3-Dimensional Printed Spinal Implants

3D printing allows for the design of implants for conditions that are considered difficult to treat, or implants with additional features, such as pre-planned screw trajectories or conformities.

Three-dimensional printing (3DP) applications possess substantial versatility within surgical applications, such as complex reconstructive surgeries and for the use of surgical resection guides. The capability of constructing an implant from a series of radiographic images to provide personalized anatomical fit is what makes 3D printed implants most appealing to surgeons.

Fiani et al. described the process of integration of 3DP implants into the operating room for spinal surgery, summarize the outcomes of using 3DP implants in spinal surgery, and discuss the limitations and safety concerns during pre-operative consideration. 3DP allows for customized, light weight, and geometrically complex functional implants in spinal surgery in cases of decompression, tumor, and fusion. However, there are limitations such as the cost of the technology which is prohibitive to many hospitals. The novelty of this approach implies that the quantity of longitudinal studies is limited and our understanding of how the human body responds long term to these implants is still unclear. Although it has given surgeons the ability to improve outcomes, surgical strategies, and patient recovery, there is a need for prospective studies to follow the safety and efficacy of the usage of 3D printed implants in spine surgery [1].

The applications of three-dimensional (3D) printing, or additive manufacturing, to the field of spine surgery continue to grow in number and scope especially in recent years as improved manufacturing techniques and use of sterilizable materials have allowed for creation of 3D printed implants. While 3D printing in spine surgery was initially limited to use as visual aids in preoperative planning for complex pathology, it has more recently been used to create intraoperative patient-specific screw guides and templates and is increasingly being used in surgical education and training. As patient-specific treatment and personalized medicine gains popularity in medicine, 3D printing provides a similar option for the surgical fields, particularly in the creation of customizable implants. 3D printing is a relatively new field as it pertains to spine surgery, and as such, it lacks long-term data on clinical outcomes and cost effectiveness; however, the apparent benefits and seemingly boundless applications of this growing technology make it an attractive option for the future of spine surgery [2].

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2)

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