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ANALYSIS OF MEDICAL FIELD BIOINKS BASED ON 3D PRINTING PROCESS AND COMPUTATIONAL MODELLING FOR VIDEO-ASSISTED THORACOSCOPIC SURGERY

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Abstract

A new generation of improved bio-inks has contributed to better designs for diverse bio-fabrication platforms without sacrificing the ability to receive encapsulating cells. 3D printing bio-inks have been created to increase the performance of printed scaffolds outside of the conventional bio-fabrication window. An esophagus and tracheoesophageal fistula in a young patient prompted the development of video-assisted thoracoscopic surgery (VATS) based on 3D-printed phantoms (VATS-3D). The CT images have been used to construct models that reflect the unique structural characteristics of the patient. We employed reusable designs, realistic mechanical qualities with various material types, and 3D printers (Fused Deposition Modelling (FDM) and PolyJet printers) to portray realistic anatomical structures. A convolutional neural network (CNN) is employed to process the obtained CT images and develops the precise 3D-printed models that reflect the unique structural characteristics of the patient's esophagus and tracheoesophageal fistula. Supramolecular bio-inks and multi-material interpenetrating networks are among the most promising techniques to achieve these goals discussed in this study. This analysis of current and forthcoming bio-ink synthesis and bio-fabrication developments examines the therapeutic use of these novel biomaterials. 3D printing technology and its usage in medical materials focus on our presentation. An introduction to additive manufacturing processes and printable materials is provided.

Key words: bio-fabrication, biomaterials, interpenetrating, networks, 3D printing bio-inks, patient, VATS

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