

1. 3D MODELING IN BONE GRAFT SUBSTITUTES, INCLUDING DEVICES FOR IMPLANTATION



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Introduction. The first documented bone transplant took place in 1686 by a Dutch surgeon, Job van Meekeren, when he used dog cranium to repair a soldier's skull defect. Today, more than two million bone transplants are performed worldwide each year. The use of 3d printing in bone graft substitutes including implantation devices is gaining more and more importance day by day. It has a significant impact on preparation of patients for surgery, probability of rejection and other complications.

Aim of study. The data that was accessible from clinical trials were gathered, and a meta- analysis and comprehensive review were carried out to evaluate the procedure of 3d modeling in bone graft substitutes.

Methods and materials. Researched and Obtained from articles that could be found using the keywords "3d modeling" "bone graft substitutes" "devices for implantation" etc. in databases (PubMed, NCIB, pubmed central, frontiers,...etc.).

Results. Bone defects can be caused from accidents, neoplasms, infection, malunion or nonunion from fracture healing and if they try to let them heal on their own it can lead to a lot of defects like shortening or loss of full functioning. Autografts were considered as the best treatment, however the complications such as availability, difference of bone structure in different parts ...etc. indicate need for newer methods like 3D printing. It can be used to make personalized implants which fits to specific needs of individual patient size and shape. 3d printing can also make functional tissues and organs for transplants. It can also create custom individual fit prosthetics that are light, strong and comfortable than all other prosthetics. They can also create replicas of patients' anatomy and perform training before they do the actual surgery. It is also used to make specific surgical instruments like scissors, forceps ...etc.

Conclusion. In orthopedics and traumatology 3d printing can be an innovative substitute to all other traditional methods. It can solve most of the problems such as tissue source, rejection of organs, transmission of diseases, contamination ...etc. this innovative method can be used in reconversion of normal bone structure of both compact and spongy bones. Even though there is scarcity in studies and experiments, also there is more improvement to be made, it is certain that 3D printing is the future of transplant medicine