

3D Model Used as a Teaching Tool of Skull Base Anatomy Through a Transphenoidal Approach for Neurosurgery Residents

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Learning Objectives

By the conclusion of this session, participants should be able to: 1) describe how 3D-printed models are created, 2) understand how 3D models are used in simulation, and 3) discuss how skull base anatomy can be taught using 3D models

Introduction

Skull base anatomy through a transsphenoidal approach is challenging for the neurosurgical resident to conquer. Typically, the anatomy is learned through 2-D books and presentations. Stereolithography, or 3D printing, allows residents to examine this complex anatomy in a three-dimensional view.

Methods

Prior to any formal teaching, residents were brought into the operating room where they were asked to identify key structures seen through an endoscopic transsphenoidal approach. Scoring was based on correctly naming the anatomical structures. After the initial testing, all residents participated in a didactic lecture reviewing skull base anatomy through a transsphenoidal approach using powerpoint with 2D pictures. Residents were then divided into two groups: A & B. Group B residents were additionally taught transsphenoidal anatomy through neurosurgical simulation using a 3D-printed model and an endoscope. Following all formal teaching, residents were once again brought back to the operating room where the initial testing was repeated.

Results

A maximum score of 8 points was possible if all the structures were identified correctly. Group A had mean scores of 2.75 on initial testing compared to 5 after lecture ($p=0.041$ using two-tailed t-test). Group B had mean scores of 2.75 on initial testing compared to 7.5 after lecture and 3D model simulation ($p=0.002$). When comparing mean scores after formal teaching in groups A & B, 5 vs. 7.5 for lecture only vs. lecture and 3D model simulation, respectively ($p=0.031$).

Table

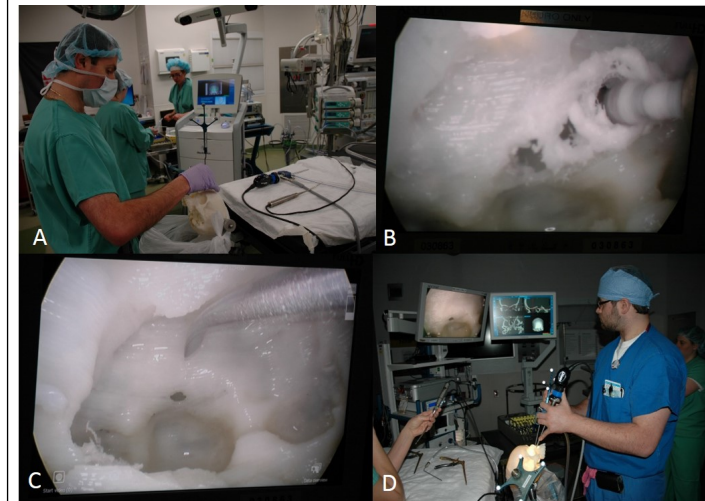
	Group A				Group B		
	No teaching	Lecture alone	Lecture + 3D simulation		No teaching	Lecture + 3D simulation	
R1	3	6	8	R5	3	7	
R2	2	4	6	R6	2	7	
R3	4	6	6	R7	4	8	
R4	2	4	8	R8	2	8	
Average	2.75	5	7	Average	2.75	7.5	

Results

Conclusions

3D models used in neurosurgical simulation to teach skull base anatomy through a transsphenoidal approach showed objective and subjective improvement in testing scores in neurosurgery residents. This study confirms that 3D models are a useful educational tool.

Photos of Simulation



- A) Registering the 3D printed model for neuronavigation;
 B) Drilling of the sphenoid sinus through the endoscope;
 C) Identification of various anatomic structures through the endoscope; D) Residents practicing endoscopic navigation