3 - Clinical Anatomy

OC-034 - (22712) - HIGH-PRECISION 3D PRINTING OF THE SPHENOID BONE: AN INNOVATIVE APPROACH

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The sphenoid bone, located at the base of the skull, is a critical anatomical structure characterized by its complex features and numerous neurovascular relationships. Its deep placement presents challenges in creating accurate models. Traditional methods using patient CT data for 3D printing are hindered by ethical concerns, segmentation challenges, and anatomical variations. This study aimed to develop an anatomically precise, cost-effective 3D model of the sphenoid bone using DICOM data from dry bone specimens to provide a standardized resource for medical education and surgical planning.

A dry sphenoid bone specimen was cleaned and positioned appropriately for high-resolution CT scanning. Scanning was performed using a small field of view, 1mm slice thickness, and spiral mode to ensure detailed anatomical imaging. Volume rendering was applied using bone presets, and segmentation was carried out through thresholding, noise removal, and voxel reconstruction. Final refinements of the 3D model were performed using sculpting tools in Meshmixer. The generated STL file was optimized for 3D printing, ensuring precise replication of the sphenoid bone's intricate anatomical features.

The 3D-printed sphenoid bone model demonstrated exceptional anatomical accuracy, successfully replicating minute details such as foramina and bony contours. Compared to traditional models derived from patient CT data, this method eliminated ethical concerns, simplified segmentation, and reduced preparation time.

This study highlights the effectiveness of using DICOM data from dry bone specimens to create high-precision 3D-printed sphenoid bone models. The approach offers several advantages, including cost efficiency, avoidance of ethical concerns, and consistent anatomical representation.

Palavras-chave : Medical Education, Surgical Planning, Anatomical Innovation