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CLINICAL REPORT

Fabricating a Hollow Obturator with Light-Cured Resin System

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Abstract Tumor resection of a cancer lesion produces maxillary defects that can be easily restored with an obturator to close the defect area. Postsurgical maxillary defects predispose a patient to hypernasal speech, fluid leakage into the nasal cavity, and impaired masticatory function. Therefore, the primary aims of prosthetic rehabilitation in total and partial maxillectomy patients include: separation of oral and nasal cavities to allow adequate deglutition and articulation, possible support of orbital contents and support of soft tissue to restore mid-facial contours. A method of fabricating a simple hollow obturator for maxillectomy patients is described. The use of a relatively long-lasting light cure resin materials in making obturators allows stable, comfortable, and effective obturation. The hollow prosthesis is lightweight and sufficiently flexible to allow relatively simple placement in retentive undercut regions.

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Introduction

One of the main objectives in the fabrication of hollow obturators is to minimize weight [2, 3]. A lightweight hollow obturator optimizes retention and stability as well as patient comfort. Controlling the thickness of hollow obturator walls during fabrication is important to provide adequate and uniform thickness to ensure the desired strength and weight of the prosthesis. Another important objective in the fabrication of closed hollow obturators is a watertight seal between the joined sections of the obturator [4, 5]. The purpose of this case report is to present a recommended technique for the fabrication of a closed hollow obturator using light cure resin materials to minimize its weight.

Case Report

A 52 year old male was referred to the Department of Prosthodontics, ITS Centre of Dental Studies and Research with a history of left hemimaxillectomy and oro-antral communication. Patient's radiotherapy treatment was completed and when he reported to us he was already using an ill-fitting obturator plate. Chief complaint of the patient was improper mastication, speech and unsightly appearance. On detailed intra-oral examination it was found that he was dentulous in both U/L arches with two teeth remaining i.e. 17 and 18 on the maxillary non defect side. Oral hygiene was satisfactory. There was nasal discharge and lodgement of food. Panorex view showed bony defect in relation to left maxilla with alveolar bone adequate in length, cortical bone dense and trabeculae evenly

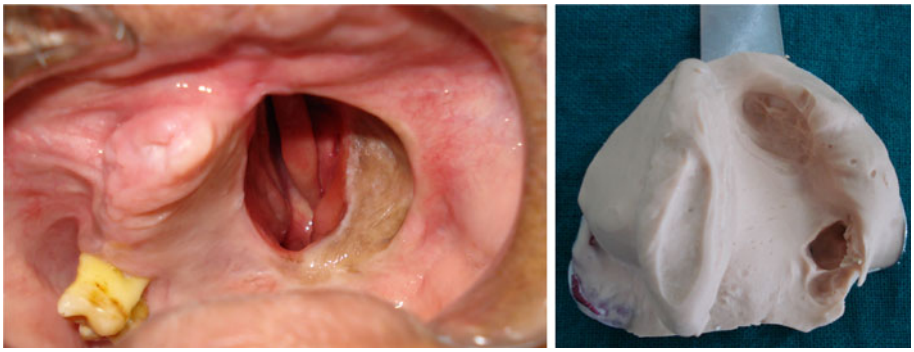

Fig. 1 Left maxillary defect and definitive impression

Fig. 2 Maxillary and mandibular definitive cast

Fig. 4 Polymerization of light cure resin sheets

distributed. Hence, fabrication of single piece, closed hollow definitive obturator was planned replacing upper missing teeth and segmented portion of hard palate. The definitive obturator was fabricated, inserted and checked for fluid leakage, speech intelligibility and esthetics. Due to an absence of fluid leakage further relining was unnecessary. Frequent recall visits were planned for first 3 months and gradually reduced to once in 3 months.

Methodology

The defect area was evaluated and defined during the clinical examination (Fig. 1). A definitive impression was made in alginate impression material using stock metal trays, which was modified using impression compound on the defect area and the definitive cast was poured in dental stone (Figs. 1, 2). Undesirable undercuts on the defect area were blocked out with wax. Wax and autoplymerised acrylic resin were used to fabricate the record base and wax occlusion rims. Maxillomandibular relationships were recorded, and the casts were mounted (Fig. 3). The teeth were set in the wax and clinically verified with try-in (Fig. 3). The cast was then placed in a flask with dental stone. The flask was opened after the wax was eliminated

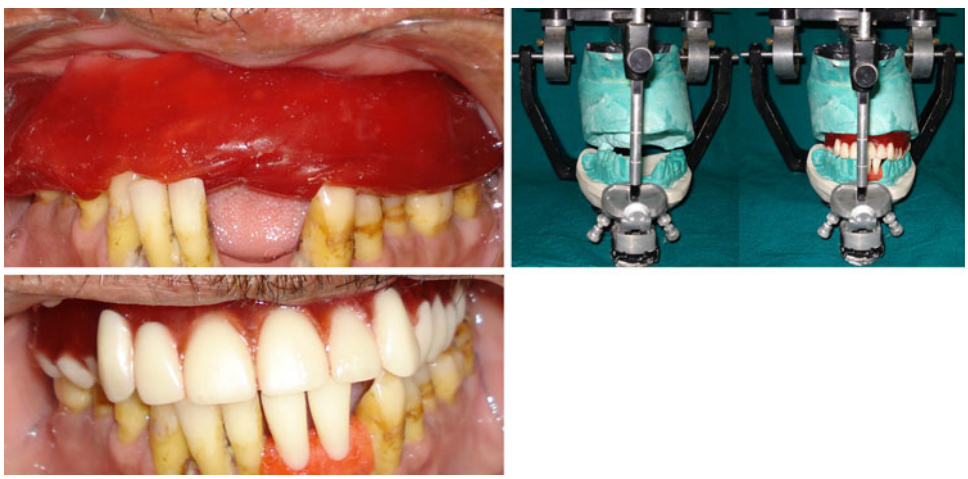

Fig. 3 Bite registration and try-in

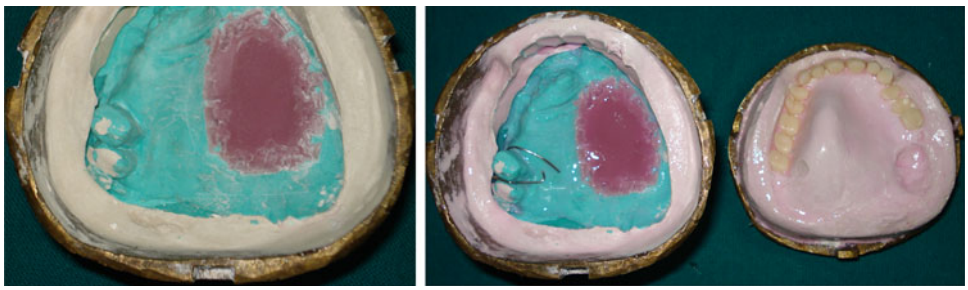

Fig. 5 Fabrication of upper and lower portions of hollow obturator

Fig. 6 U/L prosthesis in place

and undesirable undercuts along the defect floor and walls were blocked out with wax. Light cure resin sheets (Plaque Photo i.e. light-curing hybrid composite resin, Willmann & Pein GmBH, Barmstedt, Germany) was evenly applied at a minimal thickness of 3 mm to create a hollow bulb (Fig. 4) [1]. The resin was first polymerized for 3 min with a handheld UV light source. The flask was then placed in the polymerization unit i.e. Sibari Sr 620 (Sirio Dental S.R.L, Meldola, Italy) and cured for 5 min as per manufacturer's instructions (Figs. 4, 5).The upper part of the flask containing the denture teeth was covered with wax 1.5 mm thick. Light cure resin was laid 1.5 mm thick over the defect area imprint in the wax, and the flask was closed. The flask was gently separated. The light-cure resin was polymerized with a handheld light source. It was placed in the polymerization unit and cured. The upper piece of the hollow was trimmed and the lower and upper pieces of the light cured resin hollow were connected and sealed by small pieces of light-cured resin by polymerizing unit and finally grooves were made in the periphery of the upper part for mechanical interlocking with heat-cured acrylic resin (Fig. 5). Wax was removed, all areas of the processed base were roughened. Heat-cured acrylic resin (Ashvin Denture Material, Wazirpur Industrial Area, New Delhi) was mixed according to the manufacturer's recommendations, and the packing and processing was completed using accepted prosthodontic techniques. After the polymerization of the heat-cured acrylic, the prosthesis was deflasked, finished, and polished. The finished, polished, and sterilized prosthesis was inserted into the defect area (Fig. 6). The tissue surface was adjusted to relieve pressure areas and the occlusion was equilibrated. The patient was then instructed on how to use the obturator prosthesis and was provided with homecare instructions.

Discussion

This technique of using light cure resin material was having many advantages. It minimized the thickness of the obturator walls by ~3 mm all around thus reducing the weight of the prosthesis. No additional flask is needed to produce the cap section. This method does not need another flask system for connecting the different parts of the light-cured resin with the lower part of the hollow obturator. The lower unit light-cure resin is produced as a single piece in this technique [7, 8]. The floor and walls of the light-cured resin are monoblocked and compact. The bonding between acrylic resin and light cure resin in our case was purely mechanical which was made possible by grooves made in the periphery of the upper part of light cure resin for interlocking with heat-cured acrylic resin.

When exposed to the curing light, composite material closest to the light source polymerizes first, producing gaps between the cast and composite as a result of shrinkage and distortion. Polymerization proceeds through a long chain cross-linking of polymers. Some of this stress is relieved through the flow of the composite material. However, with light cured composite material, the surface facing the light source cures first and may limit the flow of the material [9–11]. By limiting the amount of composite exposed to the curing light at one time, and readapting the uncured composite to the cast between curing episodes, gap formation caused by polymerization distortion can be minimized.

Conclusion

Since the sixteenth century, maxillary surgical defects have been restored by obturator prostheses made from a variety of materials & techniques. Currently heat-polymerized or autopolymerized acrylic resins, alone or in combination are used in the construction of obturator prostheses. The availability of light-polymerized materials indicates great promise for future applications. The simplicity of construction and the controllability of the thickness of the prosthesis are the advantages of this technique. Here a technique for the fabrication of a closed hollow obturator has been presented. This technique allowed us for the control of wall thickness of the obturator extension thereby minimizing the weight of the prosthesis.

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