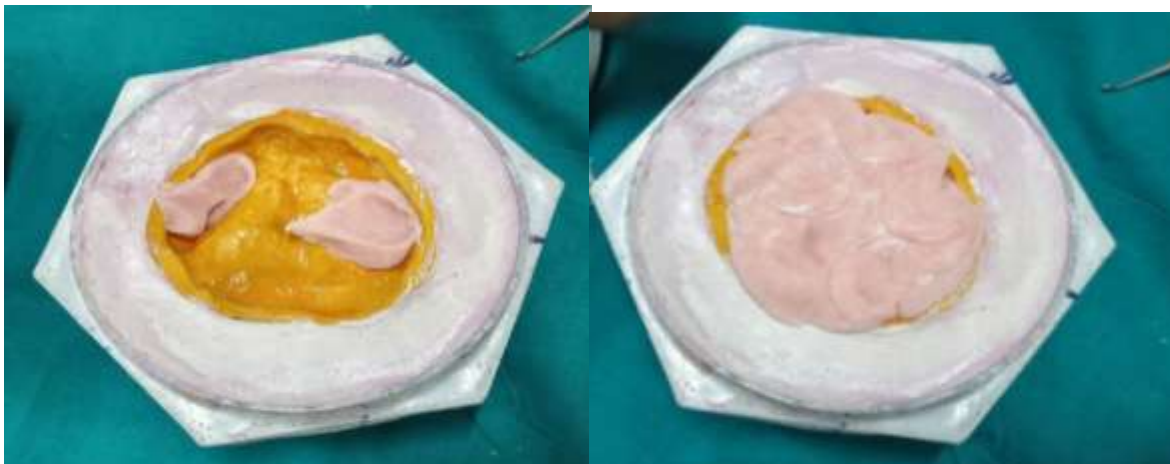

Fig.10:- Packing of heat cure acrylic resin.

After polymerization, deflasking was performed carefully to avoid damaging the denture and the lid. The thickness of the resin in the defect area was checked and any necessary corrections are milled out. A round bur was used to drill theholes and water is flushed to clear out the soap in the denture.The hole was sealed with autopolymerized resin. Denture was subjected to floating test by immersing it in water. The denture floats in water due to its hollow nature. The prosthesis was polished in the conventional manner (Fig.11)

Fig.11:- Final Denture.

Disccussion:-

This article described a new, relatively simple and less time-consuming technique to fabricate an open hollow obturator by using an innovative technique of flasking in CPVC pipe. Several techniques and materials have been described previously to fabricate a lightweight, hollow obturator.

Obturator prostheses have an important role in the recovery of oral function in congenital or acquired maxillary defects. Factors that affect the prosthetic prognosis for these patients are the size of defect, the number of remaining teeth, the amount of remaining bone, quality of existing mucosa, radiation therapy, and patient's ability to adapt to the prosthesis. For completely edentulous patients, surgical removal of the tumour usually causes a poor prosthetic prognosis because of inadequate denture bearing area, lack of stabilization and structures for denture retention; for this reason, a hollow bulb obturator is a better choice to partially solve these problems caused by maxillectomy[5,6]. The goal of rehabilitation is the creation of a prosthesis, which can restore aesthetics and function, while being easy to use, easy to clean to prevent recurrent infections, and which can be readily fabricated by simple, time-saving techniques. Numerous techniques have been described to fabricate a hollow obturator in one piece or two pieces. Hollow bulb obturator prosthesis fabricated by using a PVC Pipe and glycerine soap. A variety of materials and techniques have been described for the fabrication of hollow bulb obturators, including dissolvable materials such as sugar[8], salt[9], frozen ice[10]. After the placement of these materials in the defect area, they are removed from the prosthesis after polymerization with the help of a hole made, then this region is closed with autopolymerized acrylic resin. Other techniques involving the placement of a thermoplastic resin or polyurethane foam in the defective area of the obturator to create a hollow bulb, or techniques using potassium alum crystal, glycerine soap, gas injection and removing resin from inside the obturator to make it lightweight have been described[6].

Patil et al[11]described the incorporation of the preshaped "waxbolus" during the packing procedure of the obturator prosthesis and eliminated later by melting it once the curing procedure is completed. It is easy to prepare a hollow obturator in two separate parts and then join them after curing. This two-step procedure, though a little time consuming, is advisable, as there is less chances of inaccuracy. Some of these methods, however, increase the weight and the thickness of the hollow bulb obturator.

Eric et al described option for procedure of fabrication of inexpensive aluminium flasks from aluminium cookware. The 20 cm diameter pots that were used to demonstrate the technique. The lab time needed to prepare the flask was approximately two hours. Dental stone moulds within these flasks was not fractured when compressed[12].

Puvvadi et al explained 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[13].

Serder et al described a modified perpendicular alignment of an obturator wax pattern in a flask, a modified injection channel design that is suitable for perpendicular alignment, and a simple way to pull back the injection funnel to increase the flask volume. The pulled-back funnel described in this article permits the use of the entire volume of the flask so that large resection obturators can be processed. The pulled-back funnel is kept in position by means of the stone spacer; sprue channels completely surrounded with plaster are used to obtain continuous pressing of the mixed resin into the farthest regions of the obturator[14].

In this case report, we discussed about the fabrication of hollow bulb obturator by an innovative flasking technique. For processing, anatomyof the defect was too deep that flasking was difficult to do by using the conventional flasks.Bigger flasks were generally used which was not available. Due to unavailability of the flasks, we have to shift for other method. So CPVC pipes were selected in this. These pipes can sustain high temperature of 150°C without degradation. 2 CPVC Pipes with 5-inch and4-inch diameter which can fit into each other along with lids. 3 rectangular shape vents were drilled in the outer pipe for easy retrievability of flasks. This technique is also easy and economical and accurate.

Conclusion:-

Aninnovative flasking technique for the fabrication of hollow bulb obturators has been described. Moreover, the prosthesis is processed using a CPVC pipe flask, which helps reduce laboratory timeand the thickness of the hollow bulb was controlled.The hollow bulb obturator has emerged as the treatment of choice because of its light weight, cleanliness, and ease of fabrication. Advantage of this method was simplified, inexpensive and easy method of processing an obturator for the rehabilitation of large maxillary defect.

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