

Emerging Applications of Three-Dimensional Printed Models in Rhinoplasty

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INTRODUCTION: Two-dimensional (2D) photography has traditionally facilitated preoperative analysis and surgical planning for plastic surgeons. While this has historically been standard of care, recent technological advances have propelled plastic surgery innovation forward, transitioning from traditional 2D photography to a more comprehensive and realistic modality, using three-dimensional (3D) imaging and printing. With the advent of 3D imaging in facial aesthetic surgery, the plastic surgery community has primarily focused on its utility in preoperative surgical simulation and marketing, however, the application of 3D photography extends well beyond virtual simulation. This study highlights the clinical value of 3D printed models in helping to align patient and surgeon goals in the preoperative and consultative setting, and focuses on the value of custom surgical templates for use as operative blueprints to facilitate intraoperative decision making in rhinoplasty.

MATERIALS AND METHODS: Patients undergoing rhinoplasty had standard 3D photographs (Canfield Vectra H1) taken as part of their preoperative visit. Using Vectra, 3D digital renderings of the simulated postoperative result were created. Finally, both baseline and ideal simulated 3D printed models were created as individualized surgical templates for intraoperative guidance during rhinoplasty surgery.

RESULTS: 3D printed individualized surgical models have been successfully implemented for use during cosmetic rhinoplasty. The intraoperative application of 3D printed models surpasses not only traditional 2D photography, but also simple 3D computer renderings. The realistic facial prototypes enable the surgeon to have a more intuitive perception of patient-specific soft tissue and bony contours to help achieve superior aesthetic results.

CONCLUSION: 3D printing is an emerging technology in aesthetic surgery, and while it permeates the aesthetic market, there is an opportunity for surgeons to incorporate personalized models of patients into their practice for use as intraoperative guides. Realistic facial prototypes enable the surgeon to interact directly with models of patient-specific soft tissue and bony contours to facilitate nasal reconstruction, while optimizing aesthetic outcomes. The introduction of 3D photography as an adjunct to surgical planning has demonstrated impressive applicability, and provides a unique opportunity for aesthetic plastic surgeons to replace traditional 2D photographs, while better aligning patient and surgeon desires. Additional randomized control studies are needed to further elucidate the benefits of this technology, however, we believe this technique represents a paradigm shift and will become standard of care in the years to come.