

A Color-Coded 3D-Printed Modular Puzzle of the Temporal Bone As A Novel Conceptual Anatomy Teaching Tool.

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Introduction

The purpose of this exhibit is to utilize 3D printing in simplifying the understanding of the complex three-dimensional anatomy of the middle ear with its surrounding communications and neurovascular connections through a novel color-coded multi-piece conceptual 3D puzzle.

Methods

The middle ear along with its contents and anatomical landmarks are represented as a cube-shaped room and its communications as hallways, doors and windows. A color-coded 3D printed model is then created which is de-roofed and has multiple parts, which must be assembled. Each wall with its corresponding structures is a unique color. This approach simplifies the 3D understanding, by providing an alternative method of visualization from within the cavity itself and breaking down the complex anatomy into smaller divisions. Graphics design software, Autodesk 3D Studio Max, was used to create volumetric meshes of the conceptualized middle ear and surrounding structures. These include the ossicles, scutum, chorda tympani nerve, facial canal, tensor tympani, cochlear promontory, round and oval windows, tympanic membrane, carotid canal, jugular foramen, tympanic canaliculus, aditus ad antrum, facial recess, sinus tympani, pyramidal eminence and inner ear elements. All of the structures are available individually, which can be properly assembled into a final model similar to pieces of a puzzle.

Results

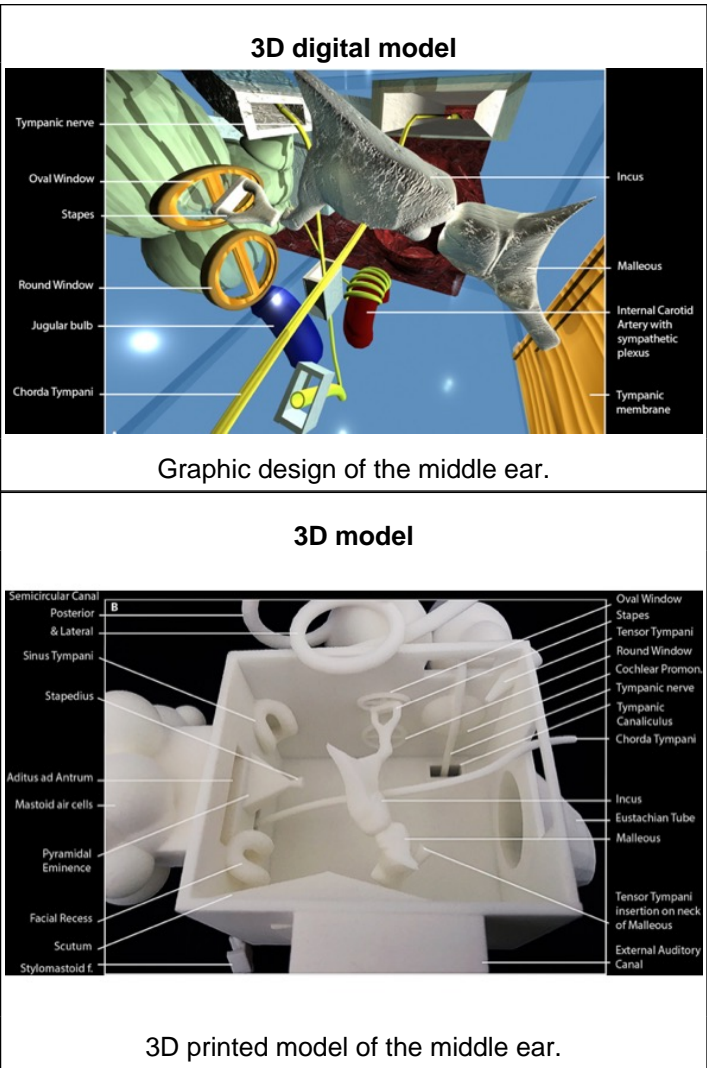
A unique color-coded physical 3D puzzle of the temporal bone was created with individual structures portrayed conceptually for the specific use of teaching complex anatomy based on the unique color of each wall of the middle ear. The model is 3D printed with polyamide and every set of structures for each wall is spray painted a unique color.

Conclusions

An alternative approach to learning the intricate anatomy of the middle ear and its communications was designed, which may help trainees commit to memory this detailed anatomy and serve as a bridge between textbook knowledge base and detection on cross-sectional imaging.

Learning Objectives

Facilitate learning of the complex anatomy of the temporal bone.



References

Takahashi K, et al. Creating an Optimal 3D Printed Model for Temporal Bone Dissection Training. Ann Otol Rhinol Laryngol. 2017 Jul;126(7):530-536. doi: 10.1177/0003489417705395. Epub 2017 Apr 19.