

Computer-aided Design and Three-dimensional Printing Improves Symmetry in Heminasal Reconstruction Outcomes

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Background:

Symmetry and balance in nasal reconstruction can be hard to achieve. Traditionally, a foil template modeled after the unaffected contralateral side is used in the design of a forehead flap. Crude two-dimensional models often generate underwhelming results. To better simulate complex nasal topography, three-dimensional printing technology was applied to nasal reconstruction.

Methods:

Between May 2012 and October 2016, twenty patients underwent forehead flap nasal reconstruction for heminasal deformities. Ten reconstructions were guided with prefabricated three-dimensional templates (CAD/CAM), and ten patients underwent traditional nasal reconstruction without CAD/CAM. In the CAD/CAM group, two templates were printed: contour guide and framework guide. These were a reference for skin flap design and cartilage framework design, respectively. Photographic records and photogrammetry was used to evaluate results.

Results:

The mean follow-up time was 19.3 months (range, 6 months to 38 months) in the control group and 17.4 months (range, 7 months to 35 months) in the CAD/CAM group. Without CAD/CAM, there was asymmetry in alar width, alar area, nostril height, width and area ($p < 0.05$) between reconstructed and native structures. In the CAD/CAM group, there were asymmetries of nostril-related parameters only. After quantifying asymmetries as a percentage, the CAD/CAM group demonstrated more symmetric reconstructions, particularly in alar width ($p = 0.043$) and alar area ($p = 0.003$).

Conclusions:

When CAD/CAM guidance and three-dimensional printing was used, there was greater symmetry between reconstructed and native structures of the nose.