

Abstract

3D printing implants for fracture healing studies in rats

By: Malcolm Horal

The purpose of this project was to investigate the possibility to create 3D printed implants intended for bone healing studies in small animals at the Biomechanics group at Lund University. The aim was to use cheaper but stable non metallic implants and find out what printers and materials are suitable and accessible today. An Ultimaker 2 was used to produce both nails and screws in Polyhydroxyalkanoates (PHA) and Polylactic acid (PLA) and Nylon which were analyzed both qualitatively and quantitatively. A three point bending test and the effect subjecting them to a wet and warm environment was investigated.

It was found that the produced nails were adequate but it was not possible to produce the screws with satisfactory results with this specific printer. The samples made out of Nylon were generally not strong enough and lost too much stiffness when immersed in saline. The quality of the produced samples varied, and manual polishing was required to achieve the desired results. The PLA/PHA samples were stiff enough even after being immersed in saline. It was concluded that it is too early to start using 3D printing with this type of printer for in vivo studies.

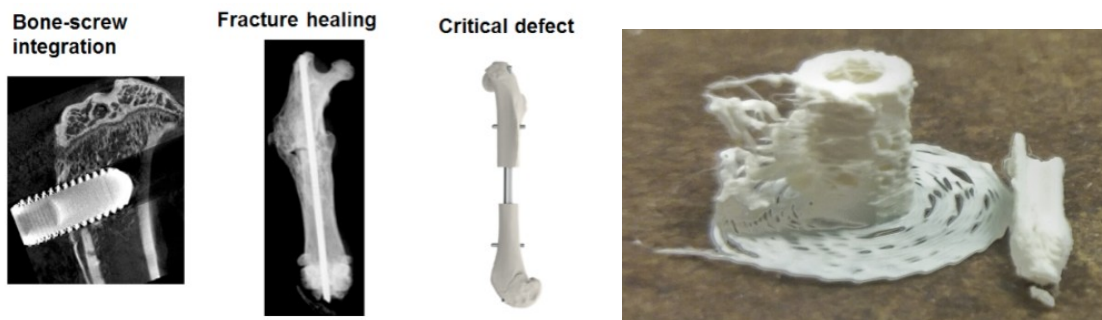


Figure 1: Left, images of the three models used for bone healing studies (bone-screw, fracture healing and critical defect). Right, Less successful printing attempt of the bone chamber screw. Other two models were successfully printed.