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Fabricating a Hollow Obturator with Visible Light-Cured Resin System

Mustafa Kocacikli, DDS, PhD,[1] Suat Yalug, DDS, PhD,[2] Huseyin Yazicioglu, DDS, PhD,[2] & Caner Yilmaz, DDS, PhD[2]

[1]Lecturer, Department of Prosthodontics, Faculty of Dentistry, Gazi University, Ankara, Turkey
[2]Professor, Department of Prosthodontics, Faculty of Dentistry, Gazi University, Ankara, Turkey

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Correspondence
Mustafa Kocacikli, 8 cadde, 82 sokak, No:4, Ankara, Turkey. E-mail: dr.dt.mustafa@gmail.com.

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Abstract

Obturators are routinely used in the rehabilitation of maxillectomy defects. Ideally, obturators should be easily constructed to produce a comfortable and stable prosthesis. This article describes a technique that provides an easy method for the construction of an obturator prosthesis using a visible light-cured (VLC) resin. As a result, technicians can easily construct obturators in little time; this would, in turn, provide patients with light, comfortable, and tolerable prostheses.

Postsurgical maxillary defects predispose a patient to hypernasal speech, fluid leakage into the nasal cavity, and impaired masticatory function. The primary aims of prosthetic rehabilitation in total and partial maxillectomy patients include: (1) the separation of oral and nasal cavities to allow adequate deglutition and articulation, (2) the possible support of orbital contents, and (3) the support of soft tissue to restore mid-facial contours.[1]

Since the 16th century, maxillary surgical defects have been restored by obturator prostheses made from a variety of materials and 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.[2]

One of the main objectives in the construction of a hollow obturator is to minimize its weight. The weight of the obturator becomes especially important when it is suspended as a cantilever. A lightweight hollow obturator optimizes retention and stability as well as comfort.[3]

Several techniques have been developed for the construction of a hollow acrylic resin obturator to minimize the weight of the obturator prostheses. Numbering among these are the joining of two separately constructed sections[4]; the construction of a single piece with an autopolymerized inner core[5]; the implementation of a magnetically retained sectional obturator[6]; and the use of a deterrent against sugar[7] or ice,[8] which is subsequently removed. An alternative to the open bulb obturator is an obturator in which the superior aspect of the bulb is covered.[9]

This article is concerned primarily with the construction of a closed hollow obturator. In this construction, all bulb regions of the flasked prosthesis are processed with a visible light-cured (VLC) resin monoblock, and the remaining obturator is processed with a heat-polymerizing acrylic resin.

Technique

A 55-year-old woman with a history of epidermoid carcinoma of the right maxilla had undergone a right maxillectomy and postoperative radiation therapy 2 years earlier. The resulting defect was rehabilitated with a definitive obturator. Upon clinical evaluation of the existing prosthesis, the decision was made to construct a new definitive maxillary obturator and a mandibular complete denture balancing appliance.

The procedure is as follows:

(1) The defect area is evaluated and defined during the clinical exam.
(2) A preliminary impression is made, and a custom tray is fabricated on the cast of the maxillary defect.
(3) The final impression of the defect is made with irreversible hydrocolloid (Algiplast HP, Tissi Dental, Milano, Italy) using the custom tray, and the definitive cast is poured in yellow stone.
(4) Undesirable undercuts on the defect area are blocked out with Iowa Wax (Sybron/Kerr, Romulus, MI).

Figure 1 Wax spacer as placed on the antagonist flask for modeling VLC cover.

Figure 2 Wax and VLC resin plaque on antagonist flask for modeling VLC cover.

(5) Wax (Polywax, Izmir, Turkey) and autopolymerized acrylic resin (Vertex Self-Curing, Dentimex, Zeist, the Netherlands) are used to fabricate the record base and wax occlusion rim.
(6) Maxillomandibular relationships are recorded, and the casts are mounted. The teeth are set in the wax and clinically verified. A waxed base plate is prepared according to the findings.
(7) The cast is placed in a flask with dental stone (Giludur, BK Guilini Gmbh Pharma-Cosmetics-Gypsium D-67065, Ludwigshafen/Rh, Germany). The flask is opened after the wax is eliminated, and undesirable undercuts along the defect floor and walls are blocked out with wax.
(8) The cast is coated with Triad VLC Model Release Agent (Triad, Dentsply International, York, PA). Triad resin is evenly applied at a minimal thickness of 3 mm to create a hollow bulb (Fig 1). The resin is covered with a Triad air barrier coating and polymerized with a handheld light source (CU-80 Visible Curing Light, Jovident International, Duisburg, Germany). The flask is then placed in the Triad polymerization unit (Model TCU-1) for final cure.
(9) The upper part of the flask containing the denture teeth is covered with wax 1.5-mm thick. VLC resin is laid 1.5-mm thick over the defect area imprint in the wax, and the flask is closed (thus covering the hollow) (Fig 2). This procedure maintains an extra gap on the upper part of the hollow (Fig 3).
(10) The flask is gently separated. The VLC resin cover is coated with a Triad air barrier coating and polymerized with a handheld light source. It is placed in the Triad curing (polymerization) unit.

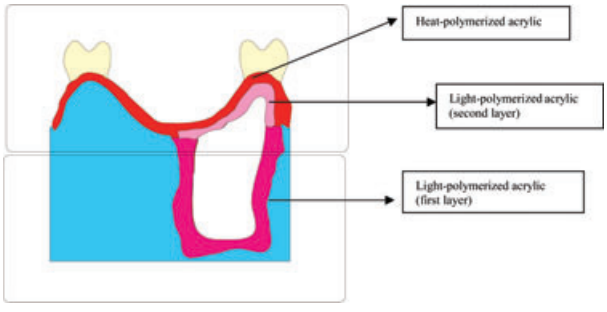

Figure 3 Finished obturator in the flask.

Figure 4 Fitting the VLC resin cover to the hollow walls.

Figure 5 View of the obturator.

(11) The upper piece of the hollow is trimmed and placed on the portion of the lower unit applied with VLC resin after polymerization of the bulb region hollow (Fig 4).
(12) The lower and upper pieces of the VLC resin hollow are connected and sealed by small pieces of VLC resin and a bonding system[10] (Triad VLC Bonding Systems) by using hand pieces of the light-polymerizing unit.
(13) Wax is removed, all areas of the processed base are roughened, and a bonding agent is applied on the VLC part. Heat-cured acrylic resin (Vertex RS, Dentimex) is mixed according to the manufacturer's recommendations, and the packing and processing is completed using accepted prosthodontic techniques. After the polymerization of the heat-cured acrylic, the prosthesis is deflasked, finished, and polished (Figs 3 and 5).
(14) The finished, polished, and sterilized prosthesis is inserted into the defect area. The tissue surface is adjusted to relieve pressure areas and the occlusion is equilibrated. The patient is then instructed on how to use the obturator prosthesis and is provided with homecare instructions. In addition, postinsertion visits are scheduled.

Discussion

In the present study, the method for fabricating the hollow obturator is modified from a technique described by McAndrew et al.[11] The modification allows for control of wall thickness of the obturator extension, therefore, minimizing the weight of the prosthesis. Furthermore, all surfaces exposed to the oral cavity are processed with heat-polymerized acrylic and light-polymerized resins. This technique has eliminated the additional steps that were described by Minsley et al[3] and McAndrew et al.[11] McAndrew et al used an additional flask to produce the cap section of the hollow obturator. In this technique, a thickness of 3 mm in all surfaces of the defect and dental areas of the obturator is obtained, whereas in McAndrew et al's[11] technique, the acrylic resin thickness is uncontrolled over the hollow part in the dental area. In the procedure we followed, the VLC resin cover on the wax mirrored the shape of the residual ridge. This allowed for the thickness of the acrylic resin in the cap section to be controlled and for an extra gap in the hollow to be maintained. Benington and Cunningham[12] found that VLC resin has a lower sorption value than heat-polymerized acrylic resin, making it a more suitable material for producing hollow obturators.

Our method differs from Benington's[13] in that the floor and wall of the VLC resin are monoblocked and compact. This method does not need another flask system for connecting the different parts of the VLC resin with the lower part of the hollow obturator. The lower unit VLC resin is produced as a single piece in this technique.

Whereas our bulb was monoblocked with VLC, the bulb cover in Asher et al's[14] quick bulb technique was self-cure acrylic resin.

DaBreo[2] found that light-polymerized material had the lowest percentage of change between the base and teeth.

Conclusion

The simplicity of construction and the controllability of the thickness of the prosthesis are the advantages of this technique.

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