

«Application of three-dimensional printing in manufacturing surgical materials with antibacterial properties»

ABSTRACT

Aim of the present thesis was the construction of surgical tools (surgical hooks) with 3D printing technology. The construction has been performed with ©MakerBot Replicator 2. Surgical retractors were firstly designed by computing program ©Solidworks.2015, followed by their construction from poly-lactic acid. The dimensions of the retractors was 17cm x 1,5 cm x 4mm. After being constructed, the surgical retractor where sterilized at standard conditions in plasma (FDA protocol). On the surface of the retractor a thin layer of Silver nanoparticles was developed. An antimicrobial property of Silver was known ever since the times of Hippocrates antimicrobial properties of silver. Subsequently studies have been conducted in order to characterize the thin layer as far as the size, the homogeneity and the morphology of the nanoparticles of silver is concerned. The materials were characterized and the antimicrobialities of the improved retractors were identified. Finally, analysis of the cost followed. To conclude, the construction of surgical tools with the technology of 3D printing is fluent, while thanks to the ability of modifying the surface of the printed materials, we created tools with antimicrobial properties. The method has with no doubt lower cost in comparison with the classic methods of construction and supply of the material. Moreover, it is given the ability to construct tools in dimensions according to the demand of the Surgeons. This ability opens new horizons to create “smart” surgical tools with further properties.