A comparative analysis of a scoliosis case against a control using 3D printing and MRI based computational modelling

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Abstract

Scoliosis is the abnormal lateral curvature of the spine resulting in loss of coordination, breathing problems and fatigue. Generally, there are three classifications of scoliosis; Idiopathic, Congenital and Neuromuscular [1]. The methods of treatment depend on its severity and the progression of the condition. A common practice is observation, bracing (back braces) or surgery, the most common of which is a posterior spinal fusion with instrumentation and bone grafting [2]. This project involved capturing MRI images from the Lumbar spines of two subjects, a scoliotic pre-surgical case, and a control. Using a Bio-CAD image-based modelling technique with ScanIP software [3], virtual 3D reconstructions were created to be used for manufacturing the 3D printed models using Stereolithography (SLA). Computational models, including finite element analysis (FEA) [4] was also used to compare the different stabilities of the two spines and analyse the functional differences. Due to the variability between patients, surgical planning is difficult, therefore, these 3D printed models of the patient's spine have allowed for increased surgical preparation and increased success rates of pedicular screw placement [5].

Biography

Joseph Bryars is studying at the University of Exeter, College of Medicine and Health. He is currently in his final year of BSc Medical Sciences.

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