

Video otology tutorials: how EES changes the game

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High definition endoscopic ear surgery (EES) redefines traditional middle ear anatomical perspectives. The surgeon can observe in situ anatomical relationships with angled objectives in a way that the traditional microscopic view, with step-wise removal of structures is unable to achieve. The identical surgical view for both operator and observer lends itself to confident teaching.



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The strength of endoscopic ear surgery (EES) is that it allows high definition visualisation of middle ear anatomy in an in situ and intact way. When compared with the operating microscope, what is truly unique is that the objective lens is placed within the ear canal or middle ear, which allows for an all-encompassing view during surgery. There is a very broad width and depth of field as well as a high optical zoom – allowing even individual clusters of blood cells to be seen coursing through capillaries on the promontory.

The endoscopic perspective redefines and reimagines the surgical anatomy allowing a better understanding of the disease / anatomy relationship. In contrast, the traditional microscopic method relies on removal of significant amounts of normal bone and soft tissue, often with removal of intact structures to fully observe the disease extent. While some cases will continue to suit a microscopic, or combined microscopic-endoscopic approach, this extra dissection can be avoided in many cases.

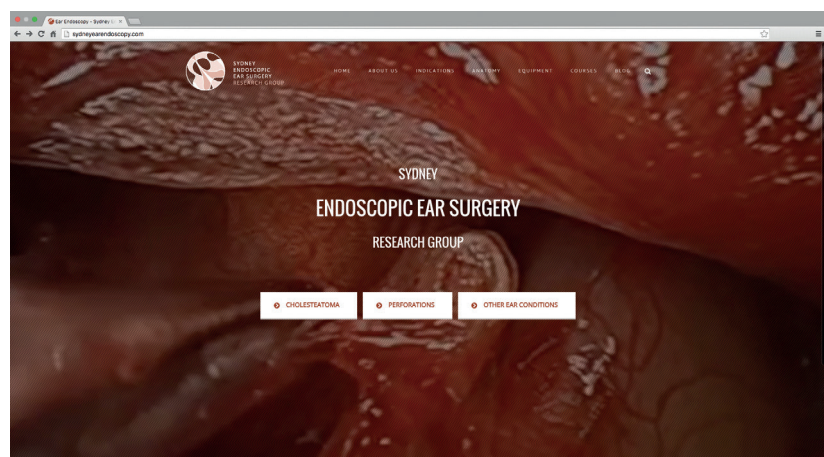
Additionally, the live image used by the surgeon is the same one that everyone else – surgical trainees, medical students, anaesthetic staff and nursing staff – is observing. This simultaneous viewing dramatically increases engagement and interest in the surgical procedure from all present in the operating room.

In the apprenticeship model of surgical training the identical surgical view allows the trainee to visualise the exact steps their mentor is performing. Conversely, when the trainee gains experiential learning through performing a procedure themselves, the mentor is able to supervise and follow their progress closely. The confidence in the view of the surgical anatomy that the mentor can achieve obviates the all too familiar phrase that otology trainees dread: “Let me take over for a second, I can’t really see what you’re doing”.

Furthermore, the ability to record this video allows for retrospective review and reinforcement for those present at the surgery. By extension, this same all-encompassing video can be edited,

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Figure 1. SEES Research Group website (sydneyearendoscopy.com), through which the Video Dissection Manual can be accessed.



overlayed with descriptors, pointers and information and used for future teaching and education. In the field of video otology tutorials, the identical operative and teaching view with the ability to overlay learning points certainly changes the game. Traditional teaching methods such as temporal bone dissection, concentrate on drilling techniques of the mastoid cavity with relative ignorance of the complex anatomical structures of the middle ear. The endoscopic approach shifts the trainee's focus immediately to the tympanic membrane, ligaments and membranous folds of the attic and hidden spaces of the mesotympanum, instilling the importance of such structures in disease pathogenesis.

The Sydney Endoscopic Ear Surgery (SEES) Research Group (sydneyearendoscopy.com) is an Australian not for profit organisation dedicated to research, teaching and advancing the technique of endoscopic ear surgery to otolaryngologists and trainees. The founding members are Drs Nirmal Patel, Jonathan Kong, Alexander Saxby and Nicholas Jufas. All the founders are members of the International Working Group on Endoscopic Ear Surgery (IWGEES). The SEES Group also offers an International Clinical Fellowship in Endoscopic Ear Surgery and Otolaryngology, applications for which can be made through the website.

The SEES Group has recently launched a series of videos, 'A Video Dissection Manual for Endoscopic Ear Surgery'. There are eight videos in total, all recorded in full high-definition 1080p. The videos were recorded using 3mm straight and angled endoscopes with 3-chip camera heads and SPIES system, generously loaned by the Karl Storz company. Both CLARA and CHROMA image enhancement algorithms were applied, rendering crisp and clear images throughout. The videos are further enriched by superb colour illustrations of endoscopic middle ear anatomy, created and kindly provided by Professor Daniele Marchioni (University of Verona, Italy) and available in his new book, 'Endoscopic Ear Surgery: Principles, Indications and Techniques'.

The videos detail, in a step-wise manner, a complete endoscopic approach to cadaveric dissection of the middle and inner ear. This forms the backbone of the Sydney Endoscopic Ear Surgery Dissection Course, which is run annually. Each video succinctly describes the salient anatomy of each region before moving deeper into the dissection. The videos are structured as follows:

- Video 1:** Tympanomeatal Flap and Prussak's Space
- Video 2:** Protympanum and Ventilation Pathways
- Video 3:** Atticotomy and Lateral Epitympanum
- Video 4:** Retrotympanum and Hypotympanum
- Video 5:** Extended Atticotomy and Epitympanum
- Video 6:** Tympanic Plexus and Facial Nerve
- Video 7:** Major Vessels and Infracochlear Approach
- Video 8:** The Inner Ear and Internal Auditory Canal

The videos are overlayed with helpful pointers to highlight relevant regions or anatomy, as well as having important didactic points as subtitles. Traditionally the teaching of such complex anatomy has relied on a combination of schematic diagrams, anatomical illustrations and confusing cross-sectional histological slides. Visualising such areas in a video format provides an integrated and vastly improved perspective of these anatomical relationships. Areas such as the sinus tympani, so important in cholesteatoma recidivism, become easily defined. This improved understanding and access may prove to assist significantly in minimising recurrence rates.

The SEES Group is proud to provide these videos online at no cost, allowing unrestricted access to an important resource

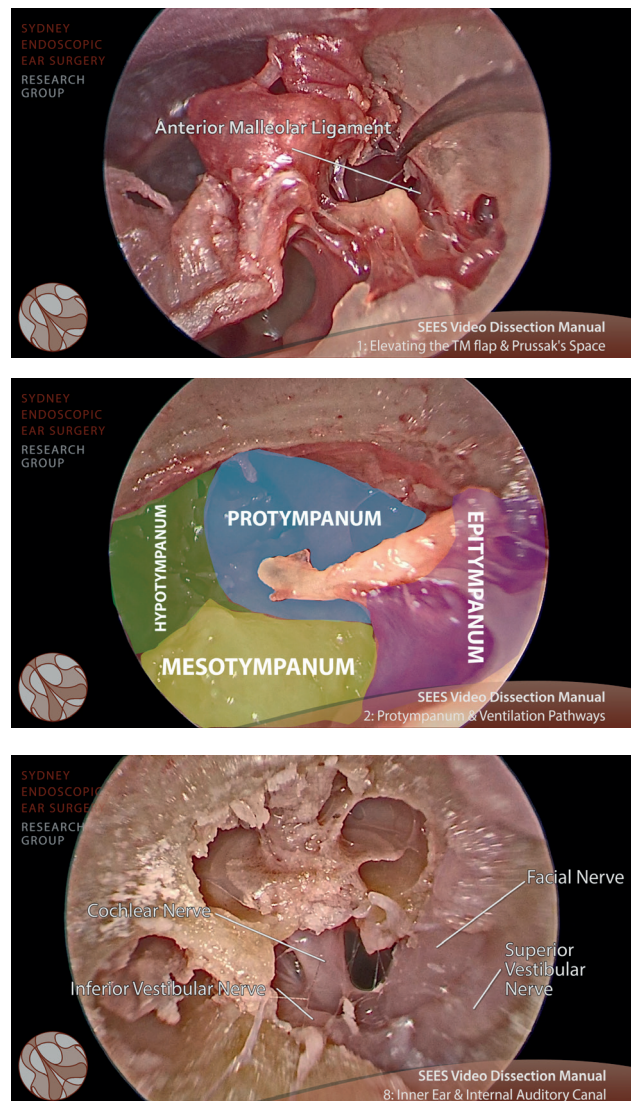


Figure 2a-c. Screenshots from the SEES Video Dissection Manual for Endoscopic Ear Surgery.

on the surgical anatomy of the middle ear from the endoscopic perspective. They can be accessed via links on the SEES Website (sydneyearendoscopy.com).

The anatomical understanding gleaned from using these videos is applicable to all otology. The videos are a clear demonstration of the visualisation capabilities of endoscopic ear surgery which has truly opened up a world of possibilities for otologists and their patients.

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SUMMARY

- Middle and inner ear anatomy is complex and traditional methods of teaching fail to convey these anatomical relationships in an easily digestible fashion.
- Free access to an invaluable video resource in learning middle ear anatomy utilising an endoscopic approach is now available (sydneyearendoscopy.com), providing an efficient, enjoyable method of familiarisation with this complex anatomy.
- The endoscopic approach to the middle ear has revolutionised the ability to visualise and target disease in difficult to reach areas.
- Better anatomical understanding of this region, combined with improved visualisation and access offers our best chance-improving treatment for patients.

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Declaration of Competing Interests:
None declared