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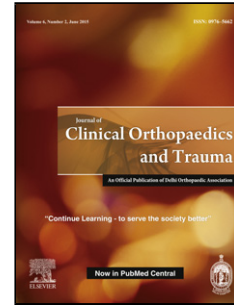
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Additive Manufacturing applications in Orthopaedics: A review

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Abstract

The applications of Additive Manufacturing (AM) have increased extensively in the area of orthopaedics. The AM applications are for making anatomic models, surgical instruments & tool design, splints, implants and prosthesis. A brief review of various research articles shows that patient-specific orthopaedic procedures provide multiple applications areas and provide directions for future developments. The purpose of this paper is to identify the best possible usage of additive manufacturing applications in orthopaedics field. It also presents the steps used to prepare a 3D printed model by using this technology and details applications in the field of orthopaedics. AM gives a flexible solution in orthopaedics area, where customised implants can be formed as per the required shape and size and can help substitution with customised products. A 3D model created by this technology gain an accurate perception of patient's anatomy which is used to perform mock surgeries and is helpful for highly complex surgical pathologies. It makes surgeon's job accessible and increases the success rate of the operation. AM provides a perfect fit implant for the specific patient by unlimited geometric freedom. Various scanning technologies capture the status of bone defects, and printing of the model is done with the help of this technology. It gives an exact generation of a physical model which is also helpful for medical education, surgical planning and training. This technology can help to solve present-day challenges as data of every patient is different from another.

Keywords: - 3D Printing; Additive Manufacturing (AM); Applications; Customisation; Implant; Medical: Orthopaedics.

1. Introduction

In recent years, there has been a significant improvement in additive manufacturing technologies, and researchers have explored its applications in various fields of engineering and medicine. It creates a physical model from the digital 3D model without any requirement of process planning, physical tools and dies. This technology has great capability to fabricate complex shape prototypes with a variety of materials such as nylon, polymers and even metals. It produces implants of biocompatible materials that meet structural requirements.^{1,2}

Additive manufacturing is a type of manufacturing technology in which materials like powder, plastic or metal are deposited layer by layer to fabricate the 3D model from Computer Aided Design (CAD) model. This method is different from traditional manufacturing technology because rather than removing of material; it adds materials layer by layer. In surgical

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