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Extended Abstract

3D printing in cosmetic surgery - New paradigm to enhance consultations, conversion and surgical planning

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Abstract

One of the most important parts of the plastic surgery consultation is aligning patient and surgeon goals. Plastic surgeons have been using simulation software as part of their consultation to help show patients what they might look like after cosmetic surgery. Despite the more recent use of 3D photography and simulation, patients still have difficulty visualizing proposed changes on a 2D computer screen. 3D printing, which is an emerging technology in various sectors including health care, may help bridge this gap. We have begun to incorporate 3D printing technology in the care of aesthetic patients. 3D prints are provided by MirrorMe3D, which offers products to surgeons and patient, including full face, facial subunit (i.e. nose) and breast models. 3D printing offers a number of benefits to doctors, including marketing and branding, as well as potential increased patient conversion rates. We have found the most useful procedures have been for rhinoplasty and breast augmentation. Baseline models are used at initial consultation to describe the deformity and educate patients on the goals and expectations of surgery. Baseline and simulated models can be used as an educational tool, but can also be utilized as a reference for intraoperative guidance. We have found this latter application particularly useful as it supplements, and may ultimately replace, the standard 2D photos currently used. 3D printing can add value to many aspects of a cosmetic surgery practice, including branding, marketing, education, conversion rates, and surgical planning.

Carrie S Stern completed her Medical degree from New York University Medical Centre and then pursued her residency training in Plastic and Reconstructive Surgery at Montefiore Medical Centre of the Albert Einstein College of Medicine. Given her previous research interests in simulation and technology in plastic surgery, coupled with her entrepreneurial interests, she decided to launch MirrorMe3D, a company dedicated to bringing 3D printing to cosmetic surgery. She has co-authored 20+ manuscripts in peer reviewed journals and 50+ presentations and national and international conferences to date.

3D printing techniques are increasingly used in engineering science, allowing the use of computer aided design (CAD) to rapidly and inexpensively create prototypes and components. There is also growing interest in the application of these techniques in a clinical context for the creation of anatomically accurate 3D printed models from medical images for therapy planning, research, training and teaching applications. However, the techniques and tools available to create 3D models of anatomical structures typically require specialist knowledge in image processing and mesh manipulation to achieve. In this book chapter we describe the advantages of 3D printing for patient education, healthcare professional education, interventional planning and implant development. We also describe how to use medical image data to segment volumes of interest, refine and prepare for 3D printing. We will use a lung as an example. The information in this section will allow anyone to create own 3D printed models from medical image data. This knowledge will be of use to anyone with little or no previous experience in medical image processing who have identified a potential application for 3D printing in a medical context, or those with a more general interest in the techniques.

Three-dimensional (3D) printing is based on additive technology in which layers of materials are gradually placed to create 3D objects. The world of 3D printing is a rapidly evolving field in the medical industry as well as in most sectors of our lives. In this report we present current technological possibilities for 3D printing in the surgical field. There are different 3D printing modalities

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and much confusion among clinicians regarding the differences between them. Three-dimensional printing technologies can be classified based on the basic material used: solid, liquid, and powder. We describe the main printing methods from each modality and present their advantages while focusing on their applications in different fields of surgery, starting from 3D printing of models for preoperative planning up to patient-specific implants (PSI). We present the workflow of 3D printing for the different applications and our experience in 3D printing surgical guides as well as PSI. We include examples of 3D planning as well as clinical and radiological imaging of cases. Three-dimensional printing of models for preoperative planning enhances the 3D perception of the planned operation and allows for preadaptation of surgical instruments, thus shortening operation duration and improving precision. Three-dimensional printed PSI allow for accurate reconstruction of anatomic relations as well as efficiently restoring function. The application of PSI is expanding rapidly, and we will see many more innovative treatment modalities in the near future based on this technology.