Case Report

Lost wax-bolus technique to process closed hollow obturator with uniform wall thickness using single flasking procedure

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Abstract

Introduction: Maxillary obturator prosthesis is more frequent treatment modality than surgical reconstruction for maxillectomy in patients suffering from oral cancer. The obturators often become heavy and hence are hollowed out in the defect portion to reduce its weight as a standard practice.

Materials and Methods: The processing technique described the incorporation of the preshaped "wax-bolus" during packing procedure of the Obturtor prosthesis and eliminated later by melting it once the curing procedure is completed.

Results: This article is a single step procedure resulting into the closed-hollow obturator as single unit with uniform wall thickness around the hollow space ensuring the least possible weight of the hollow obturator.

Conclusion: This processing technique achieves predictable internal dimension of the hollow space providing uniform wall thickness of the obturator.

Key Words: Hollow obturator, maxillectomy, obturator processing technique, oral cancer, retention of prosthesis

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INTRODUCTION

Maxillary obturator prosthesis is more frequent treatment modality than surgical reconstruction for partial or total maxillectomy in patients suffering from oral cancer.[1-3] In general, size and location of the defect decide the type of rehabilitation. 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 including bone and teeth complicated with overlying soft tissue collapse. In such situations, the prosthetic obturators help in 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.[1] The obturators often become heavy and hence are hollowed out in the defect portion to reduce its weight as a standard practice. Wu and Schaaf[4] designed different types of obturator prostheses (both solid and hollow) based on Aramany's classification and evaluated for weight reduction. They concluded that hollow obturator prostheses had

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significantly increased weight reduction, from 6.55% to 33.06% depending on the size of the defect.[4] The hollow space of such obturators may be open from top (open-hollow) or completely closed (closed-hollow). The open-hollow obturators often collect moisture and require frequent cleaning or exit holes to prevent the fluid accumulation.[5] On the contrary, the closed obturators do not get moisture collection and reducing the air space.[6] There are numerous processing techniques described in the literature to fabricate the closed-hollow obturator. Need for a water-tight closed-hollow obturator fabricated from a durable material is the principal objective in such situations.[1] Heat polymerized acrylic resin is the most commonly and successfully used material for fabrication of the obturators. Most of these articles described incorporation of dissolvable materials during packing of the resin or doing multiple flaking procedures or fabricating separate components and sealing them together to make it hollow. The processing technique described in this article is a single step procedure resulting into the closed-hollow obturator as single unit with uniform wall thickness around the hollow space ensuring the least possible weight. The preshaped "wax-bolus" is incorporated during packing and eliminated later by melting it once the curing procedure is completed.

Procedure

- After initial evaluation, the patient with the acquired maxillary defect [Figure 1a], carry out the routine procedures like impressions [Figure 1b] and maxillomandibular relationship (MMR) records [Figure 1c], mount the MMR records on to the articulator and set the teeth [Figure 1d] depending upon the clinical situation
- After the try-in of the waxed-up palatal obturator prosthesis, free the wire clasps (if any) by removing the surrounding acrylic resin from the record base. Reseat the clasps and the obturator on the master cast in original position and fill the space created while clasp removal. Seal the borders of the waxed-up prosthesis in conventional manner with the baseplate wax
- Invest the master cast along with the trial prosthesis in the utility flask with the help of gypsum product type II [Figure 2]. (Note that the size of the utility flasks is bigger than the conventional denture utility flasks to accommodate the increased size of the prosthesis)
- Complete the "flasking" procedure and keep the flasks under a mechanical clamp (Handler Manufacturing, Westfield, NJ, USA) and keep at room temperature for 24 h
- Perform "dewaxing" procedure in conventional manner and remove the record base from the flask [Figure 3]
- Mark three widely distributed straight lines originating from the defect portion of the cast (directing toward three different directions) and extend on the investing plaster surface till the end [Figure 3]. Note that these three tripoding lines are needed in future to reseat the wax-bolus in its original position during packing
- Identify the area of future hollow space in the obturator and adapt double thickness baseplate wax both on the maxillary cast (in the base flask) and on the dewaxed plaster surface (in the counter flask) as shown in Figure 4
- Prepare 3–5 widely distributed rectangular windows (3 mm × 3 mm) in the adapted wax sheet in the base flask [Figure 4]
- Apply a Vaseline petroleum jelly (Unilever, Epping, Australia) to both adapted wax sheets
- Grossly estimate the total surface area of the hollow space created between two adapted wax sheets and soften the number of modeling wax sheets accordingly to form a wax-bolus for filling-up the same space
- Place the bolus on the adapted wax sheet in the base flask and close the counter flask in close approximation under the mechanical clamp. Keep flask-clamp assembly under cold water for 10 min
- Separate the flasks and remove excess flush of the wax. Examine the surface of the wax-bolus for any deficiency

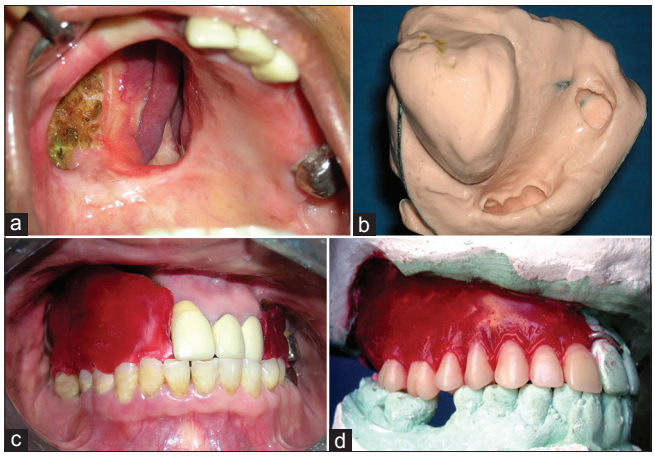

Figure 1: (a) Maxillectomy defect. (b) Irreversible hydrocolloid impression. (c) Maxillomandibular relationship record. (d) Teeth arrangement

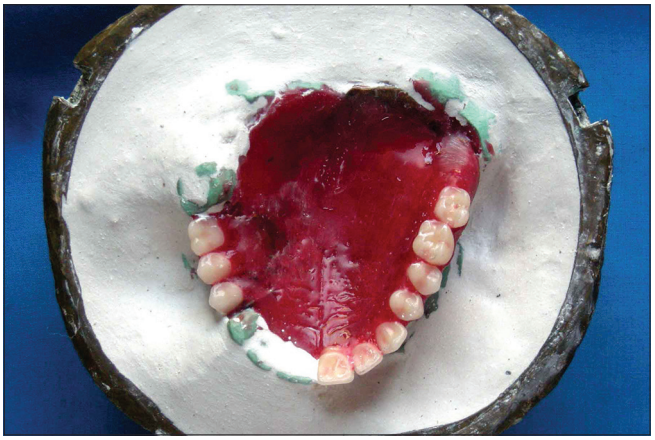

Figure 2: Flasking of waxed-up prosthesis

by careful observation and close the flasks again to ensure tight approximation [Figure 5]

- Remove the wax-bolus and examine for the elevated areas (stops) corresponding to the windows created in the adapted wax sheet [Figure 6]
- Remove the adapted wax sheets and from both the flasks. Reorient the wax-bolus using the three lines matching with the corresponding lines on the cast and investing plaster and seat the wax-bolus at the original position with the support of the 3–5 stops created in the wax-bolus [Figure 7]. Mark the three identification lines matching to the lines already marked on the cast and investing plaster surface
- Mix the heat polymerizing acrylic resin (Lucitone 199, Dentsply, York PA, USA) pack into the base flask. Orient the wax-bolus according to the guide-markings and press on the packed acrylic resin till all the stops rested in previously confirmed position on the cast in the base flask [Figure 8]
- Place the mixed acrylic resin in the counter flask and close with base flask under the mechanical clamp. Keep the assembly at room temperature for 24 h
- Perform the curing cycles as per the manufacturer instructions. Keep the flask-clamp assembly at room temperature after completion of curing cycle for 24 h (bench cooling)
- Separate the flasks after bench cooling. Look for the 3–5 openings (corresponding to the stops) in processed resin-obturator. Note that the wax-bolus is completely enclosed by the acrylic resin, partially got melted and came out of the resin-obturator through the openings during curing cycle
- Remove remaining portion of the wax-bolus by forceful cleaning with steam cleaner (Grobet USA, Carlstadt, NJ, USA). Apply the forceful steam through one of the holes to remove the remaining wax through remaining holes forming a hollow space of the shape of the wax-bolus [Figure 9a]
- Finish and polish the processed hollow obturator in conventional manner [Figure 9b]. Seal the three holes with autopolymerizing acrylic resin as described by Patil and Patil[7] [Figure 9c]
- Deliver the prosthesis and reinforce postinsertion care [Figure 9d]. Recall at the interval of 3 months for initial 1 year followed by every 6 months.

Figure 3: Dewaxing

Figure 4: Modeling wax sheet adapted on defect area on base and counter flask

Figure 5: Wax-bolus has taken shape of hollow space between two adapted sheets

Figure 6: Shaped wax-bolus. Note stops created corresponding to windows

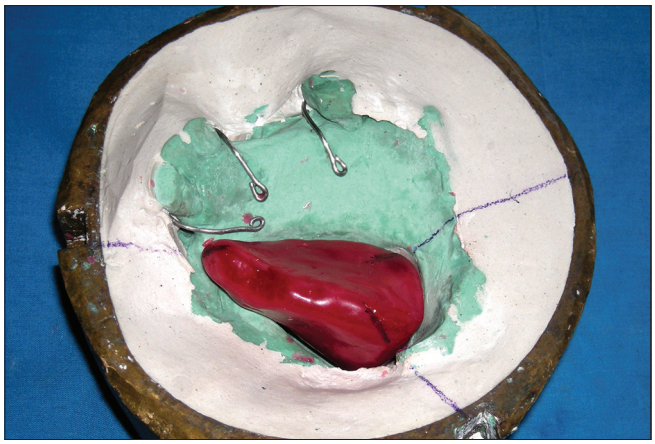

Figure 7: Wax-bolus seated in original position. Note that wax-bolus is uniformly away from cast/investment surface except the stops

Figure 8: Incorporation of wax-bolus during packing

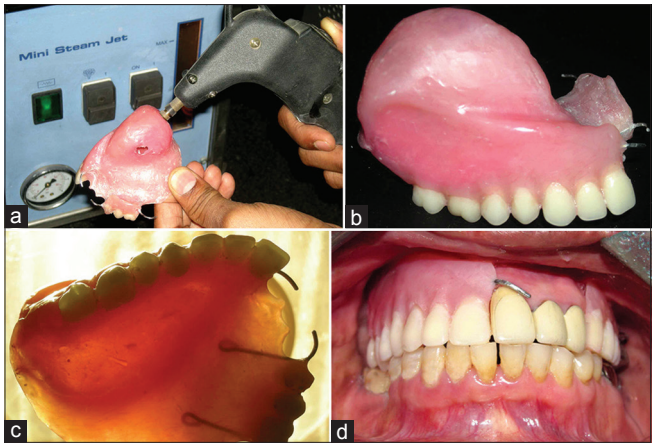

Figure 9: (a) Removal of remnants of wax-bolus with steam cleaner. (b) Completed obturator with sealed holes. (c) Translucency observed against light due to hollow space inside. (d) Obturator in place intraorally

DISCUSSION

Several techniques and materials have been described previously to fabricate a lightweight, hollow obturator.[5,7-36] Grinding out the interior of the bulb,[13] fastening the lid to the superior border,[13-15] incorporation of the materials like sugar[13,16] and ice[14] during packing are some of the methods to create the hollow prostheses. Separate processing of two halves followed by joining them with an autopolymerizing resin.[17,18] or two step processing technique,[5,8] using preformed plastic shapes,[19] plaster matrix,[20,24] resin shim,[21] and a polyurethane foam[22] are also described in the literature. Additional techniques with the use of combinations of impressions, casts and multiple laboratory procedures rendered them time-consuming and limited in application.[25-36] The uniform wall thickness of a hollow prosthesis ensures the least possible weight. Worley and Kniejski[23] described a method for the fabrication of a closed hollow obturator while controlling the thickness of the hollow portion. However, the asbestos used by them is unacceptable by current health and safety.

The technique described in this article is superior to all other techniques previously described in two ways: (1) It gives the complete prosthesis as a single unit in a heat cured acrylic resin and (2) size and shape of the hollow space achieved allow uniform wall thickness for closed hollow obturator. This technique is a variation of some previously described techniques[13,14,16,19,21,22] which comprise the use of a preshaped wax-bolus to maintain a predictable internal dimension of a hollow space. One step processing in heat cured resin as a single unit with predictable internal dimension of the hollow space is the characteristic feature of this technique. Some of the issues regarding the technique should be carefully handled to achieve the best possible results and discussed as follows:[7] (1) The reliable seating wax-bolus in polymerizing resin during packing procedure should be achieved with the help of identification markings. (2) Bench-polymerization of 24 h immediately after packing is compulsory to avoid wax-bolus distortion in curing process. (3) Make sure the wax-bolus is kept in ice-cold water to harden it to prevent distortion by packing pressure. (4) Studies are suggested to evaluate the material properties of the resin after processing with this technique.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Patil PG, Patil SP. A hollow definitive obturator fabrication technique for management of partial maxillectomy. J Adv Prosthodont 2012;4:248-53.
2. Rieger J, Wolfaardt J, Seikaly H, Jha N. Speech outcomes in patients rehabilitated with maxillary obturator prostheses after maxillectomy: A prospective study. Int J Prosthodont 2002;15:139-44.
3. Genden EM, Okay D, Stepp MT, Rezaee RP, Mojica JS, Buchbinder D, *et al.* Comparison of functional and quality-of-life outcomes in patients with and without palatomaxillary reconstruction: A preliminary report. Arch

Otolaryngol Head Neck Surg 2003;129:775-80.
4. Wu YL, Schaaf NG. Comparison of weight reduction in different designs of solid and hollow obturator prostheses. J Prosthet Dent 1989;62:214-7.
5. McAndrew KS, Rothenberger S, Minsley GE. 1997 Judson C. Hickey scientific writing awards. An innovative investment method for the fabrication of a closed hollow obturator prosthesis. J Prosthet Dent 1998;80:129-32.
6. Phankosol P, Martin JW. Hollow obturator with removable lid. J Prosthet Dent 1985;54:98-100.
7. Patil PG, Patil SP. Fabrication of a hollow obturator as a single unit for management of bilateral subtotal maxillectomy. J Prosthodont 2012;21:194-9.
8. Brown KE. Clinical considerations improving obturator treatment. J Prosthet Dent 1970;24:461-6.
9. Desjardins RP. Obturator prosthesis design for acquired maxillary defects. J Prosthet Dent 1978;39:424-35.
10. Taicher S, Rosen AG, Arbree NS, Bergen SF, Levy M, Lepley JB. A technique for fabrication of polydimethylsiloxane-acrylic resin obturators. J Prosthet Dent 1983;50:65-8.
11. Benington IC. Light-cured hollow obturators. J Prosthet Dent 1989;62:322-5.
12. Polyzois GL. Light-cured combination obturator prosthesis. J Prosthet Dent 1992;68:345-7.
13. Matalon V, LaFuente H. A simplified method for making a hollow obturator. J Prosthet Dent 1976;36:580-2.
14. Schneider A. Method of fabricating a hollow obturator. J Prosthet Dent 1978;40:351.
15. Birnbach S, Barnhard B. Direct conversion of a solid obturator to a hollow obturator prosthesis. J Prosthet Dent 1989;62:58-60.
16. Parel SM, LaFuente H. Single-visit hollow obturators for edentulous patients. J Prosthet Dent 1978;40:426-9.
17. Brown KE. Fabrication of a hollow-bulb obturator. J Prosthet Dent 1969;21:97-103.
18. Browning JD, Kinderknecht J. Fabrication of a hollow obturator with fluid resin. J Prosthet Dent 1984;52:891-5.
19. el Mahdy AS. Processing a hollow obturator. J Prosthet Dent 1969;22:682-6.
20. Asher ES, Psillakis JJ, Piro JD, Wright RF. Technique for quick conversion of an obturator into a hollow bulb. J Prosthet Dent 2001;85:419-20.
21. Chalian VA, Barnett MO. A new technique for constructing a one-piece hollow obturator after partial maxillectomy. J Prosthet Dent 1972;28:448-53.
22. Tanaka Y, Gold HO, Pruzansky S. A simplified technique for fabricating a lightweight obturator. J Prosthet Dent 1977;38:638-42.
23. Worley JL, Kniejski ME. A method for controlling the thickness of hollow obturator prostheses. J Prosthet Dent 1983;50:227-9.
24. Minsley GE, Nelson DR, Rothenberger SL. An alternative method for fabrication of a closed hollow obturator. J Prosthet Dent 1986;55:485-90.
25. Beumer J, Curtis TA, Marunick MT. Maxillofacial Rehabilitation Prosthodontic and Surgical Consideration. St. Louis: Ishiyaku EuroAmerica; 1996. p. 225-47.
26. Hayashi J, Nishiyama M, Miyake M, Kudo I, Nakazawa K. Construction of a maxillary prosthesis with a hollow obturator by the balloon technique and a case report. J Nihon Univ Sch Dent 1989;31:585-96.
27. Beder OE, Todo J. Rapid technique for constructing a hollow-bulb provisional obturator. J Prosthet Dent 1978;39:237-9.
28. Nidiffer TJ, Shipmon TH. The hollow bulb obturator for acquired palatal openings. J Prosthet Dent 1957;7:126-34.
29. Buckner H. Construction of a denture with hollow obturator, lid, and soft acrylic lining. J Prosthet Dent 1974;31:95-9.
30. Palmer B, Coffey KW. Fabrication of the hollow bulb obturator. J Prosthet Dent 1985;53:595-6.
31. Gardner LK, Parr GR, Rahn AO. Combination nasal support breathing flange with hollow obturator prosthesis. A clinical report. J Prosthet Dent 1990;63:497-501.
32. Blair FM, Hunter NR. The hollow box maxillary obturator. Br Dent J 1998;184:484-7.
33. Habib BH, Driscoll CF. Fabrication of a closed hollow obturator. J Prosthet Dent 2004;91:383-5.
34. Kocacikli M, Yalug S, Yazicioglu H, Yilmaz C. Fabricating a hollow obturator with visible light-cured resin system. J Prosthodont 2008;17:596-8.
35. Shimizu H, Yoshida K, Mori N, Takahashi Y. An alternative procedure for fabricating a hollow interim obturator for a partial maxillectomy patient. J Prosthodont 2009;18:276-8.
36. Elangovan S, Loibi E. Two-piece hollow bulb obturator. Indian J Dent Res 2011;22:486-8.