Trainee Matters

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In this issue's Trainee Matters, it's a pleasure to present a trio of excellent articles with a theme of practical training courses for otolaryngology trainees. **Miss Rachel Edmiston**, **Professor Nirmal Kumar and colleagues** have written a valuable guide to setting up and running a cadaveric dissection course in the UK; **Miss Daniela Bondin** and **Mr Raj Bhalla** offer a personal insight on the benefits of rhinology and facial plastic surgery courses for trainees; and first up, **Miss Katherine Steele** gives us a fascinating account of training in temporal bone dissection.

Training in temporal bone procedures

Methods of training novice surgeons in surgical procedures without using real patients have been increasingly sought to ensure trainees are taught skills without compromising patient safety [1]. Temporal bone surgery is no different: given the risks involved in these procedures, a simulator for trainees to practise the procedural steps in which errors can be made without causing patient harm, is valuable. There are a variety of simulators available with, perhaps, the usual method being attendance at a cadaveric temporal bone dissection course. Whilst this provides experience and training in handling tissues, the relevant anatomy and the opportunity to practise the procedural skills in a safe environment, these are often performed over an intense one-to-two-day session, with a limit to the number of bones available limiting repetition and practice.

Within London North West Healthcare NHS Trust, we have access to a virtual reality temporal bone simulator, marketed by Voxel-Man, which is available for use by the trainees in the hospital during normal working

Figure 1: Trainee using the simulator

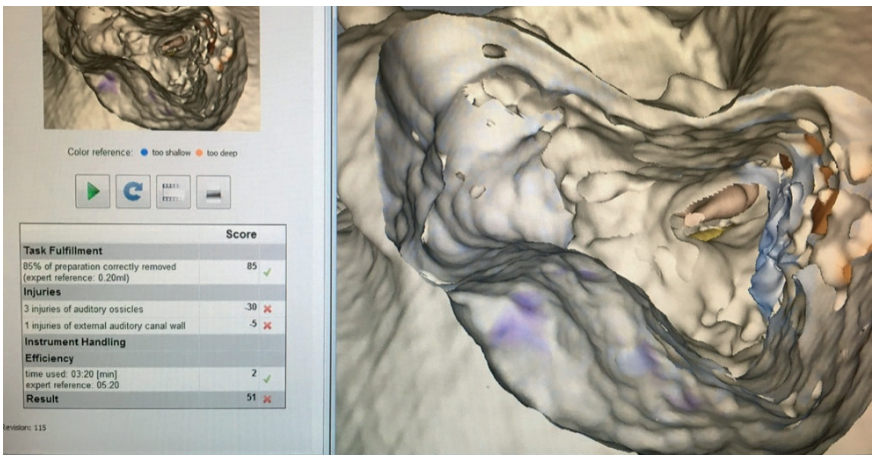

Figure 2: Example of feedback and assessment from software

hours. Use of this is designed as part of self-directed training with regular reviews with a consultant otology trainer to assess progress in the learning objectives set.

What does this involve?

Simulators for temporal bone dissection are available as computer-based programmes which use 3D-imagery and haptic instruments to confer the impression of a 3D temporal bone. The set-up requires a normal computer with 3D glasses, a 3D mouse and a pair of instruments, and requires little more space than the average modern computer desk. The computer programme arranges various steps of temporal bone surgery into short sessions to focus on the individual components with a training mode and examination mode. Both modes provide a score at the end of the session. However, the training mode also displays image guidance with three planes of corresponding cross-sectional imaging to assist the trainee in assessing the surrounding anatomy.

Assessment and feedback on the session is provided by the software which analyses and highlights onscreen, colour-coded areas where drilling was too deep or too shallow and where injuries occurred. The important structures are also colour-coded and the bone overlying these structures has a subtle hue of the colour of the structure to indicate your proximity. At the end, a score is produced, derived from the percentage correctly drilled away, with points deducted for mishandling of instruments, injuries to the dura, sigmoid sinus, ossicles or other important structures, and for the time taken over the expert time. Each session is saved with playback of the activity available for monitoring and review by a trainer.

How can this help the trainee?

In comparison to a cadaveric dissection course, virtual reality simulation of temporal bone surgery can be performed during shorter, more frequent sessions that can be scheduled into a regular training timetable. Regular access to a temporal bone simulator can be used to maintain skills for trainees who are not currently working within otology and, therefore, not performing temporal bone surgery regularly. With the number of times I have repeated each step, I would have required 12 cadaveric temporal bone specimens, using both sides, to provide the same number of practice sessions.

Whereas an argument for cadaveric models over virtual models is the presence of soft tissue and the model consisting of real bone which will behave as in surgery, there are some inconsistencies between the cadaveric model and the living patient, such as presence of bleeding, which limit its role in simulation. In the presence of tissues that bleed, a surgeon must handle two instruments concurrently; both the suction and the drill. In our virtual simulator, bleeding and suction is simulated so appropriate handling of the instruments can be simulated, as in the actual surgery, to ensure good practice in maintaining a clear surgical field, where all areas can be visualised. Using haptic instruments, the virtual simulator provides the virtual simulator to provides tactile feedback to complement the visual simulation to impart the sensations of drilling through bone. Although this is an artificial sensation, it does give the trainee a reasonable impression of depth.

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Use of a simulator can facilitate exposure to the techniques and anatomy at an earlier stage, which can help direct the trainee's focus and facilitate learning through observation in theatre. Personally, as a novice in temporal bone surgery, the virtual simulator has changed my focus when observing mastoid surgery. Since using the simulator, the learning I take from observing is with a new appreciation for the considerations made to positioning of the patient, and angling of the drill to ensure safe operating in proximity to the sigmoid sinus and the dura whilst also achieving the aim of the procedure.

Discussion with other, more senior, users of the virtual simulator suggests it benefits trainee surgeons at all stages of training as well as the consultant otologists themselves. They value the aspects of the simulator that permit practice, repetition and exploration of different techniques in a safe environment, albeit with the knowledge that the simulator is not a perfect model of a real patient.

Additionally the software allows upload of cross-sectional computed tomography imaging to generate a virtual 3D model of the temporal bone to allow practice for previous or forth coming patients. This can be of benefit to surgeons of all stages, including consultant otologists, in preparing for challenging cases.

How can this help the trainer?

The provision of a virtual simulator allows the trainer to provide a regular training programme to trainees that can be adapted, depending on the skills and experience of the trainee, to complement theatre experience. Training can be standardised between trainers as well as being able to adapt training to the needs of the trainee.

When used as a regular learning tool with the support and review with a trainer, both parties will benefit from additional feedback on the trainees' non-technical skills, including economy of movement and instrument handling. This will build the trainers' confidence in the abilities and limits of their trainees' skill set and facilitate the use of real-life surgical cases to best benefit the trainee without risking patient safety.

What are the limitations of this?

As discussed above, the virtual simulator is not a perfect model of a real temporal bone surgery patient. It lacks soft tissue and does not handle exactly as real bone

does. However, to those who have used it, it is a reasonable approximation to the real scenario. In real patients, where the bone changes in feel when in proximity to other structures, this is not replicated well in the simulator.

One other user commented on the virtual simulator and scoring turning the exercises into a game. This changes the focus of practice towards using the skills of a computer game to use the prompts to maximise the score, rather than considering it in terms of surgical practice.

Although using the virtual temporal bone simulator is intuitive in many respects, the use of a 3D mouse to manipulate the model is not a device used by most of the users in other situations and therefore needs to be learnt, adding a different skill to learn to reposition the bone appropriately, and potentially distracting from the surgical skills to be learnt.

Conclusion

Simulation in surgery is a developing field, with new simulators emerging for additional procedures. Cadaveric temporal bone dissection courses exist and are readily available but can be complemented with a virtual temporal bone simulator.

If used well to complement clinical exposure, and on a regular basis with episodic review and reflection with a senior trainer, then the virtual temporal bone simulator can teach and maintain new skills with benefits for trainers and trainees at all stages of experience in temporal bone surgery.

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How to set up and run a cadaveric dissection course

Conducting and implementing a cadaveric dissection course requires careful planning. **Rachel Edmiston**, **Rajesh Anmolsingh**, **Omar Mirza** and **Nirmal Kumar** offer a guide, highlighting the licensing and legal processes involved with the use, preservation and disposal of cadavers in the UK.

Cadaveric dissection is an ideal technique, which offers clinicians the opportunity to practice, refine and develop operative skills necessary for real world procedures. It allows clinicians to accomplish specific skill acquisition goals and reinforce good practice, before even stepping into the clinical environment. Repetition using high fidelity materials, in a high fidelity environment can reinforce positive practice, aiding cognitive development and reducing the learning curve associated with acquiring new skills [1]. With close trainer supervision and feedback, the learning process is consolidated and objectives can be identified for onward development. Additional benefits include formal assessment within the competency-based training model based on achievement of the learning objectives. Of utmost significance, by delivering training in a low-risk, controlled environment, prior to performance on real patients, competence may be attained without jeopardising patient care [2].

The idealisms and contributions of such a course is clear but the question remains: how would someone go about organising such a course?

Setting up and running a cadaveric course requires significant planning and preparation. Legal requirements must be met, cadavers must be kept as per national regulations and ethical principles must be followed.

What are the legal requirements?

As a consequence of public outcry for the inappropriate retention of human remains, the HumanTissue Act of 2004 was introduced. The act controls the use of cadaveric material and is regulated by the Human Tissue Authority (HTA). The act itself regulates the removal, storage and use of human tissue and it is vital that individuals planning to set up a cadaveric facility have a comprehensive insight into its contents.

Under this act, surgical simulation falls under a 'scheduled purpose' and can therefore be performed at any UK hospital that has a HTA post-mortem licence. Within our hospital site there is no mortuary and, as such, prior to setting up our lab we applied for a separate HTA anatomy licence, which covers the same regulations as above. This licence enables the HTA to regulate all cadaveric units properly, including regular inspections to ensure that standards are being kept.

In addition to the HTA, the institute of anatomical science also provides guidance on the use of cadavers for anatomical examination that needs to be reviewed by course organisers (www.anatomical-sciences.org.uk/guidelines/guidelines.htm). This brief document describes the monitoring required by the HTA but also the importance of regular self-audit of each unit. Each unit should have a standard operating procedure (SOP) document, which clearly demonstrates how cadavers are handled, used and disposed of to ensure this is in line with the HTA guidance. Importantly, a designated individual (DI) needs to be identified as the individual with ultimate responsibility for the specimens.

Once set up, how do we source cadavers?

Within the UK there is no current source of fresh frozen cadavers and, as a result, units often obtain material from overseas.

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Within our unit, cadavers are obtained from the USA. In accordance with the HTA, specimens themselves should not incur a charge if they have been freely donated for examination. However it is acceptable to levy extra charges, which are specifically applied for the preparation and transport of specimens. In some instances, charges will occur for specimens themselves, particularly if sourced from overseas.

Fresh frozen cadavers arrive in containers containing dry ice with efficient delivery and a courier service from our local airport that alerts the unit staff as to the likely timing of arrival. The cadavers must meet the requirements described in the HTA's Code of practice 8, which describes the import and export of human bodies, body parts and tissue.

As per the guidance on use of cadavers, each specimen should have a unique identification code, appropriate donor consent and the medical death certificate available. Upon arrival at our unit, each cadaver documentation must include:

(i) cause of death
(ii) whether the cadaver was 'willed'
(iii) medication history
(iv) past medical history
(v) results of serology including HIV, Hepatitis B and C

Our donor source makes life a lot simpler in this regard by ensuring all documentation is clear but, if using alternative agencies, ensure that the vital information is included.

What to do before the course

Preparation is key, as cadavers often need to be ordered at least one month in advance. Good, well-prepared specimens enhance the benefits derived by participants of dissection courses.

Before use, the cadavers need to thaw and this is dependent on the type of body part. Within our unit, we use the full cephalus - which usually takes 72 hours to thaw. Our process for this includes bringing the cadavers into a locked secure room within the skills lab with gradual exposure, starting with the nose until the full head is exposed and also gradually increasing the exposure to ambient (room) temperature.

In accordance with HTA guidance, authorised access to cadavers in the lab area is restricted to individuals with a specific purpose to view, such as healthcare professionals. This should be a formal sign in and sign out registration process.

In our unit, the registration process involves candidates reading the standard operating procedure and risk assessments, as well as being asked to sign a disclaimer which includes the following:

- Though the cadavers are screened for infectious diseases, delegates are asked to assume that the specimen has a blood borne virus and use universal precautions as they would adopt in their place of work (usually an apron and gloves)
- Acknowledge that filming or photography is strictly prohibited
- Signature of acknowledgement that the unit is not accountable for any personal injury that might occur.

During the course

Throughout the course, it is emphasised that cadavers should be handled with respect and dignity at all times. It is also important to remember that the thawed specimens need careful handling and continued preservation (with or without using storage fridge units) for the length of the course.

It is important to plan the number of delegates correctly. With the use of the full cephalus we find that one cadaver between two is sufficient for a three-day course programme.

In using the full cephalus we are able to cover all subspecialties of ENT in a time and resource-effective way. Each day covers a key aspect of ENT surgical practice including rhinology, head and neck, otology and facial plastics. Each day has a dedicated faculty, with a faculty to delegate ratio of 1:2 facilitating the provision of excellent teaching and hands on experience.

Each session starts with a revision of anatomy followed by a run through of the surgical steps via a cadaveric dissection demonstration projected to the room through a large screen. Following this demonstration, delegates have the opportunity to practice these taught skills under close supervision. Trainees are encouraged to use recognised surgical techniques and methods and a prize is awarded to the best dissection at the end of each session.

An outline of the timetable is as follows:

- Day one:
  - o Introduction to facilities
  - o Rhinology
    - Sinus surgery techniques
    - Epistaxis management
    - Rhinology emergencies including lateral canthotomy, CSF leak repair and orbital decompression
- Day two:
  - o Head and neck
    - Salivary gland dissection
    - Neck dissection
    - Laryngeal surgery
  - o Facial plastics
    - Rhinoplasty
    - Facial flaps
- Day three:
  - o Otology
    - Approaches to the ear
    - Myringoplasty
    - Mastoidectomy
    - Ossiculoplasty and stapes surgery
    - IAM access

Instruments designated to specified use on cadavers must be handled with care. In covering all aspects of ENT, multiple surgical instruments are required and detailed planning is needed to ensure that all instruments for each procedure are available in suitable numbers. Within our unit, common instruments, including basic head and neck equipment, must undergo a sterilisation process following each use. Instruments such as endoscopes and microscopes are often loaned by specialist equipment companies who clean them in line with their own policy

What happens after the course?

Specimens are kept for one week. During this time, they will be thawed and then refrozen in preparation for disposal. Within our centre, this process is organised through official hospital channels: the specimens are placed in containers with the unique identification number and specimen type labelled. A separate company is responsible for arranging the disposal of the specimens.

Cadaver dissection courses have historically proven their worth to clinicians throughout the ages. The knowledge and skills acquired through this unique

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experience are unparalleled to any simulated courses and have a more profound impact on daily clinical practice. We must acknowledge, however, that the bodies were donated for the purpose of education and research and deserve utmost respect for their magnanimous and selfless act. Without this, modern medical science would not be the life-saving spectacle it is today.

SUMMARY

Conducting and implementing a cadaveric dissection course requires careful planning. It is vital that organisers have good insight into the legal and ethical aspects highlighted. Preparation is key in providing a high quality course in terms of cadaver preparation, faculty provision and instruments.

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ENT and Audiology News acknowledge that this article is based on UK legislation. If you have you organised a cadaveric dissection course in a country outside the UK and would like to write about this, we here at ENT and Audiology News would love to hear from you.

IN CONVERSATION WITH

Mr Raj Bhalla

In search of insight and wisdom on the topic of practical training courses in rhinology and facial plastic surgery for otolaryngology trainees, we sent Miss Daniela Bondin to interview **Mr Raj Bhalla**, whose vast experience in this area speaks for itself!

Can you tell us a little about your professional roles?

I am a Consultant Rhinologist and Endoscopic Skull Base Surgeon at Manchester Royal Infirmary and Salford Royal Hospital. I spend roughly 40% of my clinical time working with patients who have nasal air flow difficulties and nasal deformities, often requiring surgery. I spend another 40% of my time working on tertiary sinus cases and the remaining 20% running an endoscopic anterior skull base service with my neurosurgical colleagues. I am an Honorary Senior Lecturer with the University of Manchester, and the Clinical Director of the Manchester Surgical Skills and Simulation Centre. I am Chair for Courses and Simulation with ENT UK. I am also on the council of the Royal Society of Medicine, and am closely involved with FPS UK and the British Rhinological Society.

In your opinion, what objectives should trainees have when attending rhinology, sinus or facial plastic courses?

Having been involved with the STC (Specialist Training Committee) and training at many different levels, both undergraduate and postgraduate here in the UK and further afield, I do think it's important that trainees attend regular training courses, either facial plastic, rhinoplasty or sinus courses throughout their training. This

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Mr Raj Bhalla,

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educational groundwork can then make the most of precious face to face time between a trainee and their Consultant, and also provides exposure to some procedures that have become increasingly more difficult to perform widely in the NHS, or are only performed in a few specialist centres.

As a trainer and a course organiser, I tend to classify trainees broadly into three stages; their learning objectives will differ, and will very much depend on the stage they are at. The first stage I call 'Foundation': this includes first and second year core surgical trainees as well as ST3 trainees. At this particular level, learners should focus on developing how to hold an endoscope, improve their hand-eye coordination and dexterity, and learn how to utilise powered instruments safely, whilst introducing themselves to essential anatomy. Facial plastics and rhinoplasty courses at this stage can further help the trainee familiarise themselves with nasal anatomy and key surgical steps of performing a rhinoplasty and facial flaps.

The middle years, which I call 'Intermediate', include ST4, ST5 and ST6 trainees and at this level, trainees benefit from attending courses that ensure that they can consolidate their understanding of sinus and nasal anatomy. Other objectives at this stage would be for trainees to feel more confident in not only knowing the steps involved in a particular procedure, but also performing most of the operation independently or with minimal guidance.

Finally, trainees in their penultimate (ST7) and final (ST8) years of specialist training, which I call the 'Advanced' group, should aim to build their confidence in being able to perform procedures as a solo practitioner. This is more about refining technique and keeping rhinological practice current before completing their CCT (Certificate of Completion of Training). With rhinoplasty and nasal or facial plastics cases in particular, trainees should feel more confident in performing finer, more delicate suture techniques, using different materials for reconstruction or augmentation, and performing more complex or advanced activities including skin flaps and some of the more advanced tip suture techniques.

In your opinion, how can a trainee best benefit from a facial plastic rhinoplasty or sinus course?

There are various simulation techniques, from simple to high fidelity simulators but the gold standard courses to attend and develop facial plastics, rhinoplasty and sinus surgical techniques are cadaveric courses. The best cadaveric courses are those that utilise fresh frozen or formalin-flushed specimens. This is because these specimens are better preserved and the closest to live patients, thus allowing learners the feel that is most directly transferable to clinical situations.

I would recommend that trainees have a good knowledge of the course programme. This is particularly important when choosing a course for the right level of the trainee but also helps the trainees achieve their objectives better. Moreover, the trainee should remember that every learner will have their own learning objectives and I believe that trainees should set their learning objectives early and make that known to the faculty to help attain them by the end of the course.

It is also important that learners cast an eye over their anatomy books and familiarise themselves with the basic anatomy that the course will cover. This prevents trainees from coming into the course fresh and unfamiliar with some of the anatomy and surgical techniques that will be discussed. This gives trainees more time to focus on developing their technical skills by avoiding cognitive overload.

I completely understand that for some trainees attending a course can be daunting. This could be due to their anxiety around their lack of knowledge or surgical skills or the fact that there are Consultants watching them 'operate'. Thus, it is imperative that trainees can identify courses that have seasoned faculty, experienced in educational courses, who understand that there are different levels of trainees in attendance, each with different and individual learning needs.

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