Intracranial surgery can be complex and high risk. Safety, ethical and financial factors make training in the area challenging. Head model 3-dimensional (3D) printing is a realistic training alternative to patient and traditional means of cadaver and animal model simulation.

Maclachlan et al. described important factors relating to the 3D printing of human head models and how such models perform as simulators.

Searches were performed in PubMed, The Cochrane Library, Scopus and Web of Science. Article screening was conducted independently by three reviewers using Covidence software. Data items were collected under five categories: 'Study information', 'Printers and processes' 'Head model specifics,' 'Simulation and evaluations' and 'Costs and production times'.

Forty articles published over the last 10 years were included in the review. A range of printers, printing methods and substrates were used to create head models and tissue types. Complexity of the models ranged from sections of single tissue type (e.g., bone) to high-fidelity integration of multiple tissue types. Some models incorporated pathology (e.g., tumours, aneurysms) and artificial physiology (e.g., pulsatile circulation). Aneurysm clipping, bone drilling, craniotomy, endonasal surgery and tumour resection were the most commonly practiced procedures. Evaluations completed by those using the models were generally favourable.

This review's findings indicate that those who practice surgery and surgical techniques on 3D printed head models deem them to be valuable assets in cranial surgery training. Understanding how surgical simulation on such models impacts on surgical performance and patient outcomes, whilst considering cost-effectiveness, are important future research endeavours [1].

1)
Maclachlan LR, Alexander H, Forrestal D, Novak JI, Redmond M. Properties and characteristics of 3-dimensional printed head models used in simulation of neurosurgical procedures: a scoping review. World Neurosurg. 2021 Sep 24:S1878-8750(21)01422-4. doi: 10.1016/j.wneu.2021.09.079. Epub ahead of print. PMID: 34571242.