



CONCEPTS OF FUNCTIONAL ENDOSCOPIC EAR SURGERY

Sinus & oto
CENTRO

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DISCLOSURE

- Research grant ACCLARENT/J&J
- Support by Karl Storz (Silver Books)

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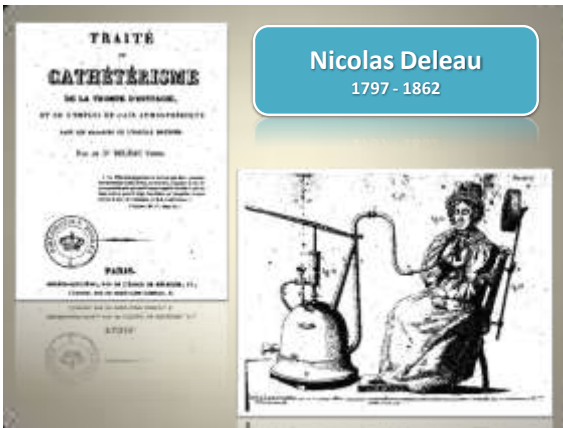




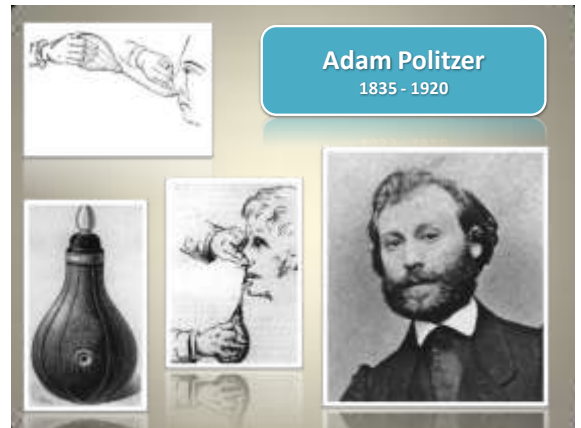

Antonio Maria Valsalva
 (1666 – 1723)



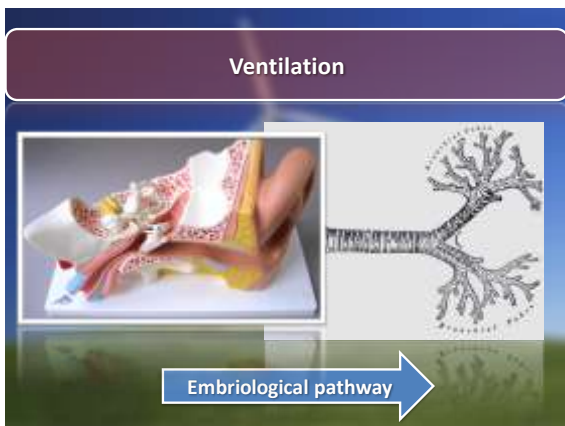
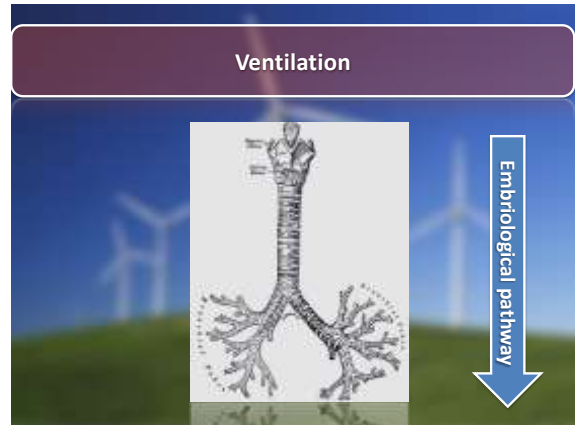
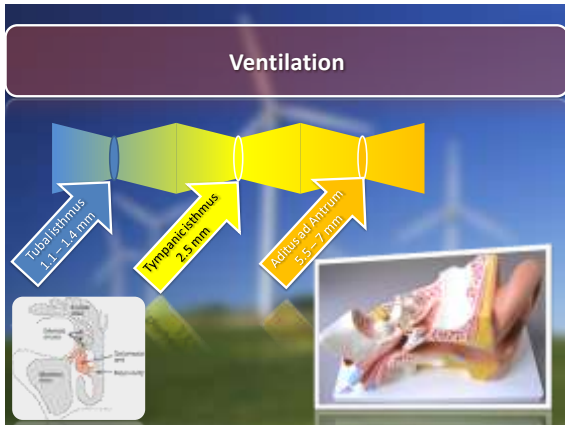
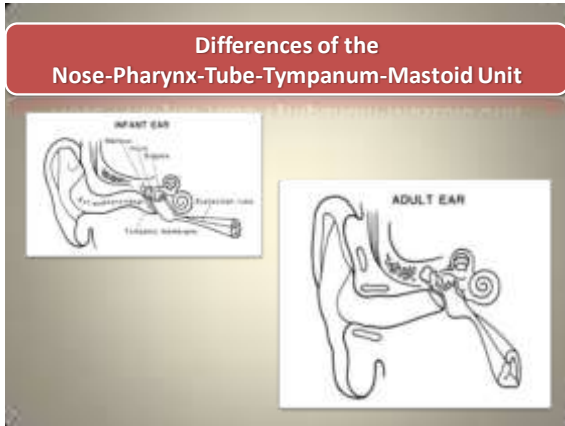
ANT. MAR. VALSALVA
 TUGLENSIS
 Phil. et Med. B. et Honorat. Doctoris et Lectoris of
 Algebrae, Astronomiae, Astronomiae, Astronomiae,
 Astronomiae Astronomiae Astronomiae
**AURE HUMANA
 TRACTATUS,**
 In quo
 AURIS EXTERICA, mediae Vasis
 Internae et Tympani, Malleoli, Membranae,
 Malleus, et Foramen Cochlearium
 generis ANATOMICA
 MONUMENTA UNIVRSI, cum OBSERVATIONIBUS
 Haec Disceptant, et Discernunt
 In 8.
 Typis et Sumptibus
 Apud JOHANNEM JOHANN. WITTEL, in
 Paderborna, sub. h. anno.



Nicolas Deleau
 1797 - 1862



Adam Politzer
 1835 - 1920



Hammar JA

Studien über die Entwicklung des Vorderdarms und einiger angrenzenden Organe. 1. Abt: allgemeine Morphologie der Schlundspalten beim Menschen. Entwicklung des Mittelohrraumes und des äusseren Gehörganges. Arch Mikrosk Anat 1902; 59:471-628

The Embriology

Between the third and seventh foetal month the gelatinous tissue of the middle ear cleft is gradually absorbed. At the same time the primitive tympanic cavity develops by a growth, into the cleft, of an endothelial lined fluid pouch extending from the eustachian tube. Four primary sacs or pouches then bud out. They are saccus anticus, saccus medius, saccus superior and saccus posticus (Hammar, 1902). Where these pouches contact each other mucosal folds are formed. Between the mucosal layers of the folds are remnants of the mesoderm, including blood vessels supplying the "viscera" of the tympanic cavity

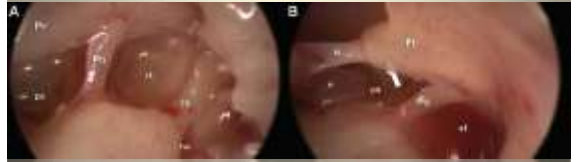
Proctor B

The development of the middle ear spaces and their surgical significance. The Journal of Laryngology and Otology 1964

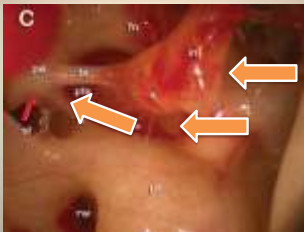


In this sense we can define the intratympanic ventilation routes as the result of the path travelled by four pockets of the middle ear embryological cavitation process

Saccus Posticus – Sinus Tympani



Saccus Superior

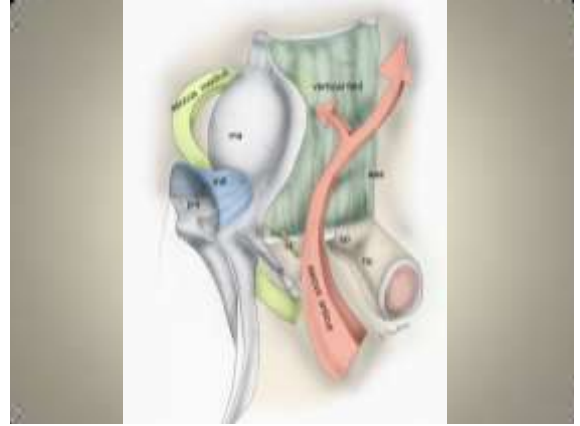


Saccus Anticus



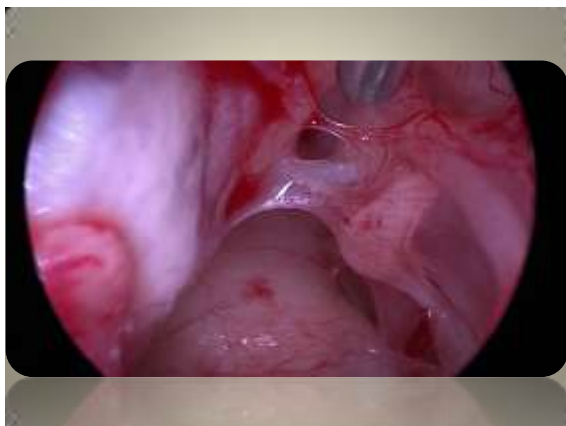
Saccus Medius





Ventilation Routes Middle Ear

Marchione D, et al. The Contribution of Selective Dysventilation to Attical Middle Ear Pathology. Medical Hypotheses; 2011; in press



CEO Chinese and Experimental Otorhinolaryngology Vol. 1, No. 1, 39-43, March 2007

Original Article

Clinical Results of Atticotomy with Attic Reconstruction or Attic Obliteration for Patients with an Attic Cholesteatoma

Ji-Hoon Kim, MD · Seung-Hyo Choi, MD · Jong-Woo Chang, MD
Department of Otorhinolaryngology, Seoul Medical Center, College of Medicine, University of Ulsan, Seoul, Korea

Other factors responsible for the attic retraction seems to be an narrowing of Ponsick's space. Natural aeration pathways, such as lower and upper floor units (19), could be blocked by the obliterated cartilage and the tissue fluid interfering the reestablishment of the aeration route (20). According to this observation, retraction may occur easily in the postoperative attic area, especially in the obliterated cases, even though the Eustachian tube function is normal.

occur more frequently. However, the most important factor determining postoperative retraction is ventilation in the middle ear

Original Article

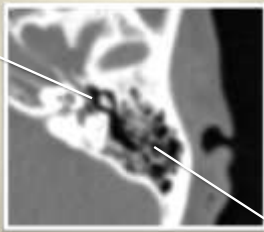
Gas flow into and within the middle ear

David J. Stankovic, PhD, MScPhD
University Research Laboratory, Department of Mechanical Engineering, Faculty of Engineering and Architecture, University of Western Australia, Perth, Australia

Abstract The middle ear is a highly specialized system involved in many critical conditions related to daily needs. Space limitations in the middle ear require the Eustachian tube and middle ear ventilation via ossicular motion. The mechanism that governs the flow of gas into and within the middle ear is investigated using computational fluid dynamics (CFD) to study the role of the Eustachian tube and middle ear ventilation in the middle ear. The results show that the Eustachian tube and middle ear ventilation are highly dependent on the middle ear pressure and the Eustachian tube function. The Eustachian tube and middle ear ventilation are highly dependent on the middle ear pressure and the Eustachian tube function. The Eustachian tube and middle ear ventilation are highly dependent on the middle ear pressure and the Eustachian tube function.

MACS


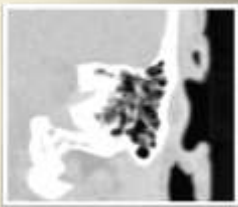
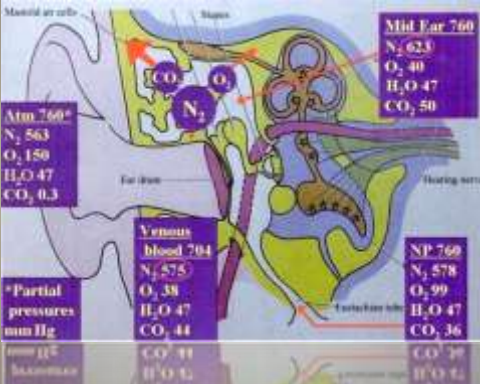
Mucosal respiration – Gas diffusion



The tympanum is a single, large air cell that contains the ME ossicles.

The MACs are multiple partitioned cellular airspaces that increases ME volume

LUNGS x MACS

Atm 760:
N₂ 563
O₂ 150
H₂O 47
CO₂ 0.3

Middle Ear 760:
N₂ 623
O₂ 40
H₂O 47
CO₂ 50

Yamada blood 704:
N₂ 575
O₂ 38
H₂O 47
CO₂ 44

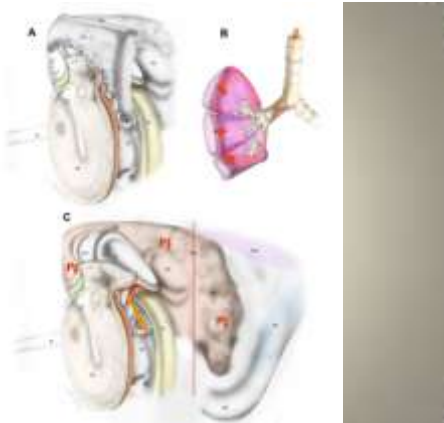
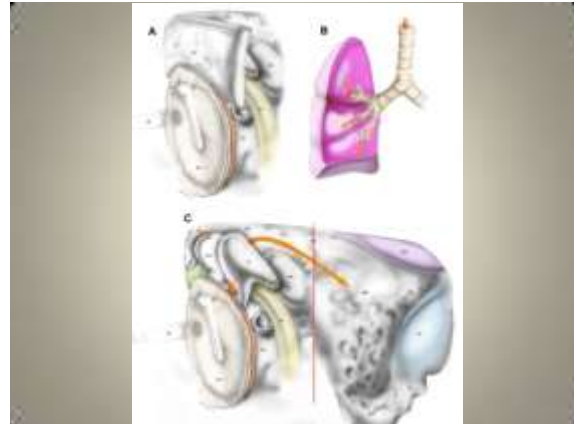
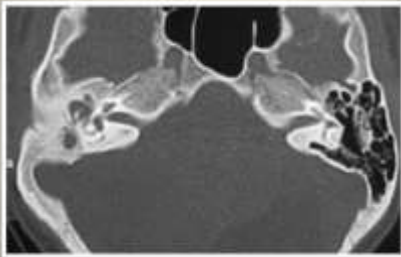
NP 769:
N₂ 578
O₂ 99
H₂O 47
CO₂ 36

Partial pressures mm Hg:
CO₂ 41
H₂O 32

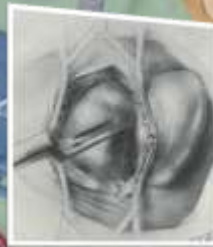
Abstract The middle ear is a highly specialized system involved in many critical conditions related to daily needs. Space limitations in the middle ear require the Eustachian tube and middle ear ventilation via ossicular motion. The mechanism that governs the flow of gas into and within the middle ear is investigated using computational fluid dynamics (CFD) to study the role of the Eustachian tube and middle ear ventilation in the middle ear. The results show that the Eustachian tube and middle ear ventilation are highly dependent on the middle ear pressure and the Eustachian tube function. The Eustachian tube and middle ear ventilation are highly dependent on the middle ear pressure and the Eustachian tube function.



Small mastoid volumes tend to cause greater changes in pressure



History of Otologic Surgery



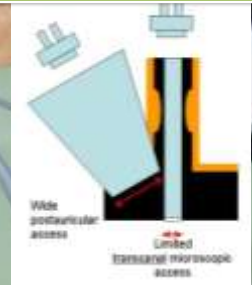
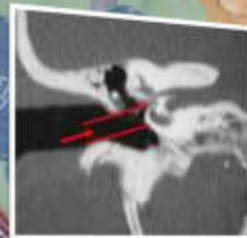
Nogueira JF Jr, et al. A brief history of otorhinolaryngology: otology, laryngology and rhinology. Braz J Otorhinolaryngol. 2007;73(5):693-703.

History of Otologic Surgery

- 1921 – Microscope in otology
– Carl Olof Nylen (Sweden)
- 1950 - Drills

Nogueira JF Jr, et al. A brief history of otorhinolaryngology: otology, laryngology and rhinology. Braz J Otorhinolaryngol. 2007;73(5):693-703.

History of Otologic Surgery

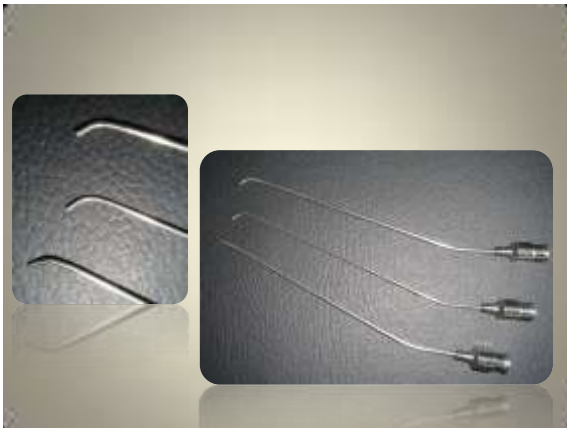


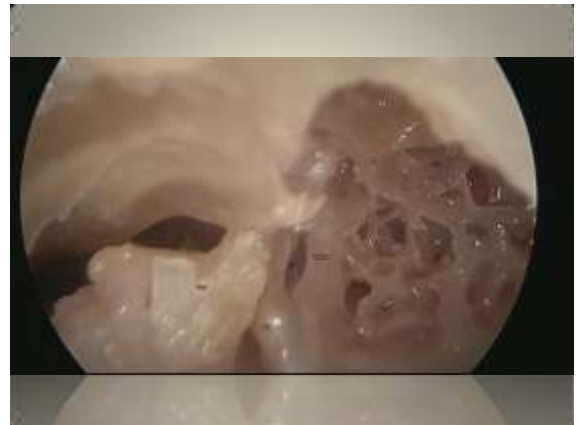
Tarabichi M. Endoscopic middle ear surgery. Ann Otol Rhinol Laryngol. 1999;108:39-46.

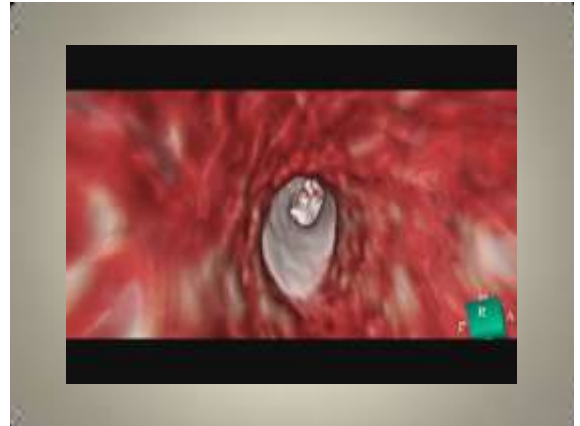
Endoscopic Otologic Surgery

The diagram shows two cross-sections of the ear canal. The left side is labeled 'Limited macroscopic Field of view' and shows a narrow view of the ear canal with a 'Narrowest segment of the ear canal' indicated by a red arrow. The right side is labeled 'Wide endoscopic Field of view' and shows a much wider view of the ear canal, including the eardrum and surrounding structures.

Tarabichi M. Endoscopic middle ear surgery. Ann Otol Rhinol Laryngol. 1999;108:39-46.











Tympanic membrane changes following pediatric cochlear implantation
 Oates M, Gannon A, Turner J, et al.
 Cochlear Implant Program, Institute for Otolaryngology-Head and Neck Surgery, University of Texas, Austin, Texas, United States
 OBJECTIVE: To investigate the effect of cochlear implantation on the tympanic membrane in children.
 DESIGN: Case-control study.
 SETTING: Tertiary care center.
 SUBJECTS: Eighty-two children who had cochlear implants were enrolled in a retrospective study. The tympanic membrane was examined and the appearance of the external auditory canal, middle ear, and ossicles were documented. Tympanometry and acoustic reflex tests were performed on 40 of the 82 children. Tympanometry was performed on 40 of the 82 children. Tympanometry was performed on 40 of the 82 children.
 RESULTS: Tympanic membrane changes were observed in 75% of children with cochlear implants. The most common abnormality was retraction of the tympanic membrane in the lower or middle ear. The incidence of significant retraction was higher in children with cochlear implants than in children without cochlear implants.
 CONCLUSIONS: Cochlear implantation may cause tympanic membrane retraction. The significance of this retraction is unclear. Careful attention to the external auditory canal should be avoided to prevent infection and perforation of the tympanic membrane.

Endoscopic cochlear implantation a new procedure, primary results

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The long-term history of middle ear operation
 Oates M, Gannon A, Turner J, et al.
 Cochlear Implant Program, Institute for Otolaryngology-Head and Neck Surgery, University of Texas, Austin, Texas, United States
 OBJECTIVE: To investigate the long-term history of middle ear operation.
 DESIGN: Retrospective study.
 SETTING: Tertiary care center.
 SUBJECTS: Eighty-two children who had cochlear implants were enrolled in a retrospective study. The tympanic membrane was examined and the appearance of the external auditory canal, middle ear, and ossicles were documented. Tympanometry and acoustic reflex tests were performed on 40 of the 82 children. Tympanometry was performed on 40 of the 82 children.
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 CONCLUSIONS: Cochlear implantation may cause tympanic membrane retraction. The significance of this retraction is unclear. Careful attention to the external auditory canal should be avoided to prevent infection and perforation of the tympanic membrane.



Koerner's efforts at entering the attic and antrum through the external auditory canal cannot help but arouse our interest. The day may be near, with our increasing knowledge of these parts and improved technic, when this operation will not be considered as ill advised to avoid under certain conditions the more radical and disfiguring procedure against the mastoid cells. Its analogy to vaginal hysterectomy and ovariectomy is interesting.

"In clear contrast to the impact of the introduction of endoscope in most surgical disciplines, the practice of ear surgery has changed little and it continues to be the domain for the microscope. Depending on the task at hand, there are many distinctions that would make the endoscope a better instrument than the microscope and vice-versa. We all need to master working with both instruments to better understand and treat pathologies of the ear. The objective of the IWGEES is to neutralize these longstanding biases toward the microscope and to get all of us to use the best instrument in the best way possible to help our patients."

Muazz Tarabichi – American Hospital of Dubai



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