Use of 3D Printing for Auricular Template Molds in First Stage Microtia

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Abstract

Background: Three-dimensional printing provides a quick and inexpensive way to create model replicas. We sought to investigate its use in creating an inverse replicate of the normal ear for a template in first stage microtia surgery.

Methods: Photographs were obtained of the normal ear to create a negative mold of a patient's microtic ear using rapid prototyping (RP) with polylactic acid (Figure1). The three-dimensional mirror image of these images was created using computer aided design (CAD) software (123D Catch, Autodesk- San Rafael, CA). The negative image of the lateral contours of the ear including, the conchal floor, conchal wall, antihelix-schapa complex and helix, were created by subtraction of the patient's anatomy from a virtual disk whose boundaries were at least 5mm from any boundary of the ear (Figure 2).

Figure 1. Preoperative lateral photo of 7 year-old girl with microtia of right ear.

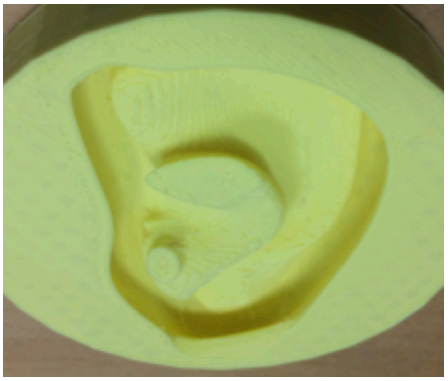

Figure 2. 3D printed polylactic acid right ear mold based upon photographs of the patient's normal left ear. All photographs were processed with a free, open-source iPhone application- 123D Catch (Autodesk- San Rafael, CA).

Results: The 3D molding process took 90 minutes to complete. The mold was then sterilized to be used intraoperatively as a template to create an autologous costo-chondral implant in its likeness. The total cost of disposables for the printing process was $0.57.

Conclusions: The resulting mold provided a normal, sterilizable impression of the patient's affected ear that can be used to mold and design the cartilaginous framework from harvested costal cartilage. This process may improve accuracy and decrease operative times by eliminating the need to mold intraoperative templates.

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