Article published online: 2022-06-15

Predicting the Position of the Internal Landmarks of Middle Cranial Fossa Using the Zygomatic Root: An Attempt to Simplify Its Complexity

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Indian J Neurosurg 2024;13:179–180.

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Neurosurgery is a rapidly ever evolving, challenging, and young specialty. We are in a race toward technological advancement to achieve excellence in postoperative outcome, avoiding and anticipating complications. Skull base neurosurgery has moved significantly forward with pioneering contributions from eminent neurosurgeons to enrich neuroanatomical knowledge, promoting safe and innovative surgical approaches.

We have evidence on temporal bone embryology and its development.[1,2] Considering wide variability in the skulls noted in Caucasian and Indian skulls, the current evidence that the mean depths of the lateral projections are smaller and greater distance from anterior root of lateral projections is a useful tool.[3] This leaves the corridor open for further anatomical studies.

Patients with trigeminal neuralgia receiving foramen ovale (FO) injection or balloon rhizolysis, radio frequency ablation of trigeminal nerve often pose a challenge in terms of anatomical localization and knowledge about the middle cranial fossa anatomy will potentially avoid failure of procedure and subsequent complications. Zygomatic root (ZR) in this anatomical study has shown that in 89% of specimens analyzed, the FO projected on to the anterior two-third of ZR.[3] This is practically a useful tool both for the neurosurgeons and interventional neuroradiologists in terms of localization of FO. ZR identification can help prevention of facial droop by preserving frontalis branch of facial nerve and assist in epilepsy surgery by identifying the temporal horns of lateral ventricle, temporal tip, and the inferior temporal gyrus.[4,5]

Virtual reality (VR), augmented reality, and haptic simulation are burgeoning in neurosurgery particularly to aid preoperative surgical planning, mental rehearsal, and training residents.[6–9] They eliminate the task of having to mentally reconstruct and rotate triaxial images and provide additional information on the real operative field that is otherwise invisible and inaccessible.[6] VR technology might improve neurosurgical skull base teaching quality, which should be promoted in the teaching of clinical subjects.[7] Case-specific VR-based surgical simulation is shown to allow the users to intuitively understand the positional relationships between organs, blood vessels, and lesions within a patient’s body, resulting in assistance for surgical planning and intraoperative management.[8] “Cost factor” may be a limitation for the utility of these technological adjuncts in the low- and middle-income countries in terms of access but this will hopefully be more accessible and affordable in the near future.

Preoperative computed tomography along with magnetic resonance imaging brain and an understanding of applied neuroanatomy are vital to visualize, plan, and guide the operating neurosurgeon during middle and posterior fossa surgical approach for a variety of neurosurgical pathologies.[7] Haptic simulation as a tool is emerging and may be a norm in the future albeit it has its limitations.[9] Neuroanatomical nuance and understanding will help vascular, trauma, functional, oncological neurosurgeons and ENT surgeons (who form a part of the skull base team). As elucidated by the authors in this study, the reliability of ZR in 80% predicting the position of FO, foramen spinosum, and trigeminal fossa will remain a useful adjunct to existing technology in delivering a “safe and sustainable” care package to the global neurosurgical patients.[3]

article published online
June 15, 2022

DOI https://doi.org/10.1055/s-0042-1750297.
ISSN 2277-954X.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

Conflict of Interest
None declared.

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