Abstract

Objectives: The primary objective of this study is to describe clinical outcomes of microtia repair with the intra-operative use of sterile 3D printed models.

Methods: This was an observational case series with retrospective chart review of patients with microtia who underwent 2-stage Firmin technique microtia repair with the assistance of custom 3D printed models.

Results: Models needed to be scaled down to 90% of the desired dimensions in order to account for increase in size once the soft tissue envelope was draped over the cartilage framework. Unanticipated outcomes were improved ability to teach residents and fellows with 3D printed models.

Discussion: This technique for microtia repair allows for harvesting and carving cartilage of exactly the necessary dimensions in order to achieve symmetry.

Introduction

Regardless of the surgical technique used to reconstruct a microtic ear, one of the most time consuming and challenging aspects of the surgery is to carve a cosmetically acceptable cartilaginous framework with all of the necessary anatomic subunits of the ear. The most widely used technique that surgeons use to create a template to use while carving the reconstructed ear is to trace a two dimensional image of the normal ear on X-ray paper. Other techniques include sculpting a three dimensional wax template and calculating measurements and drawing detailed angles on the side to be reconstructed.

Computer aided design and computed aided manufacturing (CAD/CAM) technology is widely used in the field of dentistry and maxillofacial surgery, and it was first described in the microtia literature as an aid with designing prosthetic ears to be used with osseointegrated implants 1. Benefits include minimizing time and guesswork when designing the ear. This technology has not yet been described in the English literature as a template for carving autogenous costal cartilage for surgically reconstructed ears.

Methods

This was an observational case series with retrospective chart review of patients with microtia who underwent 2-stage Firmin technique2 microtia repair with the assistance of custom 3D printed models. The primary endpoint was symmetry between the two ears. Additional endpoints included complication and revision rate.

Table of Sample Results

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<tr>
<th>Contralateral ear</th>
<th>Pre-operative</th>
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Table 1. Patients A and B have unilateral microtia. Patient A was treated with a Firmin type 3b skin approach Type I graft. Patient B was treated with a Firmin type 2 skin approach Type II graft. Patient C has bilateral microtia. Mirrored 3D models were created from a previous patient’s 3D model. The right side was performed utilizing a Firmin type 2 skin approach Type I graft. The left side is scheduled to be performed later this summer.

Conclusions

With the adoption of a three dimensional printed model assisted technique for microtia repair, the surgeon has improved ability to harvest and carve cartilage of exactly the necessary dimensions in order to achieve symmetry. It may also allow new fellows and surgeons to learn the technique more easily and more efficiently.

References


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