

presence of a mobile stapes and absent or deficient incus. The KURZ Variac total prosthesis for use when the stapes is absent will be demonstrated with the omega shoe connector. Malleus relocation combined with the Vincent ALTO prosthesis and the malleus replacement prosthesis will also be shown. Data on results will be discussed with time for questions.

doi:10.1017/S0022215116002863

Middle ear function in normal and pathological ears (K723)

ID: 723.1

Middle Ear Function in Normal and Pathological Ears

Presenting Author: **John Rosowski**

John Rosowski

Massachusetts Eye and Ear Infirmary

Learning Objectives: - New measurements of TM motion tell us more about its function in normal and pathological ears. - Besides being of use in diagnosing the presence of middle-ear effusion, WBI can aid in the diagnosis of ossicular and other conductive disorders. - Normal 'third-window's affect the response of the inner-ear to non-ossicular conducted sound.

Introduction: In recent years multiple technical and research developments expanded our understanding of the workings of the normal and pathological ear: New measurements of normal and pathological tympanic-membrane (TM) function, new ways to assess ossicular disorders, and an improved understanding of the effect of cochlear 'third-windows'.

Methods: The clinic-based techniques of Wide-Band acoustic Immittance (WBI) and Laser-Doppler Vibrometry (LDV) are described along with experimental techniques: Digital Opto-Electronic Holography (DOEH), Optical Coherence Tomography (OCT), and inner-ear sound pressure measurements.

Results: WBI and scanning LDV and OCT shed new light on the function of the TM. DOEH, without scanning, reveals the temporal response of over 100,000 points on the TM surface, and demonstrates the complex modal response of the TM surface in response to frequencies as high as 20 kHz. The TM motions induced by sound of a few kHz and less assess the presence of multiple conductive disorders, including ossicular fixations or interruptions, as well as the presence of several cochlear conductive disorders. Recent clinical and basic research led to a re-evaluation of the 'two-window' model of the inner ear, which occurred in the presence of evidence for pathological 'third windows' that result from abnormalities in the bone around the inner-ear fluids.

Conclusions: Advances in measurement tools increased our understanding of the workings of the normal and pathological middle ear. (1) Spatially uniform sound-induced TM motions dominate the response to sound, and TM motions near the ossicular attachment contributes most to

ossicular stimulation at high sound frequencies. (2) Multiple clinical techniques aid the pre-surgical diagnosis of ossicular and inner-ear conductive hearing disorders. (3) Normal inner-ear third windows explain multiple lines of evidence associated with non-ossicular stimulation of the inner ear.

doi:10.1017/S0022215116002875

Balloon Tuboplasty (R731)

ID: 731.1

Site of Eustachian Tube Obstruction in COM

Presenting Author: **Muaaz Tarabichi**

Muaaz Tarabichi, Muaaz Tarabichi

American Hospital Dubai

Learning Objectives: 1-Understand the existence of obstructive pathology in COM. 2-Learn how to evaluate for the site of obstruction. 3-Consider options for addressing obstruction within the proximal Eustachian tube.

Objective: To assess the patency of the proximal and distal segments of the Eustachian tube in patients undergoing surgery for chronic ear disease.

Study Design: Case study with control group.

Methods: All consecutive patients presenting for surgery for chronic ear disease in our practice over 14 months underwent preoperative Valsalva computed tomography (CT) and an attempt was made intraoperatively using angled rigid scopes to evaluate obstruction of the protympanic segment of the Eustachian tube. Endoscopic examination of the same segment in 19 cadaver ears served as a control group.

Results: Preoperative Valsalva CT showed patency of the distal one-third of the Eustachian tube in 51 of 53 ears. Intraoperative endoscopy allowed visualization of the protympanic opening of the Eustachian tube in 31/53 ears; 21/31 ears showed obstruction of the protympanic opening of the Eustachian tube.

Conclusion: A clear obstruction was more likely to be present in the protympanic opening of the Eustachian tube in the patient population undergoing surgery for chronic ear disease than in the cadaver control group, and equally likely to be present in the distal cartilaginous tube in patients as in the control population.

doi:10.1017/S0022215116002887

Balloon Tuboplasty (R731)

ID: 731.2

Defining disease and outcome measures

Presenting Author: **Mahmood Bhutta**

Mahmood Bhutta

Royal National Throat Nose and Ear Hospital

Learning Objectives: A review of diseases hypothesised to be due to disorder of the Eustachian tube and a critical review of disease classification. Discussion of future research on tuboplasty, including disease categorisation and outcome measures.

This is for the round table on “Balloon Tuboplasty”

For any treatment it is important that we define and segregate the disease(s) being treated, and evaluate effectiveness in terms of benefit to patient symptoms. Eustachian tuboplasty is a relatively new treatment for disorders of the middle ear, but to date most of the published literature has failed to segregate disease being treated, nor report on relevant outcomes.

I present a synopsis of diseases hypothesised to be due to an underlying dysfunction of the Eustachian tube. I argue that in most of the published literature such diseases are conflated (for example disorders classified under disorders of the Eustachian tube include glue ear, tympanic membrane retraction, and symptoms of aural fullness) but should be segregated. I suggest a nosology with disorders classified under “mucosal otitis media”, “squamous middle ear disease”, and “Eustachian Tube Dysfunction”, with the latter classification based upon a recent consensus statement. There is an inter-relation between such disease categories. However there is little evidence that a disorder of the Eustachian tube is the primary or initiating pathology underlying all of these diseases.

Whether the Eustachian tube is or is not a pathological mechanism for these diseases may be debated, but is largely irrelevant to the evaluation of treatment. Outcomes need to be reported with segregation of disease categories (as much as possible), and using patient reported outcome measures. Such measures may include hearing disability, otorrhoea, otalgia, aural fullness, and disease-specific or general quality of life.

This is a critical consideration in future trials of Eustachian tuboplasty if we are to better understand and define the role of this novel treatment.

doi:10.1017/S0022215116002899

Balloon Tuboplasty (R731)

ID: 731.3

Balloon Dilation of the Cartilaginous Eustachian Tube

Presenting Author: **Dennis Poe**

Dennis Poe

Boston Children's Hospital

Most of the pathology that is responsible for Eustachian tube dilatatory dysfunction has been observed within the cartilaginous portion and is most commonly due to inflammatory disease, which can be readily diagnosed with transnasal endoscopy. A careful assessment of the dynamics of the ET by endoscopy can be very effective in determining the etiology, location and severity of dilatatory dysfunction within the functional valve in the cartilaginous portion. Disorders of dilation may be observed and classified.

Inflammatory disease can be graded on a recently validated mucosal inflammation score instrument. The etiology of the inflammation can be investigated and treated, with the most common causes being infectious or reflux in younger children and over age 6, allergic disease, reflux, rhinosinusitis, adenoid hypertrophy and other commonly known causes of nasopharyngeal inflammation.

Treatment of the underlying medical conditions can result in improvement of ET function and resolution of middle ear disease. When the medical causes have been optimally treated, but ET dilatatory dysfunction persists, possibly due to irreversibly injured mucosa, biofilms or other pathology, tympanostomy tubes are usually recommended. When tubes fail to resolve the problem, treatment of the underlying pathology with surgery can be offered. Surgery is tailored to the sites of inflammatory or obstructive pathology and may involve turbinate reduction, sinus surgery, adenoidectomy, or balloon dilation of the ET. All of these procedures are designed to remove irreversibly injured tissue and provide a fresh start, assuming the underlying medical conditions are adequately controlled. Failure to control the medical problems can lead to recurrence of inflammatory disease.

doi:10.1017/S0022215116002905

Balloon Tuboplasty (R731)

ID: 731.4

Measuring Eustachian tube dysfunction

Presenting Author: **James Tysome**

James Tysome

Cambridge University Hospitals

Learning Objectives: Understand the methods available to measure Eustachian tube dysfunction.

Background: Eustachian tube (ET) dysfunction is a common but poorly understood cause of patient symptoms and an important factor in the development of middle ear pathology. Despite this, there are no specific tests of ET function in widespread clinical use. A renewed interest in treatments for ET dysfunction has led to a demand for methods of measuring ET function non-invasively.

Objective: To identify currently available tests and imaging modalities to assess ET function and, where possible, report on their accuracy.

Methods: Narrative systematic review. Tests and imaging methods in included studies were required to measure a physiological function of the ET, or play a role in the diagnosis of poor ET function.

Results: While many tests of ET function have been developed, with some in routine clinical use, all have significant limitations. Published accuracy data are limited and of variable quality due to the range of comparative tests and the spectrum of otological disorders associated with ET dysfunction. CT and MRI are best suited to identifying features associated with obstructive or patulous ET dysfunction