

Background

- Surgical anatomy must be taught in a more clinically relevant format integrating multimodal resources, to meet the needs of the current generation of medical students
- Relative anatomy is poorly taught especially with displaying complex regional structures
- Endoscopic approach is adopted in various forms across general surgery, urology, gynaecology, otolaryngology and neurosurgery. Its ability to navigate confined spaces and visualise deep-seated structures makes it an attractive medium to understand key relationships between nerves, vessels, spaces and tissue planes¹
- Video modality is more engaging and easily accessible and offers students the flexibility to study materials at their own time and pace

Objectives

- To integrate endoscopic images and videos with traditional methods (atlas drawings, anatomical models, dissections) to provide a more clinically relevant and engaging means of teaching and learning surgical anatomy

Example 1 Pelvic anatomy

Learning points:

- Understand the relationship between subserous myomas and surrounding uterine structures

Methods: uterine manipulator pulled caudally and anteriorly during laparoscopy

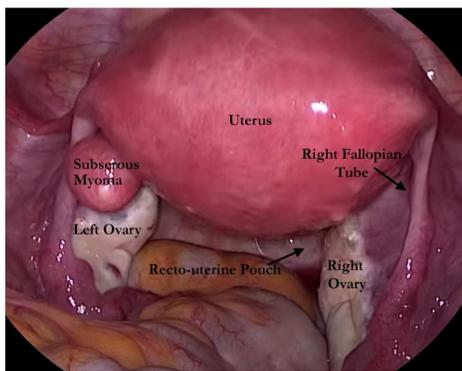


Fig 1. Relation of subserous myoma to surrounding uterine structures during diagnostic gynaecological laparoscopy²

Example 2 Cerebellopontine angle (CPA) anatomy

Learning points:

- Understand the relationship between arteries of the posterior cerebral circulation and cranial nerves in CPA
- Understand how anatomy is distorted by pathologies such as neurovascular compression, aneurysm, tumours in CPA

Methods: Zero-degree endoscope inserted into retrosigmoidal craniotomy

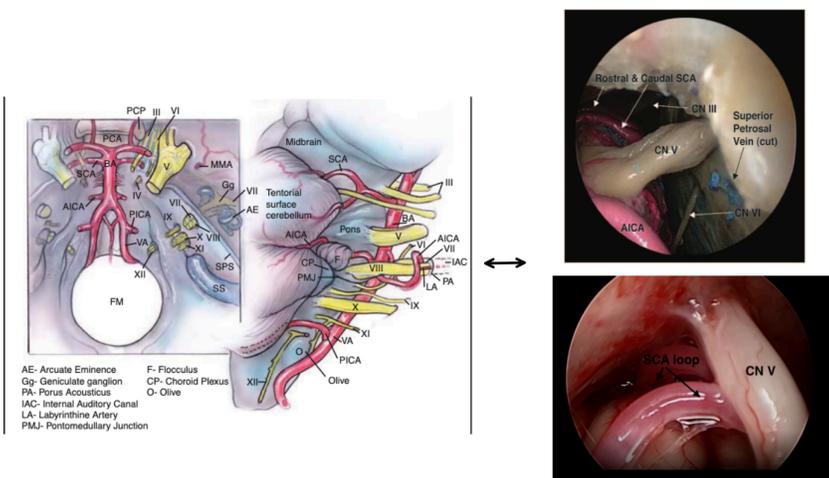


Fig 2. Visualising the relationship between cranial nerves and arteries of posterior circulation in CPA through atlas drawing (left)² and endoscopic approach in anatomical specimen (top right).¹ Endoscopic view (bottom right) of the offending superior cerebellar artery (SCA) loop compressing trigeminal nerve, CN V, during microvascular decompression in trigeminal neuralgia (bottom right).³ AICA, anterior inferior cerebellar artery; CN III, oculomotor nerve; CN VI, abducens nerve.

References

1. Van Rompaey J, Bush C, McKinnon B, Solares C. Minimally Invasive Access to the Posterior Cranial Fossa: An Anatomical Study Comparing a Retrosigmoidal Endoscopic Approach to a Microscopic Approach. *Journal of Neurological Surgery Part B: Skull Base*. 2012;73(S 01).
2. Bush M, Welling D. Cerebellopontine Angle Tumors. In: Johnson J, ed. *Bailey's Head and Neck Surgery: Otolaryngology*. Wolters Kluwer Health; 2013. p. 2557.
3. Belykh E, Onaka N, Zhao X, et al. Endoscopically Assisted Targeted Keyhole Retrosigmoid Approaches for Microvascular Decompression: Quantitative Anatomic Study. *World Neurosurgery*. 2018;119:e1-e15.
4. Netter, Frank H. *Atlas Of Human Anatomy*. Philadelphia, PA : Saunders/Elsevier, 2011. Print.
5. Mastoidectomy for Cholesteatoma [Internet]. ENT USA mastoid surgery; 2017 [updated 2017; cited 2020 July 13]. Available from: http://www.entusa.com/mastoid_surgery.htm

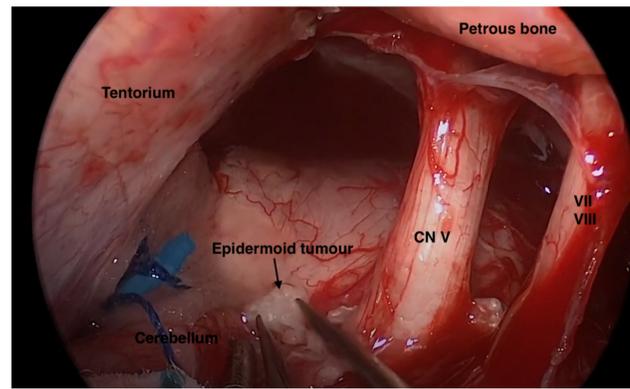


Fig 3. Endoscopic view of the origin of the trigeminal (CN V), facial (VII) and vestibulocochlear (VIII) nerves during epidermoid tumour removal in the CPA

Example 3 Middle ear anatomy

Learning points:

- Understand the relationship between nerves (chorda tympani, facial nerve), bones (malleus, incus, stapes) and lesions (cholesteatoma) in the middle ear
- Understand how anatomy is distorted by pathologies in the middle ear and can cause complications such as facial nerve paralysis

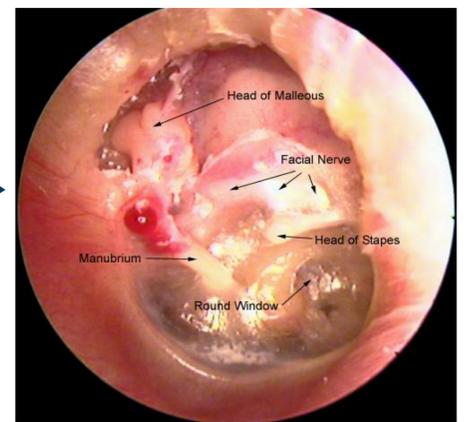
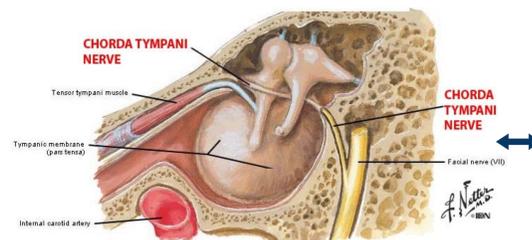


Fig 3. Illustrated chorda tympani nerve location relative to the middle ear (left)⁴ and a large cholesteatoma of ear with exposure of head of malleus visualized by transmitting an endoscope through the ear canal (right)⁵

Discussion

Advantages

- Motivates students to visualise relationships between anatomical structures in clinical context
- Endoscope allows high magnification and access to deep anatomy
- Helps students adapt early on to view anatomy from surgical approaches in current use

Challenges

- Learning curve in visualising anatomy from different angles of endoscopic views
- Students need to gain basic theoretical knowledge of anatomical structures prior to viewing the videos

Future studies should evaluate the effectiveness of incorporating endoscopic videos into curriculum on student learning and explore students' perceptions and interest using this mode of delivery

Conclusion

Endoscopic surgery videos may provide an **engaging means of teaching and learning surgical anatomy in the clinical context**

- Increase depth of students' understanding into the relationships between structures, vessels, nerves and tissue planes
- Inspire them to appreciate the relevance of anatomical principles in an array of medical and surgical conditions