



Digital construct.

The internal surface dimensions of the rapid prototype construct are set back in a manner that takes into consideration the expected thickness of the forehead flap

Using 3-D Rapid Prototyping Surgical Algorithms in Nasal Reconstruction

Recreating the human nose is perhaps the most difficult challenge in reconstructive surgery. It not only must have lifelike dimensions and surface contour, it must be vascular enough to heal predictably, stable enough to maintain symmetry, and functional enough to be acceptable to the patient's lifestyle. Normally, computer models provide 3-D imaging of the nasal structure to aid reconstructive surgeons with achieving these goals.

Johns Hopkins physicians now have developed a way to custom-reconstruct a patient's own nose. First, a medical illustrator draws an initial rendering. This drawing is then converted into a lifelike model using 3-D laser scanning and a process called rapid prototyping, which creates a solid object by delivering material in a sequential, layered approach for each cross-section of the drawing. The end result: a translucent surgical guide that fits like a mask on the patient's face.

"During the surgery, the sterilized guide can be placed directly on the patient's face to help achieve

stability and completeness of the nasal reconstruction,” says Patrick Byrne, assistant professor of otolaryngology–head & neck surgery and director of the Division of Facial Plastic and Reconstructive Surgery. “These guides improve the accuracy of creating a subsurface framework of an appropriate size, shape and contour. To our knowledge, ours is the first report of the use of custom-made 3-D translucent intraoperative surgical guides for nasal reconstruction.”

The technique is used in patients with complex, subtotal or total nasal defects.



The template is placed on the face as a visual reference. The magnitude of the individual's reconstruction is demonstrated.

FULL ARTICLES

Byrne PJ, Garcia J. Complex nasal reconstruction: improving accuracy with the use of reverse engineered 3-dimensional surgical guides. *Plastic and Reconstructive Surgery* (accepted for publication).

Byrne PJ, Garcia J. Autogenous nasal tip reconstruction of complex defects: a structural approach employing rapid prototyping. *Archives of Facial Plastic Surgery* (in press).