Virtual reality-based learning of neuroanatomy

Virtual reality-based learning of neuroanatomy is a new feasible method to explore, visualize, and “dissect” interactively complex anatomical regions. Corvino et al. provide a new interactive photorealistic 3D model of sellar region microsurgical anatomy which allows to explore of side-by-side views of exocranial and endocranial surfaces to assist young neurosurgery residents in learning the microsurgical anatomy of this complex region.

Four head specimens underwent an endoscopic endonasal approach extended to the anterior and posterior skull base to expose the main bony anatomical landmarks of the sellar region. The same bony structures were exposed from a transcranial perspective. By using the photogrammetry method, multiple photos from both endocranial and exocranial perspectives, different for angulations and depth, were captured, fused, and processed through dedicated software.

Results: All relevant bony structures were distinguishable in the 3D-model reconstruction, which provides several benefits in neuroanatomy learning: first, it replicates bony structures with high degrees of realism, accuracy, and fidelity; in addition, it provides realistic spatial perception of depth of the visualized structures and their anatomical relationships; again, the 3D model is interactive and allows a 360 degrees self-guided tour of the reconstructed object, so that the learner can “read the bones” and their anatomical relationship from all desired points of view.

Detailed knowledge of key surgical landmarks representing keyholes and/or anatomical structures to not violate is mandatory for safer surgery, especially for complex regions like skull bases. Highly accurate virtual and functional neurosurgical models, like photogrammetry, can generate a realistic look to further improve surgical simulators and learning neuroanatomy [1)]

1)
Corvino S, Piazza A, Spiriev T, Tafuto R, Corrivetti F, Solari D, Cavallo LM, Di Somma A, Enseñat J, de Notaris M, Iaconetta G. The Sellar Region as Seen from Transcranial and Endonasal Perspectives: Exploring Bony Landmarks through New Surface Photorealistic 3D Models Reconstruction for Neurosurgical Anatomy Training. World Neurosurg. 2024 Feb 9:S1878-8750(24)00219-5. doi: 10.1016/j.wneu.2024.02.022. Epub ahead of print. PMID: 38342178.