3D printing for spine surgery

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Spine surgery has the potential to benefit from the use of 3D printing technology (additive manufacturing) particularly in cases of complex anatomical pathologies. Custom devices have the potential to reduce operative times, reduce blood loss, provide immediate stability and potentially improve fusion rates.

A 34-year-old male presented with 3-year history of bilateral L5 radiculopathy due to bilateral L5 pars defect, and L5/S1 Degenerative Disc Disease and severe foraminal stenosis. ALIF surgery was determined to be the most efficacious method for distraction of the disc space to increase the foraminal volume and stabilization of the motion segment. Surgical decompression and reconstruction was performed in combination with a 3D printed, custom interbody implant. Custom design features included; corrective angulation to restore lumbar lordosis, pre-planned screw holes in the 3D implant and device endplate interface geometry designed to shape-match with the patient's endplate anatomy.

The use of Patient Specific Implants has reduced operative time significantly, which may offset costs of increased time spent pre-planning the procedure. Surgical procedures can be pre-planned using 3D models reconstructed from patient CT and/or MRI scans. Planning can be aided by 3D printed models of patient anatomy, which surgeons can use to train prior to performing complex procedures. When considering implants and prostheses, the use of 3D printing allows a superior anatomical fit for the patient compared to generic devices, with the potential to improve restoration of none-pathological anatomy [1)].

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Mobbs RJ, Parr WC, Choy WJ, McEvoy A, Walsh WR, Phan K. Anterior Lumbar Interbody Fusion (ALIF) using a personalised approach: Is custom the future of implants for ALIF surgery? World Neurosurg. 2019 Jan 8. pii: S1878-8750(19)30003-8. doi: 10.1016/j.wneu.2018.12.144. [Epub ahead of print] PubMed PMID: 30633990.