

A Simplified Method to Fabricate a Pneumatic Ocular Prosthesis for Large Ocular Defects

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Abstract When an enucleation or exenteration procedure removes the entire orbital contents but not the eyelids, an abnormally large orbital socket is created that would require an equally sized volume enhancing, flush fitting ocular prosthesis. The solid acrylic prosthesis would rest on or in the lower fornix and owing to its weight, causes distortion of the lower eyelid and/or asymmetrical alignment of the entire palpebral fissure. The aim of this article was to describe a method of fabricating a pneumatic light weight custom ocular prosthesis using lost wax technique to overcome the deteriorating effects of conventional solid ocular prosthesis.

Keywords Hollow · Ocular prosthesis · Pneumatic · Technique

Introduction

Studies for the development of techniques in the fabrication of artificial eyes are long standing. With the passage of time, it was realized that in cases of excessive orbital volume loss as a result of an enucleation or exenteration procedure, an abnormally large orbital pocket is created that would require an equally sized volume enhancing, flush fitting ocular prosthesis. A conventional solid ocular prosthesis would

rest on or in the lower fornix and owing to its weight, causes lower fornix dehiscence and/or asymmetrical alignment of the entire palpebral fissure. In order to solve the problem of voluminous ocular prostheses, Turn [1] and Dias [2] demonstrated techniques for making hollow artificial eyes. Dias [2] proposed using Styrofoam in acrylic resin in order to lessen the burden of these prostheses, providing greater range of motion, comfort and preventing deformity of the anophthalmic socket. This paper suggests a new technique for fabricating a pneumatic custom ocular prosthesis for large ophthalmic cavities by using lost wax technique, aiming at reducing the weight of the prosthesis and thus improving mobility, comfort and aesthetics apart from preventing lower lid distortion and/or asymmetrical alignment of the entire palpebral fissure. This study also compares the differences in weight of stock eye, solid custom ocular prosthesis and pneumatic custom ocular prosthesis.

Method

Follow all the steps involved in the fabrication of ocular prosthesis by conventional method till the final wax try-in [3].

- (1) The technique varies at the processing step wherein after investing and dewaxing of the moulds (Fig. 1), do the packing of the acrylic resin by two step technique.
- (2) In the drag part of flask containing the iris (Fig. 2a), sprinkle the properly shade matched tooth-colored autopolymerized acrylic resin (SC 10, Pyrax, Roorkee, India) to a thickness of about 2 mm to form the polished surface of the prosthesis (Fig. 2b).
- (3) After curing of the resin material, place excess of softened wax spacer over it and close the flask to

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Fig. 1 Picture showing wax pattern (a), invested wax pattern (b) and dewaxed moulds (c)

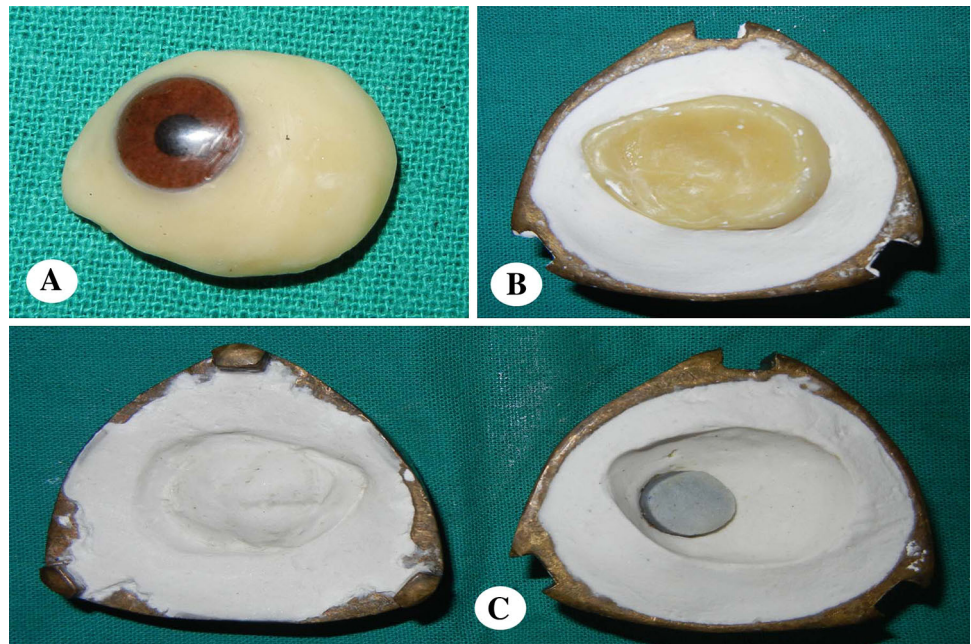
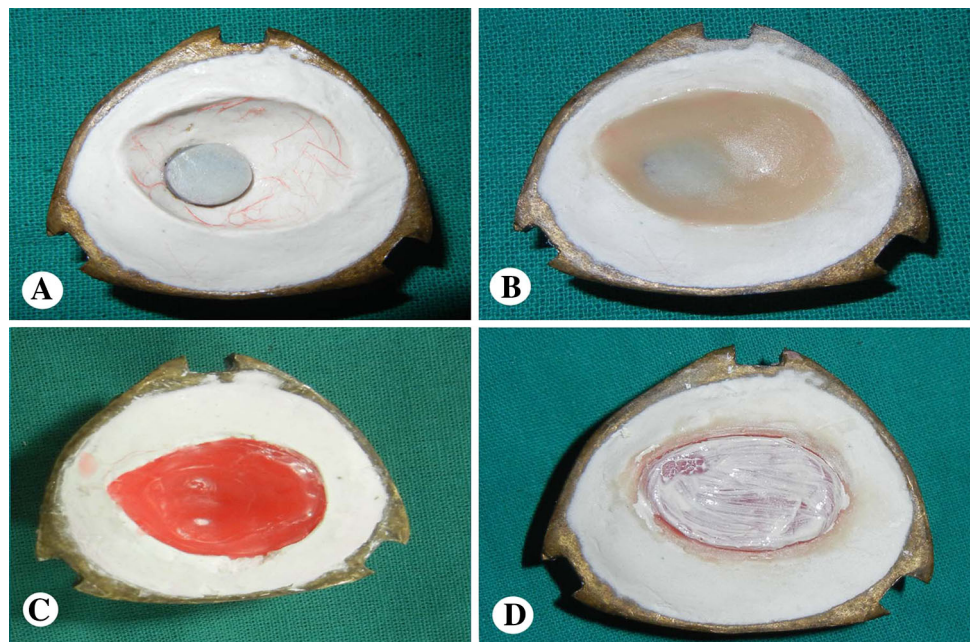


Fig. 2 Application of veins to drag portion of flask (a), packing of first layer of resin (b), wax spacer (c) and pressure indicating paste showing area of smudging (d)



- allow excess of wax to escape. Now, the wax spacer occupies whole of the remaining space of the mould (Fig. 2c).
- (4) Scrape 2 mm from top surface of wax spacer and also approximately 2 mm of wax from circumferential marginal area where two layers of resin will bond. In order to check if wax spacer is too thick, apply pressure indicating paste (Pressure Indicator. Paste; Mizzy, Inc, Cherry Hill, NJ, USA) over the wax spacer and close the flask again.
 - (5) Smudging and removal of pressure indication paste was indicated in areas where insufficient space exists for resin material (Fig. 2d). Thin the wax spacer accordingly in these pressure point areas (Fig. 3a).
 - (6) Remove the pressure indication paste and pack the second layer of tooth colored autopolymerized resin in dough stage over the wax and close both parts of the flask.
 - (7) After curing (Fig. 3b), retrieve the prosthesis carefully and do the grossly finishing.

Fig. 3 Picture showing removal of wax in pressure point area (a), packing of second layer of acrylic resin (b), escape holes for wax (c) and prosthesis after removal of wax (d)

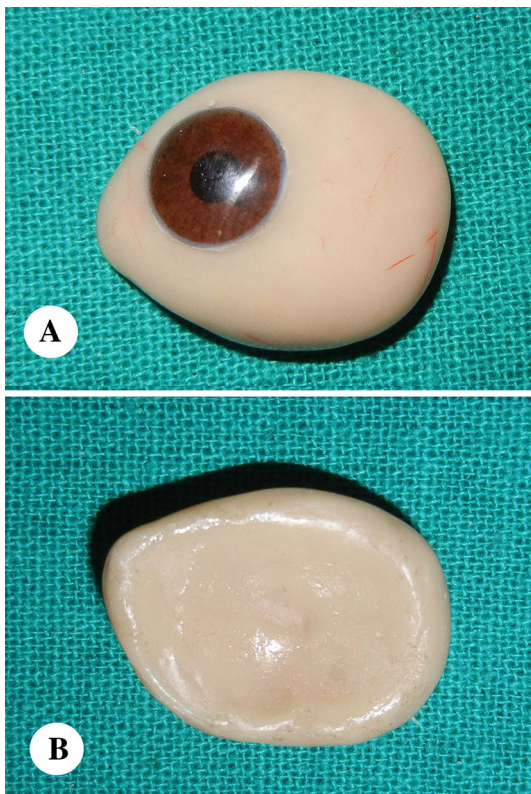
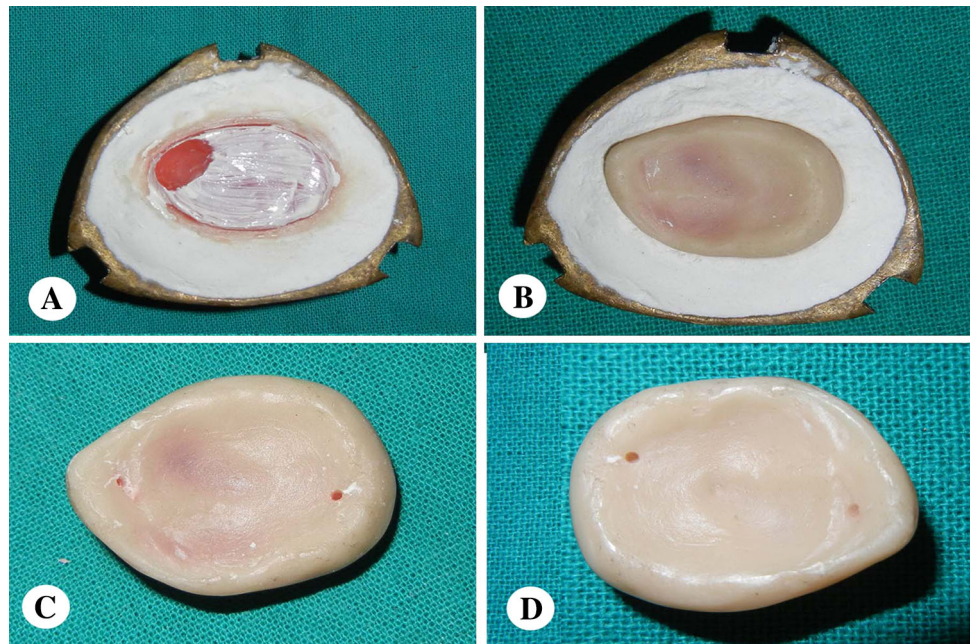


Fig. 4 Polished (a) and intaglio surface of prosthesis with sealed escape holes (b)

- (8) Make two small holes in intaglio surface of prosthesis (Fig. 3c), to allow escape for wax.
- (9) Immerse the prosthesis in the steam cleaner to remove the wax.

- (10) After complete removal of wax (Fig. 3d), seal the escape holes with autopolymerizing resin (Fig. 4a, b), thus obtaining a pneumatic prosthesis.

The weights of three types of ocular prosthesis fabricated by different techniques for the same defect were calculated. Weight of the prostheses was found in the following order; stock prosthesis—2.84 g (Fig. 5a), solid ocular prosthesis—3.80 g (Fig. 5b), and pneumatic ocular prosthesis—2.74 g (Fig. 5c).

Discussion

The technique suggested here for fabricating custom pneumatic ocular prosthesis by lost wax technique is a novel, feasible, simple and cost effective approach to overcome problems associated with the long term use of conventional bulky solid ocular prosthesis. It is also efficient in preventing lower lid distortion and/or asymmetrical alignment of the entire palpebral fissure (Fig. 6) that is caused by conventional solid ocular prosthesis. The great advantage of this technique is that it permits making a custom prosthetic eye hollow, without leaving any residues, seeking the ultimate goal of concealment, and enhancing comfort and mobility.

Conclusion

The technique described here seems to be a logical and simple approach to make a light weight ocular prosthesis in

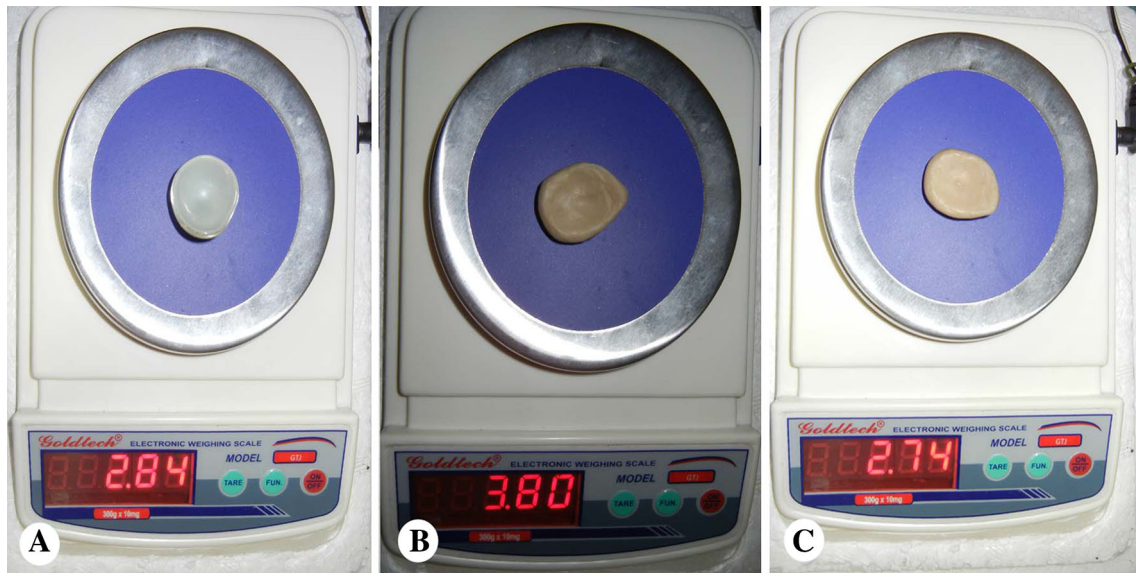


Fig. 5 Weight of stock (a), solid (b) and pneumatic (c) ocular prostheses



Fig. 6 Patient wearing stock prosthesis (a) and patient wearing pneumatic ocular prostheses (b)

cases of large ocular defects, so as to prevent lower lid distortion and/or asymmetrical alignment of the entire palpebral fissure associated with conventional solid ocular prosthesis.

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