

Considerations for ENT Specialist Training In the Establishment of a Temporal Bone Laboratory

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ABSTRACT:

Dissection of cadaveric temporal bones in a laboratory for temporal bones is an essential component of teaching safe, competent otorhinolaryngologists. Recent organ retention problems have resulted in a diminished supply of temporal bones. Thus, contemporary trainees dissect far fewer bones than their mentors. We explain the construction of a temporal bone laboratory in the Department of Anatomy at University College, beginning with the timely preparation and preservation of tissue and ending with its disposal. Comparisons are made between our experience and training programmes. The laboratory for temporal bones is the only one. The exposure and experience gained by rotating registrars has resulted in considerable improvements in their operational skills. The laboratory for temporal bone remains an essential component of training. It is hoped that this publication will help other units overcome barriers to create a laboratory for temporal bone research.

Keywords: Cadaveric temporal bone dissection , Temporal bone laboratory, ENT specialist training.

INTRODUCTION:

The ancient precept of primum non nocere remains very applicable to temporal bone surgery. The intricate three-dimensional anatomical structure and the underlying the concerns of otorhinolaryngology residents and specialists is the potential for severe morbidity and mortality from injury to structures within or surrounding the temporal bone. It is well acknowledged that regular cadaveric temporal bone dissection in a temporal bone laboratory (TBL) is essential for studying the fundamental anatomy and obtaining safe otological skills [1]. It also provides a setting for the study of the physiology and pathology of diseases affecting hearing and balance; Meniere (1861) and Hallpike (1938) detected the endolymphatic hydrops that occurs in Meniere's disease by dissecting temporal bones. The otorhinolaryngology head and neck surgery intercollegiate examination for consultants in Ireland and the United Kingdom also evaluates temporal bone dissection.

Historically, temporal bones were obtained from postmortems [2]. In recent years, the number of postmortems performed and the number of bodies available for undergraduate and graduate instruction have decreased in Ireland and the United Kingdom. Events like Our Lady's Hospital for Sick Children in Crumlin, Alder Hey, and Bristol Royal Infirmary have highlighted organ donation and retention. In response to public outrage, the British government conducted investigations that determined the Human Tissue Act (1961) was insufficiently comprehensive [3, 4]. The Human Tissue Act (2004) was consequently enacted in the United Kingdom; among its considerations were body bequest and anatomical education legislation. One notable modification to the law concerns the obtaining of agreement for the inspection and retention of human tissue for the purposes of research, transplantation, and teaching.

Temporal Bone Register. While studies have demonstrated that ENT patients are prepared to donate their temporal bones particularly for the objectives .For the purposes of anatomical dissection and medical research [6], trainees dissect much fewer temporal bones than their advisors did. Despite the recent development of synthetic temporal bones and computer-assisted software, cadaveric dissection remains the safest and most successful method for learning how to operate on a patient's temporal bone [7].

Currently, there are 27 temporal bone laboratories in the United States, per the National Temporal Bone, Hearing and Balance Resource Registry [8]. There is one one in the Republic of Ireland, located in the Department of Anatomy at University College Cork (UCC).In this paper, we address the development of a laboratory for temporal bone research, the necessary equipment, safety considerations, specimen processing, and the overall benefits and drawbacks of our programme.

METHODS AND MATERIALS:

A temporal bone laboratory was created in collaboration with the Department of Anatomy at UCC and the Department of ENT at the Santosh Hospital in Ghaziabad two years ago, within the Anatomy Department. This space contains two workstations. Each station includes a surgical microscope, suction pump, electrical drill, and previously discarded hospital surgical instruments. Used disposable cutting instruments and surgically collected diamond burrs are also utilised in the laboratory.

Annually, approximately ten cadavers are donated to UCC. The relevant goals of temporal bone extraction from cadavers include prompt fixation and accurate dissection. It is known that tissue decomposition occurs within minutes of death. In an ideal situation, recovery of a temporal bone, especially for research purposes, should not be delayed for more than 24 hours. However, delays in acquiring specimens are frequently inevitable for a variety of reasons. The temporal bone can be removed using intra-cranial techniques (removal of all ear structures), extended intra-cranial techniques (removal of the Eustachian tube and part of the palate in addition to the ear structures), or extra-cranial techniques (when temporal bones

have been donated for research but a complete autopsy with brain removal has not been permitted) [9]. It is essential to protect vital interior structures and retain anatomical landmarks. For instance, the dura should remain intact to prevent damage to the endolymphatic sac, and the VII and VIII cranial nerves should be severed at the porus acousticus before to removing the brain to prevent traumatic avulsion of the internal auditory canal.

The temporal bones are fixed in a 10% solution of neutral buffered formalin at a temperature of 4 degrees Celsius for at least two weeks [10]. The buffered solution reduces the propensity for formalin to oxidise when exposed to air, which releases caustic formic acid. It is advised that the volume ratio of fixative to specimen be at least three to one. Formalin causes well-known and conventional histological artefacts.

Specimen containers are labelled with an identification number, and great care is taken to keep all tissue from individual specimens together for future cremation or burial. Earlier on, a consent document is signed by the next of kin. In any lab for temporal bone, biological and chemical dangers are a concern. Some pathogenic organisms (particularly viruses) are resistant to fixation. When possible, the dissection is performed in a fume hood to protect against airborne germs, and the dissectionist always wears disposable surgical masks, gowns, gloves, and eye protection. Eating and drinking are prohibited in the laboratory, and thorough cleaning of the environment and instruments (by autoclaving) is required. Alcohol is flammable and ethyl ether is explosive, while HCl is caustic and formaldehyde is carcinogenic; there are also a variety of other chemical risks. The health and safety declarations and evaluations are essential for mitigating all of these risks.

RESULTS:

The specialist registrars rotating through the department are permitted to visit the temporal bone laboratory under the supervision and facilitation of the ENT specialists in Cork around six hours per week. Using prepared manuals and DVDs, each learner should be able to perform anatomical dissection in a predetermined, step-by-step way, including cortical mastoidectomy, posterior tympanotomy, accessing the epitympanum, and removing the canal wall. Comprehensive techniques, such as endolymphatic sac decompression, postauricular labyrinthectomy, and middle fossa approaches, maximise the usage of the limited temporal bones.

Cork-based ENT specialist registrars have benefited tremendously from having regular access to a laboratory for temporal bone dissection. The trainees' operating standards have risen as a result of the nourished and developed essential competencies.

DISCUSSION:

A temporal bone laboratory with the required equipment and temporal bones provides a unique perspective on the anatomy of the temporal bone. This facility is exclusive to the ENT department.

As a result, there is a great deal of interest among registrars in rotating through Cork. A temporal bone specimen is not significantly altered by the fixation process, unlike intestinal or other soft tissue specimens. This enables for a 'real life' simulation of the sclerotic or aerated mastoid bones that may be encountered during surgery.

Our Temporal Bone Laboratory has a few deficiencies. In contrast to the temporal bone register in the United States, where temporal bones are donated with an underlying pathology and their clinical details are available, our temporal bones come from cadavers donated for medical science and, in most cases, will not have an underlying otological pathology. Even in the rare occurrence of underlying otological pathology, there is no history, examination findings, audiological examinations, radiological investigations, etc.

Disposal of temporal bone material necessitates precise specimen labelling, and any material removed from one specimen is retained with that specimen. According to the wishes of the deceased or their relatives, cremation or burial of the cremains. Temporal bone dissection is a prerequisite for any contemporary otologist. We are incredibly lucky to have a laboratory for temporal bone within the Department of Anatomy.

The availability of the laboratory for temporal bone in Cork has significantly improved the training and experience of registrars. In 2009, the otorhinolaryngology head and neck surgery intercollegiate examination will be place in Cork, and it is intended that this laboratory would be utilised at that time.

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