

Chronic Otitis media

An Overview



Thomas Linder



Definitions: Chronic

Eardrum in

- OME (otitis media with effusion)
- Middle ear atelectasis
- Chronic silent otitis media



the REGISTRY

CD National Temporal Bone, Hearing and Balance Pathology Resource Registry

Chronic Silent Otitis Media

Michael M. Paparella M.D., Sebahattin Cureoglu M.D.,

Patricia A. Schachern, Carolyn Sutherland

University of Minnesota, Department of Otolaryngology, Otopathology Laboratory,
Minneapolis, Minnesota

Otolaryngology is the only specialty in medicine that cannot routinely use the services of the Pathology Department of a hospital for pathologic diagnosis. Human temporal bone histopathology is more important than ever, but it requires the expertise of a human temporal bone processing laboratory; only a few such laboratories are in existence. Otopathologic studies in humans and animals have led to findings of pathology within the middle ear cleft that were hitherto unnoticed; in turn, such findings have resulted in innovative ways to diagnose and treat patients.

Chronic otitis media has been defined in textbooks as a condition associated with a perforation of the tympanic membrane with a past or present history of otorrhea. The Committee for nomenclature of otitis media has replicated this standard definition on a regular basis (1). In 1979, Paparella et al introduced the concept of 'silent' otitis media, to describe chronic pathological conditions that are clinically "undetected" behind an intact tympanic membrane (2). Since this chronic pathology is potentially undetected, there is usually lack of medical treatment, which increases

the risk of complications and sequelae such as endolymphatic hydrops, serous labyrinthitis and sensorineural hearing loss (3).

A classic example of chronic tissue pathology that can occur behind an intact tympanic membrane is congenital cholesteatoma. However, acquired cholesteatoma can also exist behind an intact tympanic membrane (Figure 1). Several studies have reported intractable tissue pathologies other than cholesteatoma that went undetected.



Figure 1: Human temporal bone slide showing a cholesteatoma behind an intact tympanic membrane. The cholesteatoma fills the posterior part of the tympanic cavity and extends to the stapedial footplate. Note that the facial nerve is dehiscence.

Definitions: Chronic Suppurative Otitis media

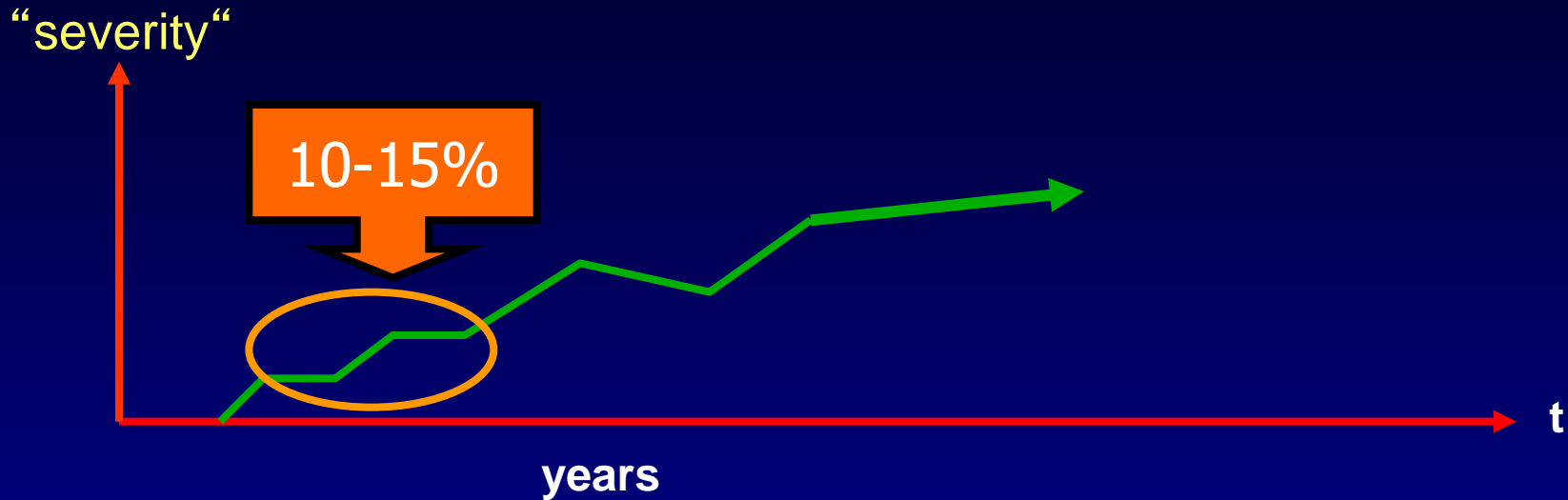
Eardrum *perforated*:

Chronic Otitis media

- with central perforation (= OMC simplex)
- with marginal perforation
- with marginal perforation and cholesteatoma formation (= OMC cholesteatomatosa)



Otitis media continuum



acute

- AOM
- OME



10-15%

chronic

- Otitis prone
- cOME
- OMC, MO-Atelectasis, Cholesteatoma



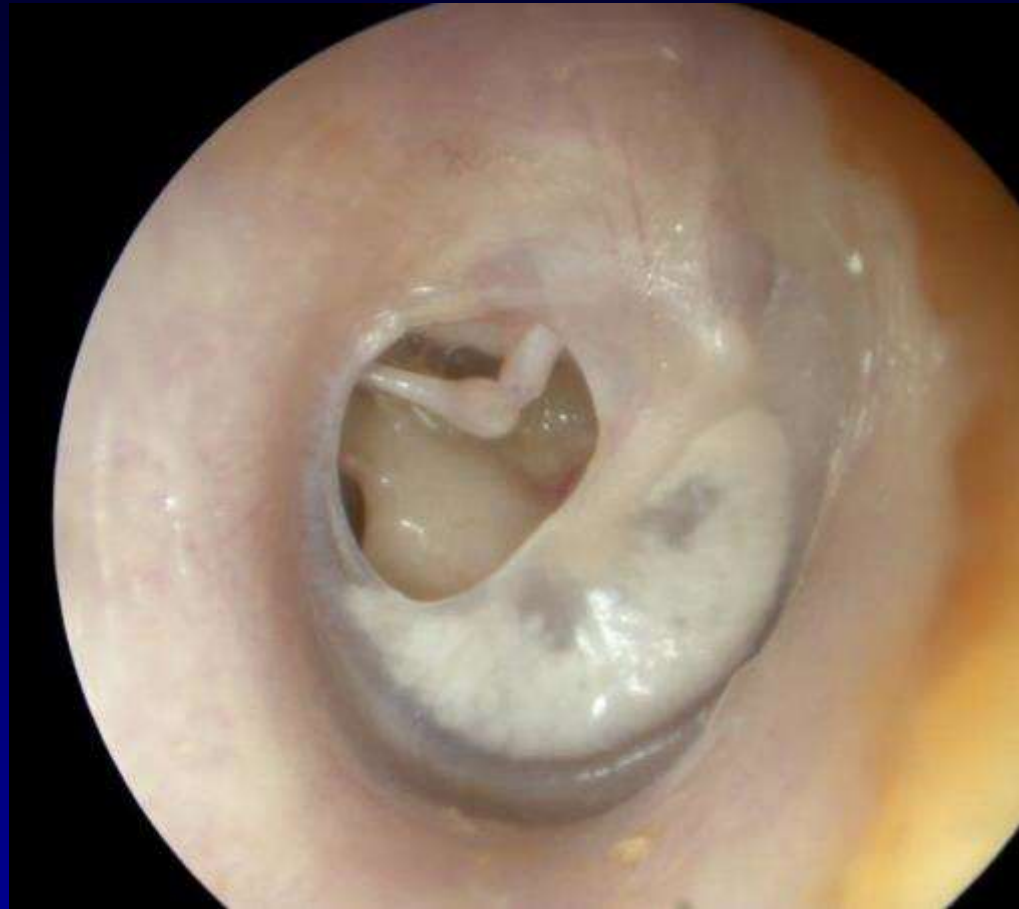
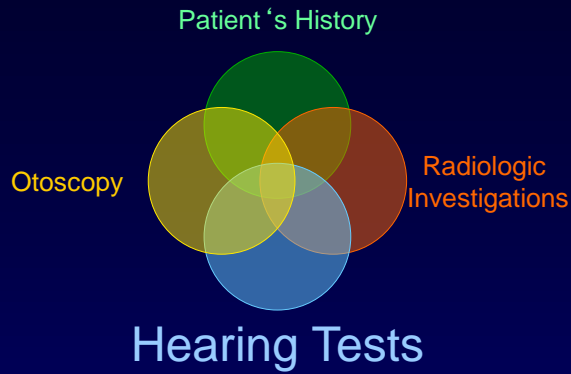
Patient 's History

Otoscopy

Radiologic
Investigations

Hearing Tests

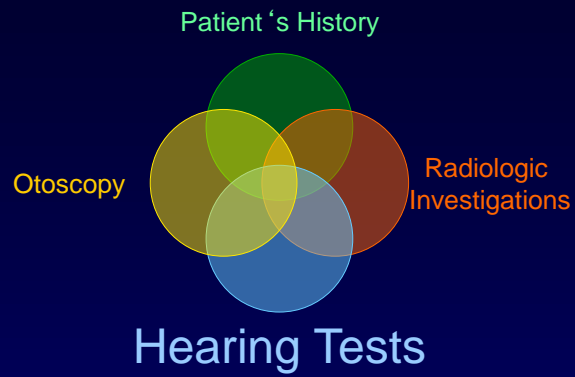




What so see on otoscopy ?

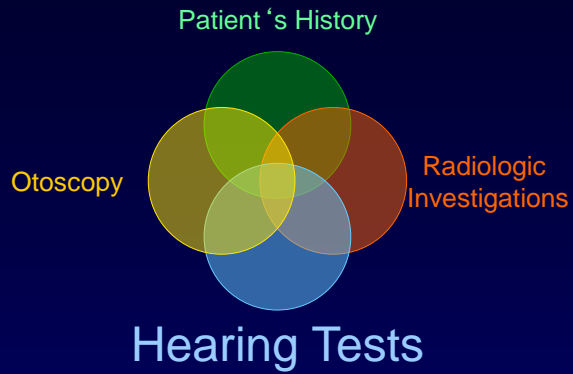
Where does the perforation end?

How large is the perforation?

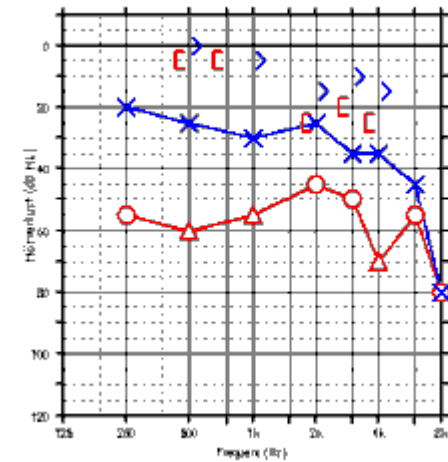
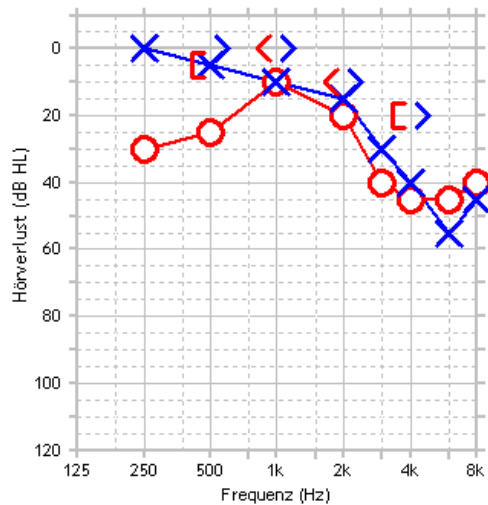


Which is the simplest and most important hearing test?





How do you rate the audiogram?



Size Matters ?



Two simple questions

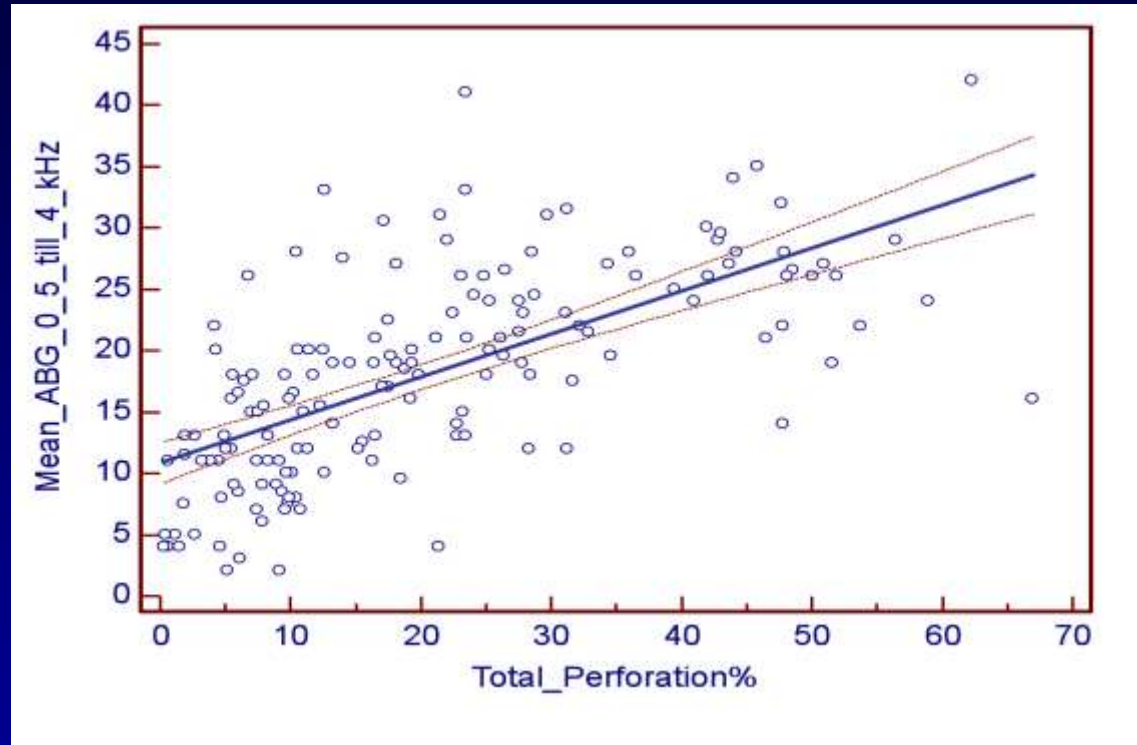


Is there a linear relationship between size of perforation and hearing loss?

Is there a difference between anterior and posterior perforations ?

linear relationship & impact of frequencies

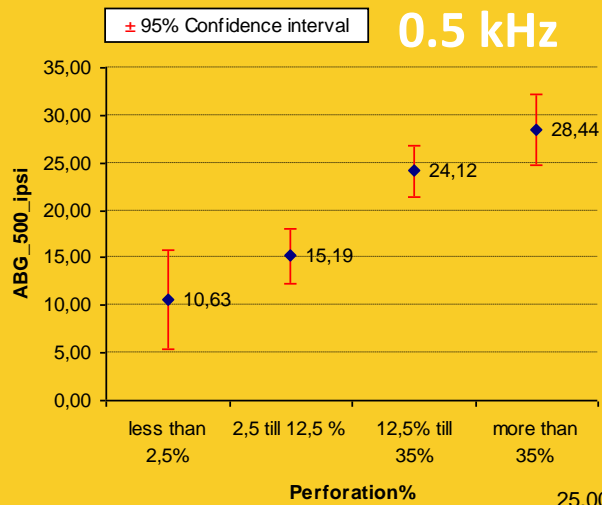
Yes



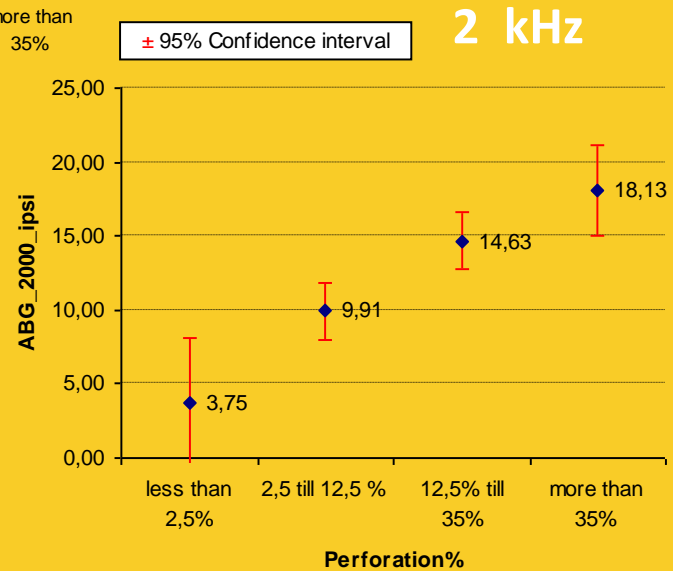
there is a linear relationship

Formula: $y = (0.35 \times P) + 10.84$ (P=perf. Size)

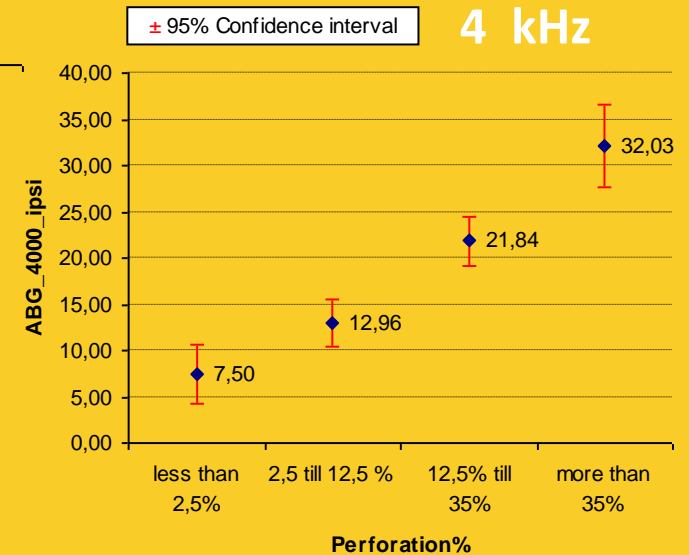
RSquare = 0.43 (43% of the variability is explained by the model)

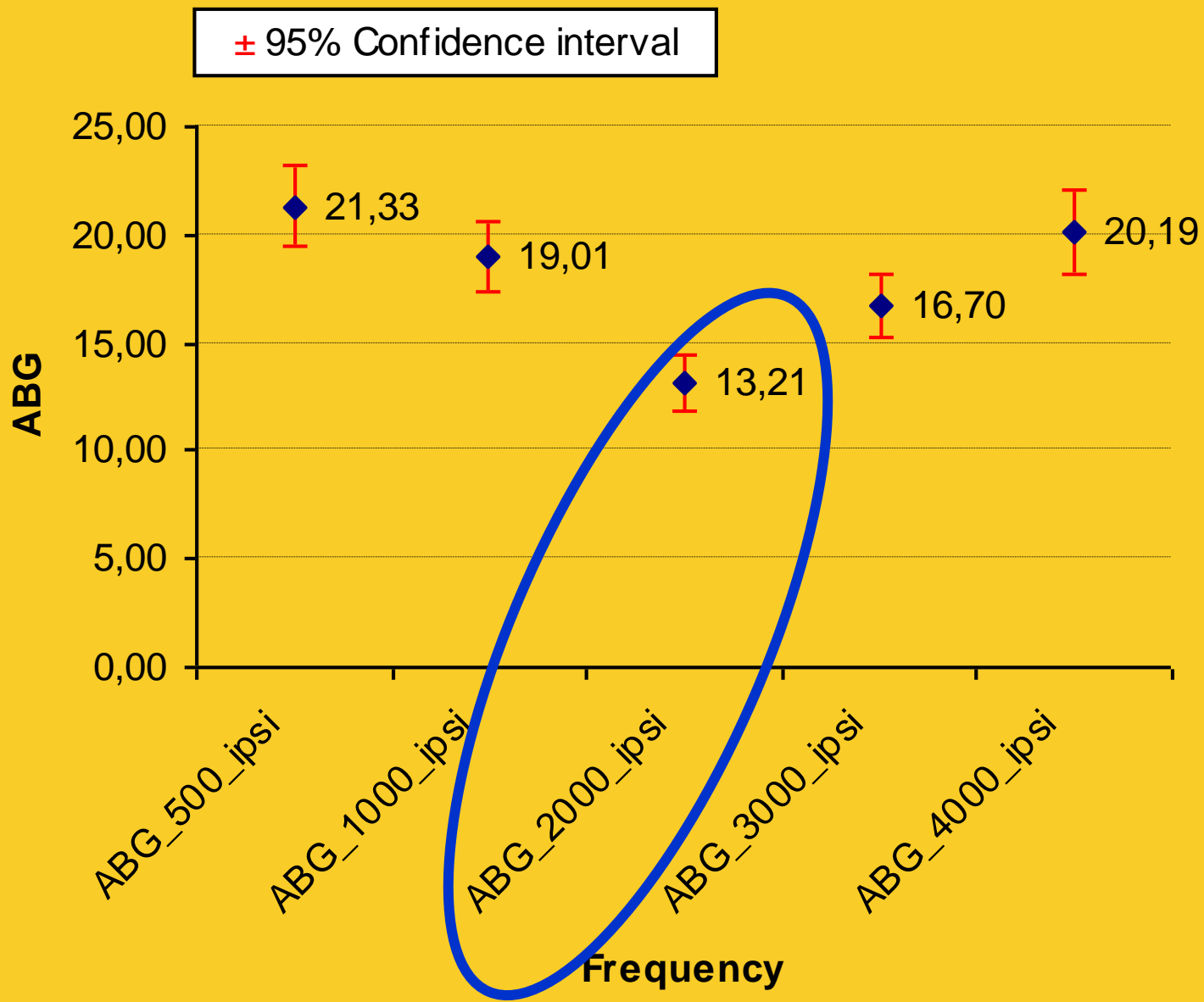


Yes

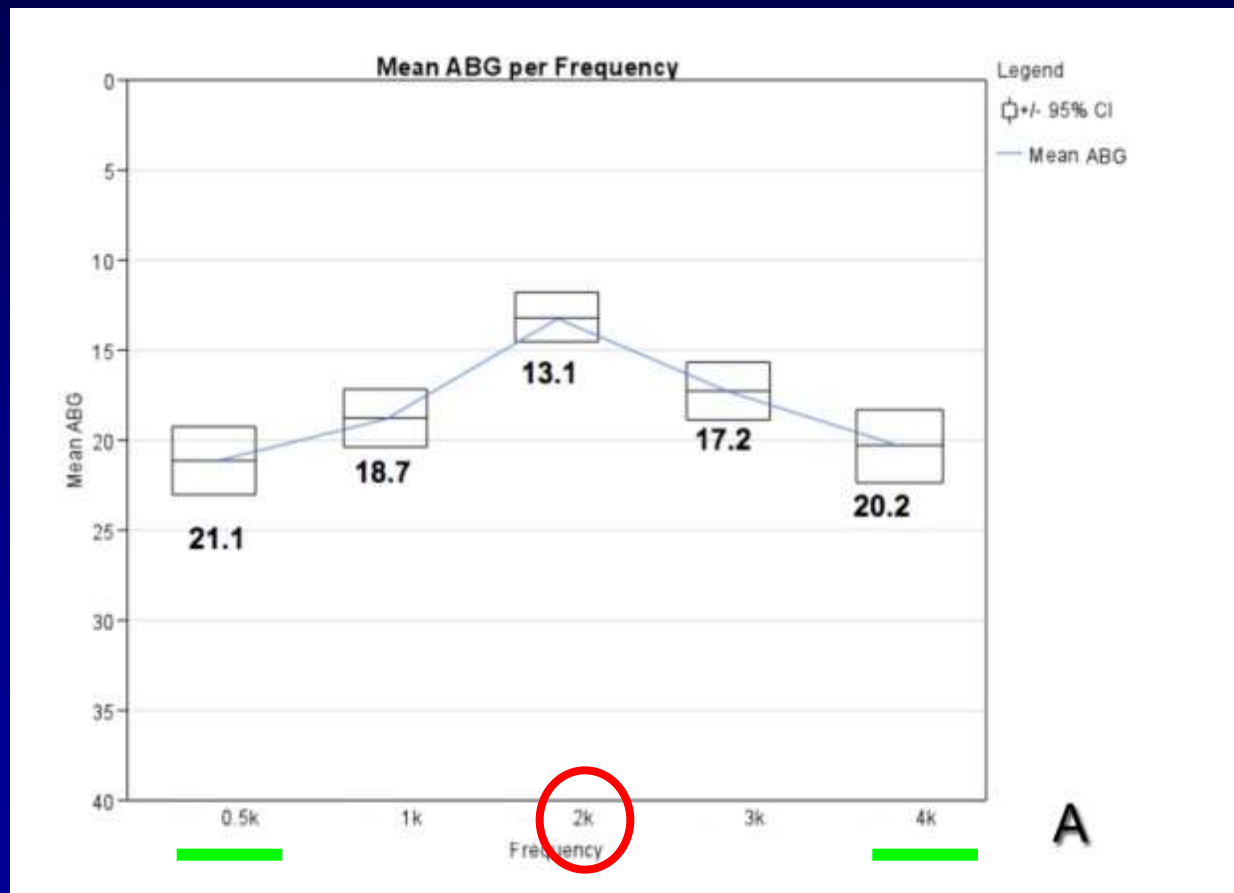


Differences between individual frequencies ?



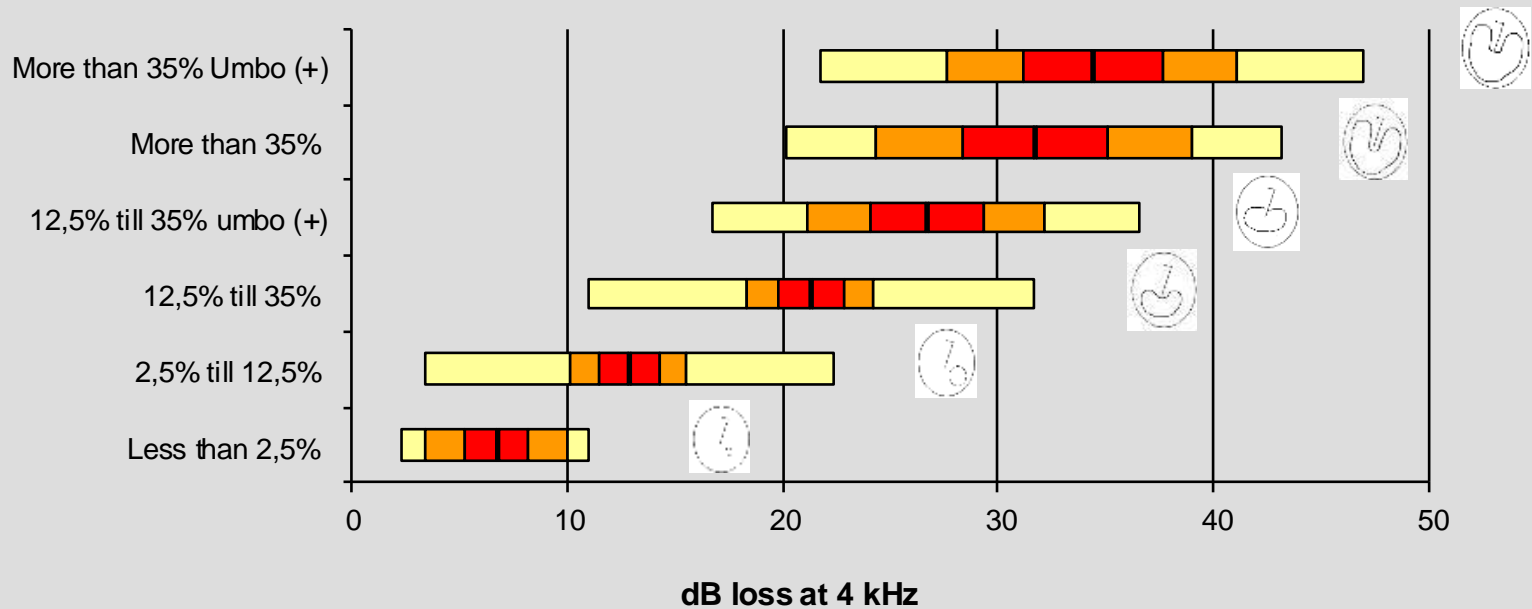


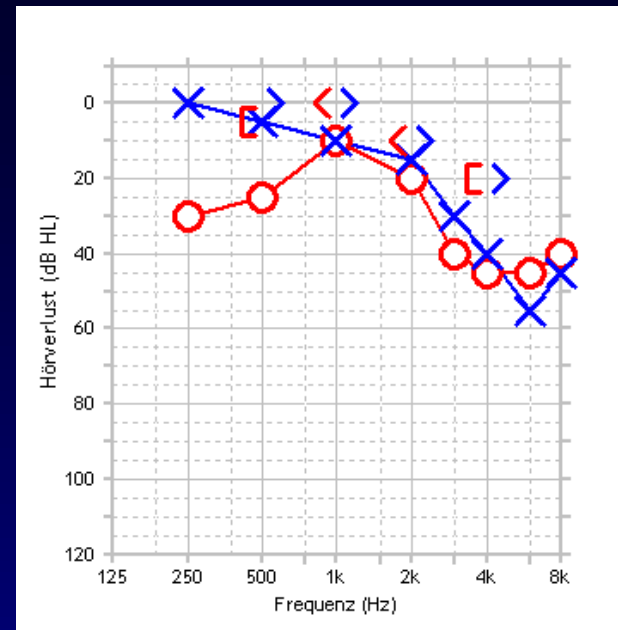
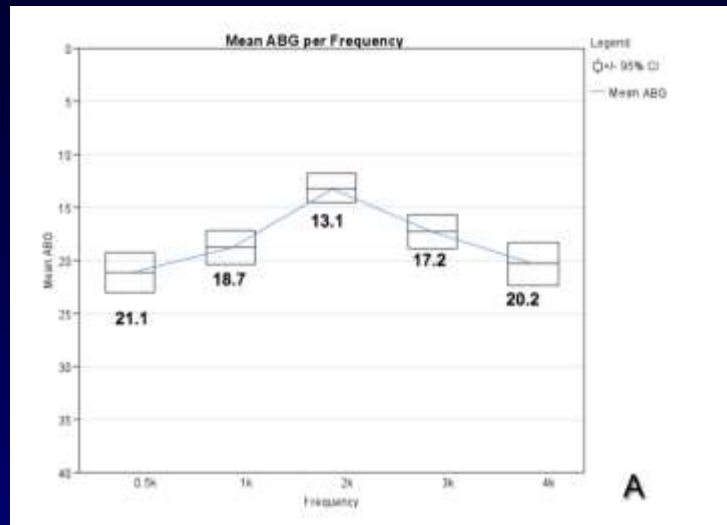
- Least changes seen at 2kHz
- Most changes seen at 0.5 and 4 kHz



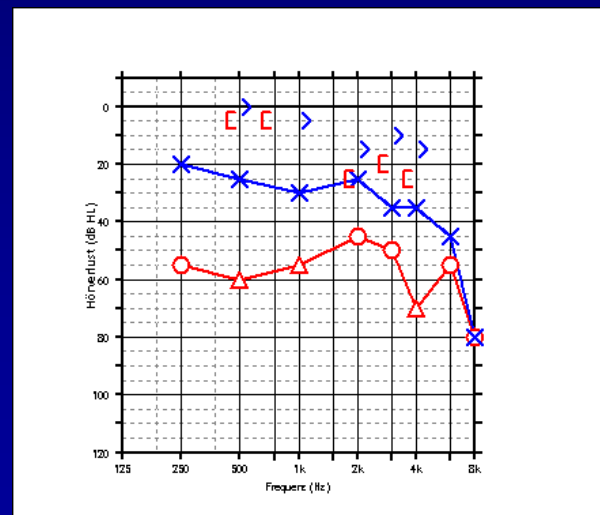
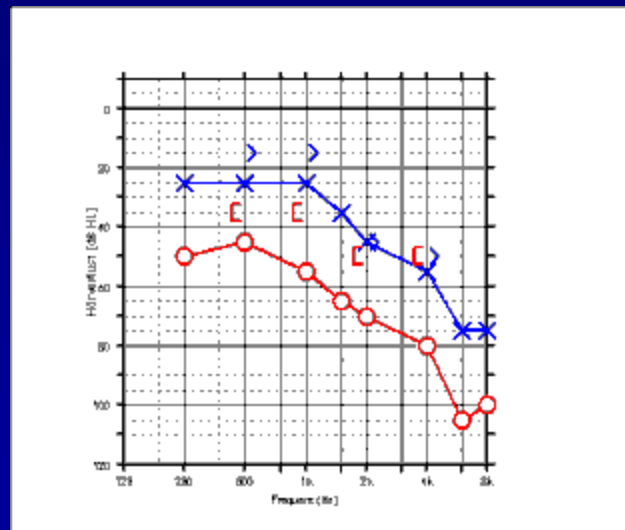
Summary

Perforation Size and Umbo involvement





typical

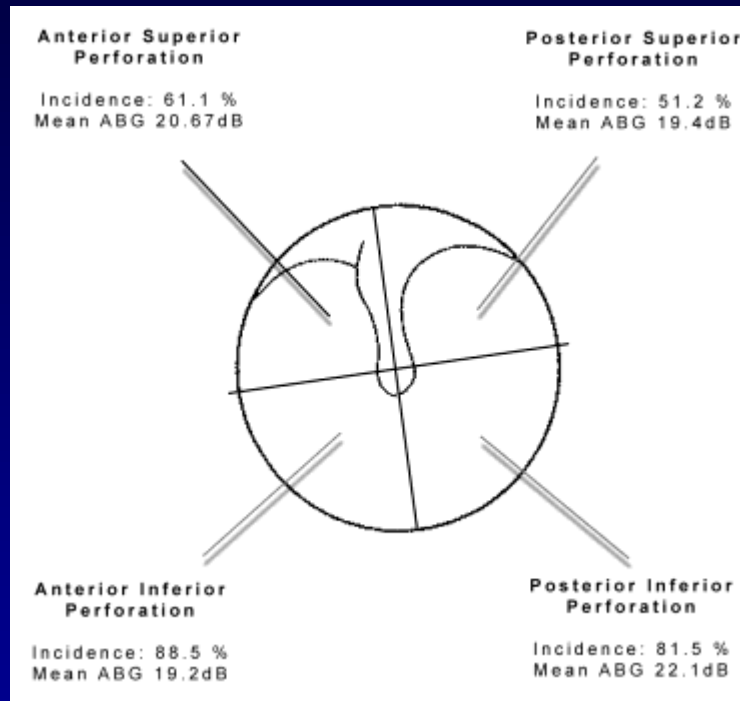


atypical

**Is the location of the
TM-perforation
relevant to the
hearing impairment ?**

impact of location within the drum ?

No



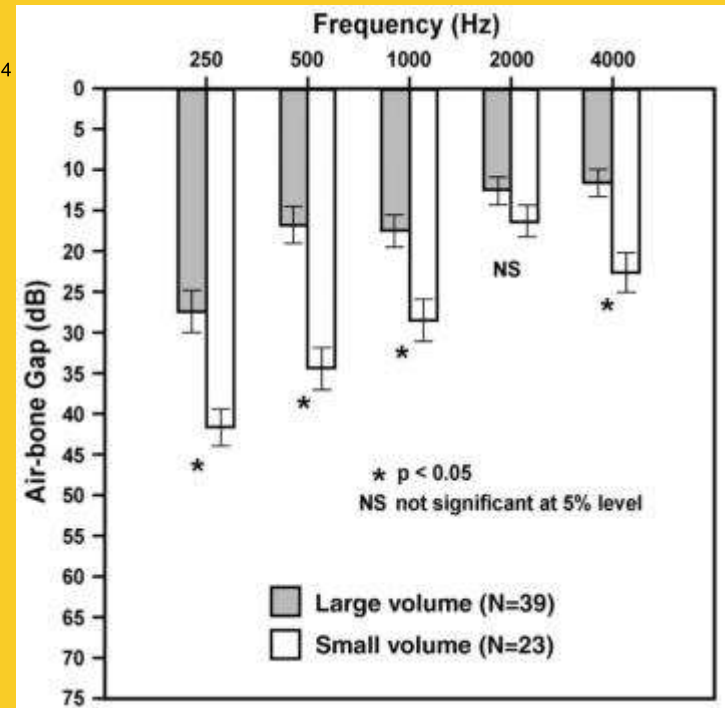
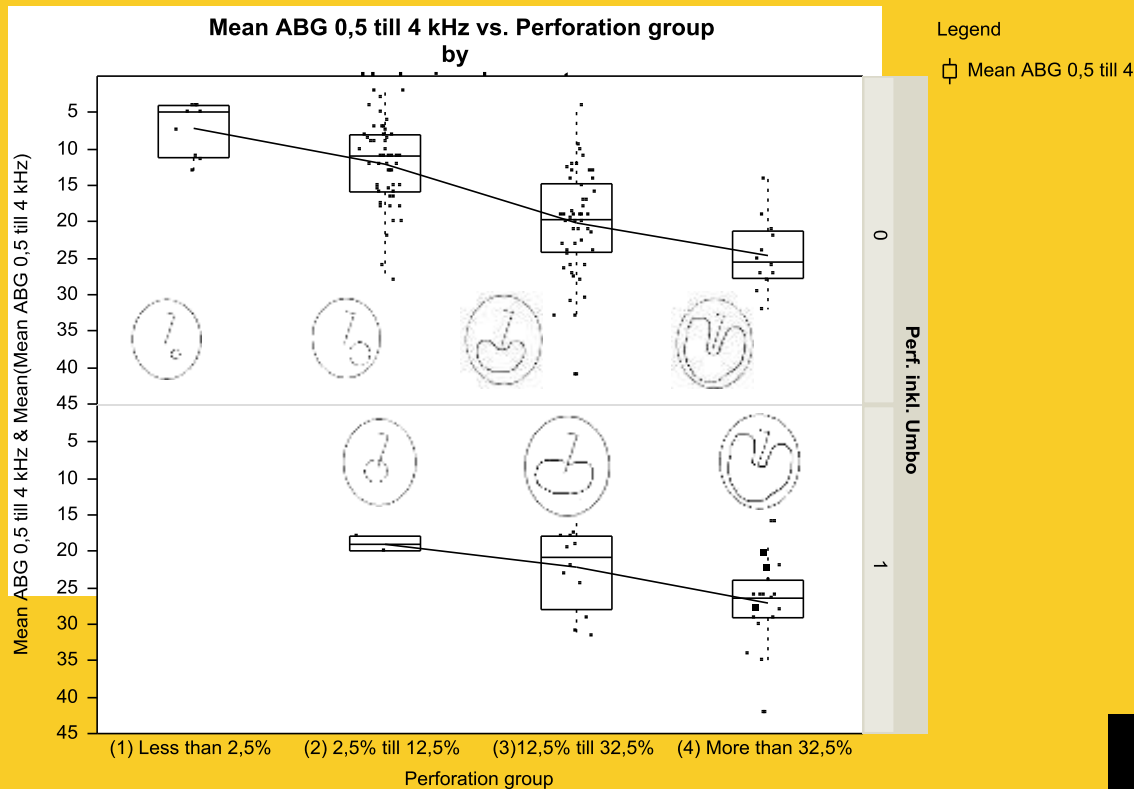
anterior or posterior perforations behave the same !

Other factors

involved in

hearing impairment ?

Umbo involvement had a 3-5dB worse ABG independent of the perforation size



Otol Neurotol. 2006 Feb;27(2):136-43.

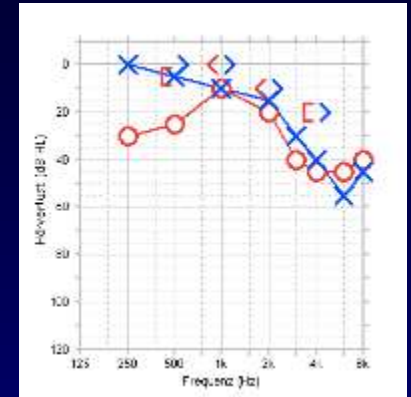
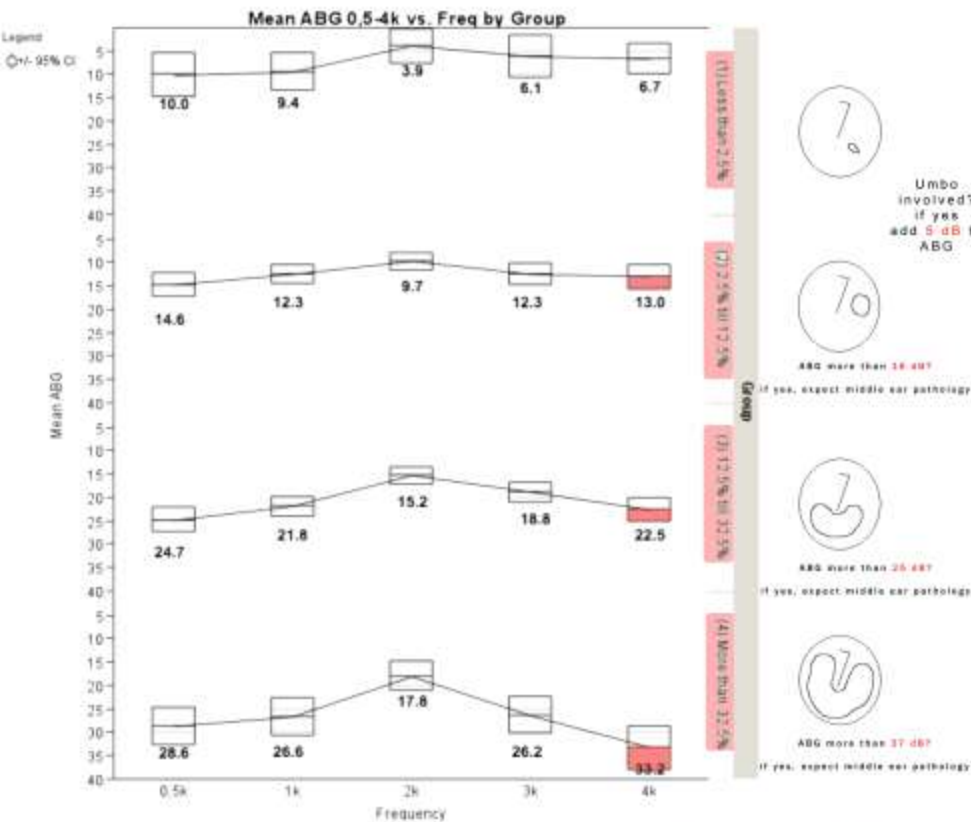
Determinants of hearing loss in perforations of the tympanic membrane.

Mehta RP, Rosowski JJ, Voss SE, O'Neil E, Merchant SN.

Effect of mastoid volume was not evaluated

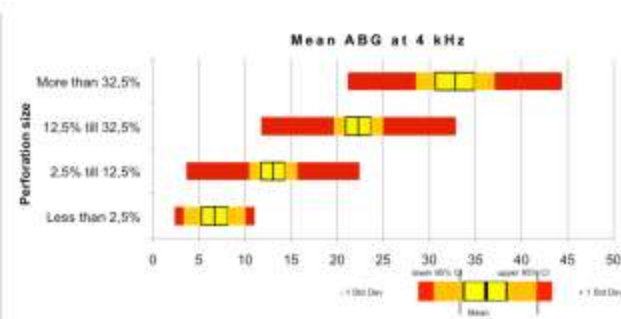
Summary and Practical Tool

EVALUATION TOOL FOR TYMPANIC MEMBRANE PERFORATION AND MIDDLE EAR PATHOLOGY



If perforation size does **not** match the expected ABG:

Expect further pathology within the middle ear and mastoid



Use tool as follows:

1. assign your TMP to a category cat (1) - (2) - (3) - (4)
2. check if umbo is involved
yes ☐ no ☐
3. write down expected ABG
..... dB
4. perform an audiogram
5. check 4kHz, if middle ear pathology should be suspected or not.
if the umbo is involved, add 5 dB to the above mentioned values.

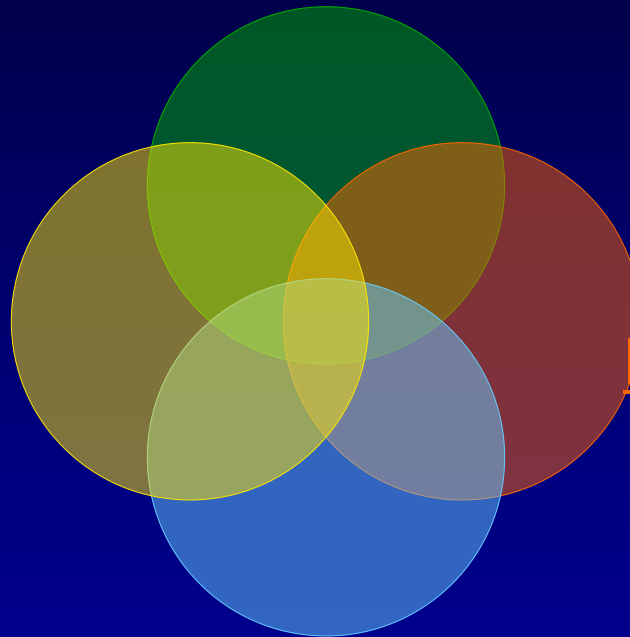


Patient 's History

Otoscopy

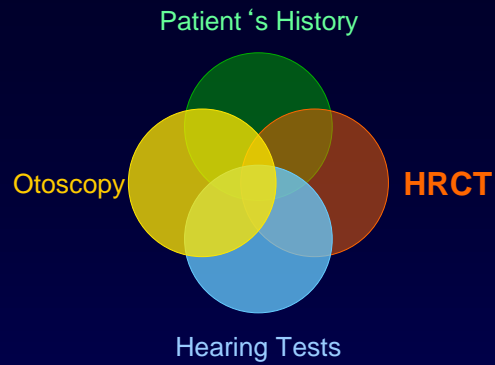
Radiologic
Investigations

Hearing Tests

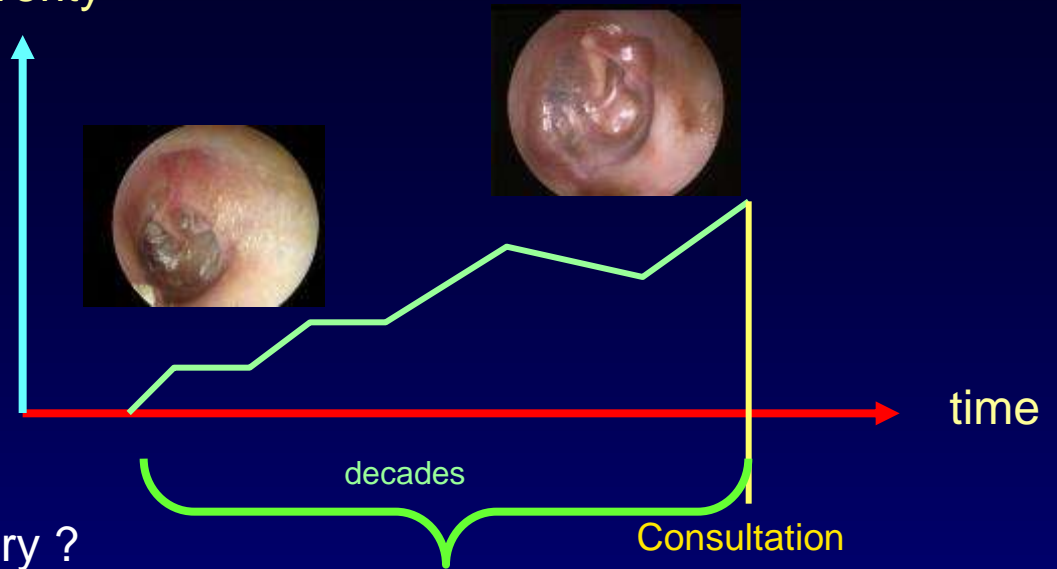


Radiology: Yes No Why ?

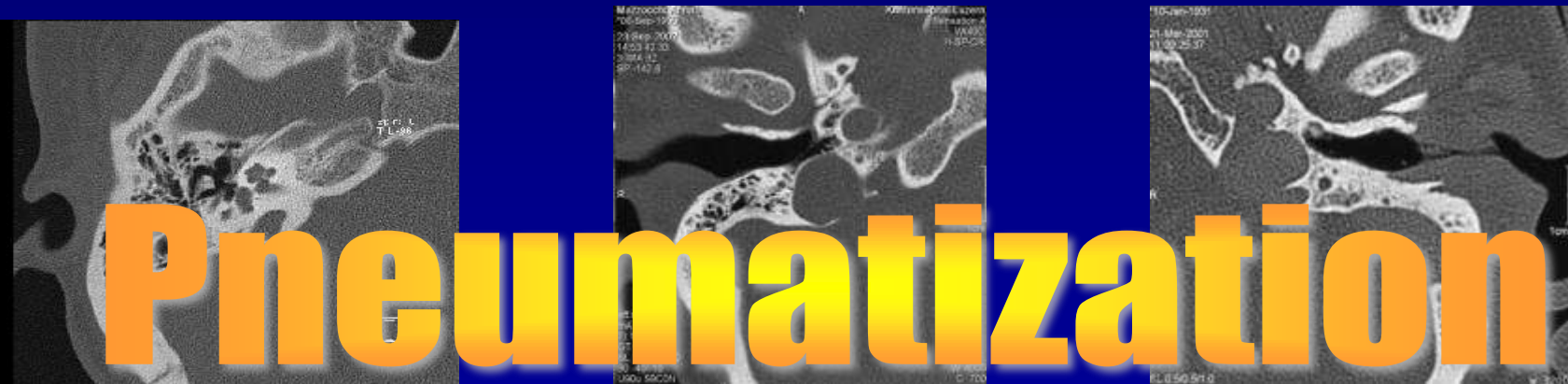




“Severity”

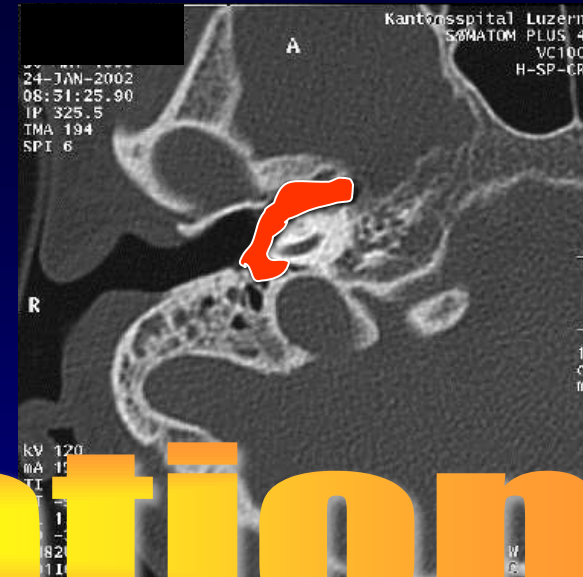
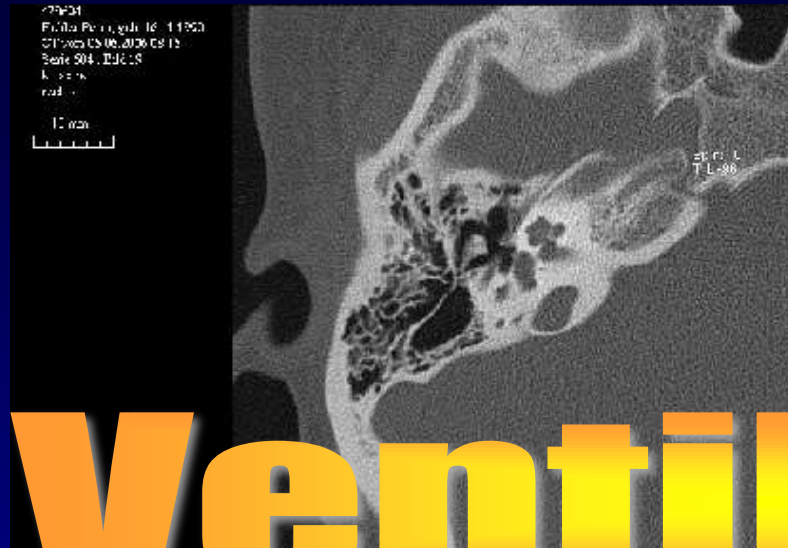


How to evaluate the ear's history ?



A CT scan is the history book of the ear

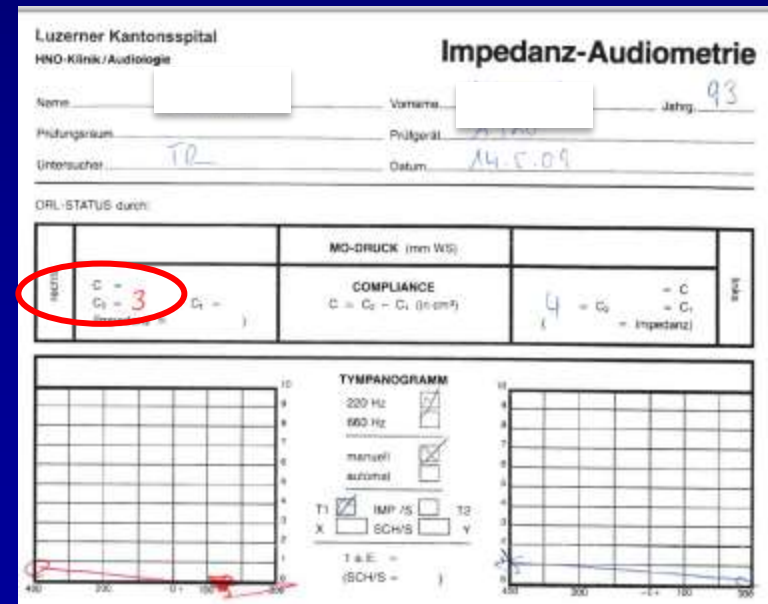
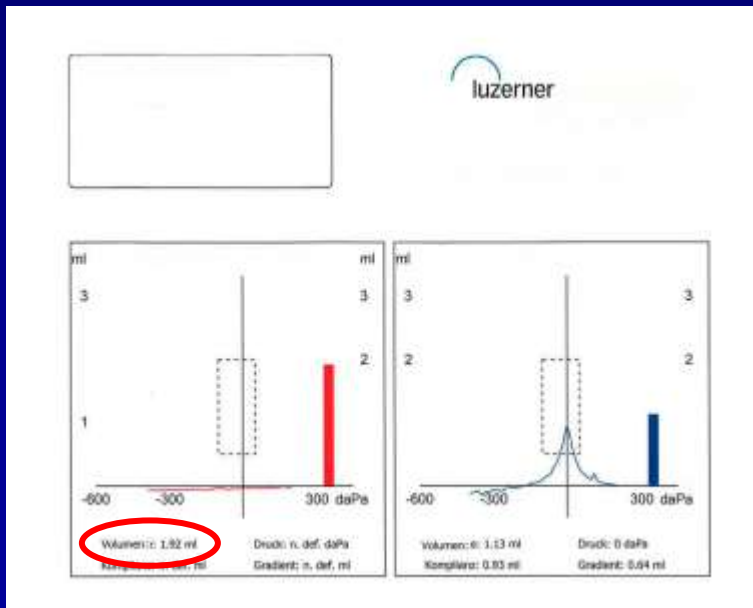
Pneumatization and ...



Ventilation

Pneumatization	Ventilation Mastoid / ME	Outcome
+++	++ / ++	Excellent
+	-- / ++	Favourable
-	-- / --	Poor

How to estimate pneumatization and ventilation *easily* ?



Chronic Suppurative Otitis Media

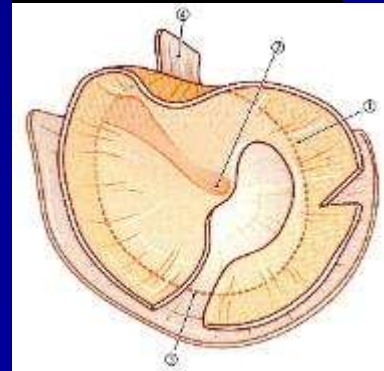


Who needs surgery ?

... and who does not ?

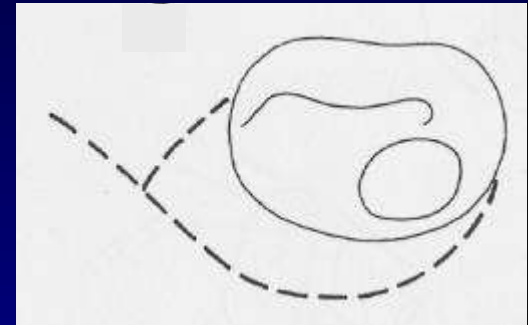
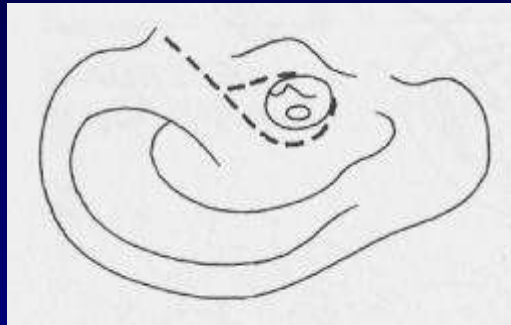
What do we need for surgery ?

- Knowledge of patient's anatomy
- Adequate instrumentation and proper drilling technique
- **Surgical Concept & Knowledge** of your results (with that concept)



Which approach ?

Endaural or Transcanal



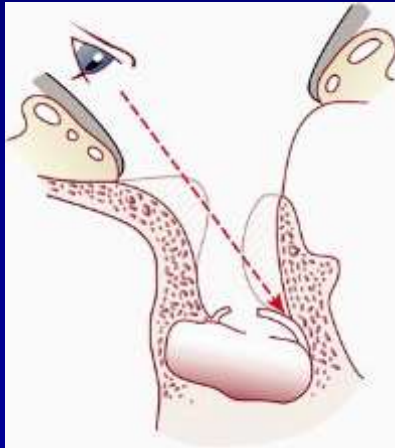
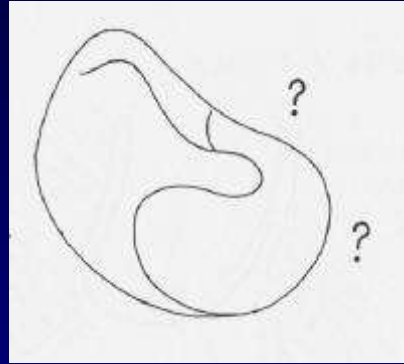
Indications:

- Posteroinferior or central perforation
- No myringosclerotic plaques
- Adequate ventilation (no antrostomy required)





Retroauricular

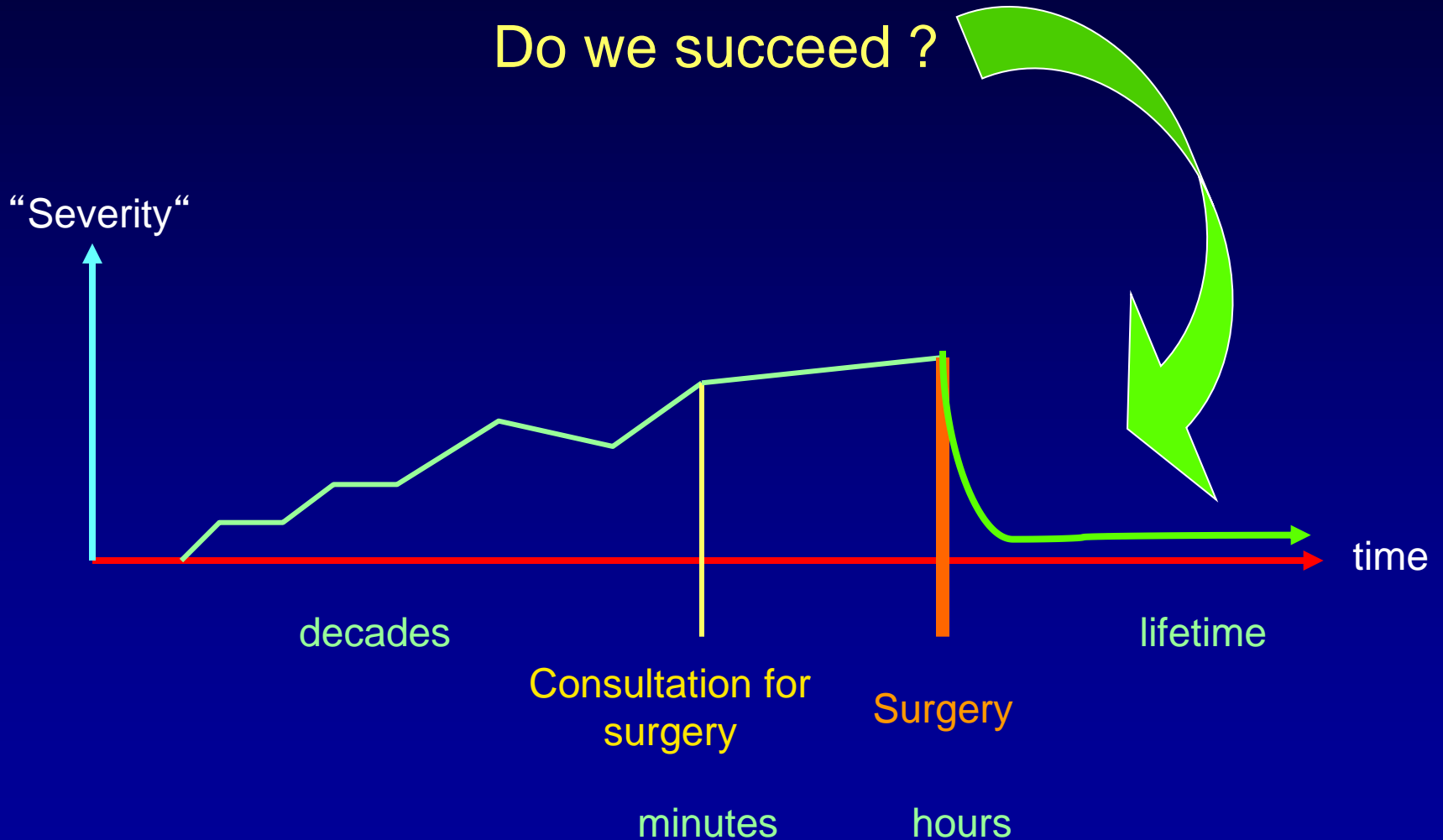


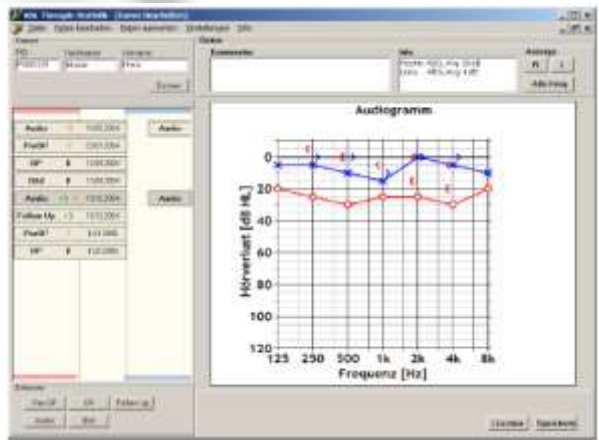
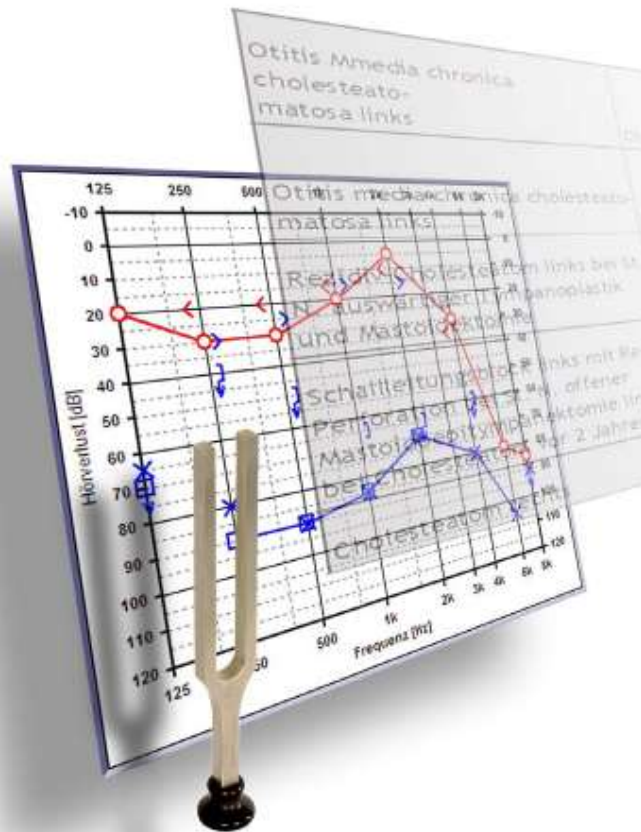
goal:

maximum exposure

Chronic middle ear disease

Do we succeed ?





Record your own results

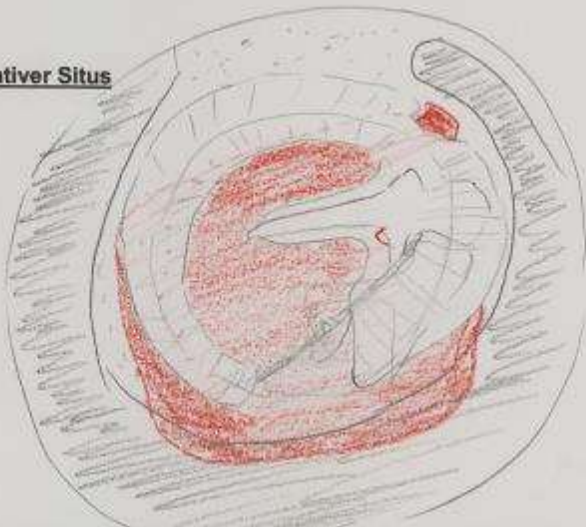


Operating Report: in writing and drawing !

raoperativer Situs



stoperativer Situs

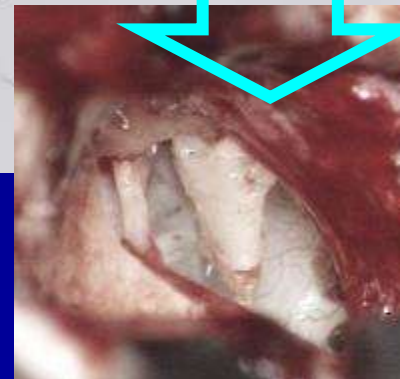
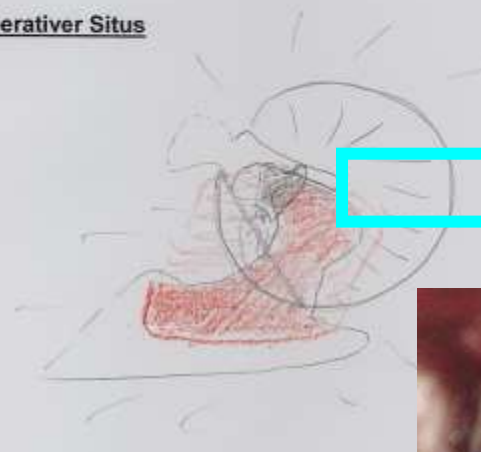


Intraoperativer Situs



links gebrochen

Postoperativer Situs

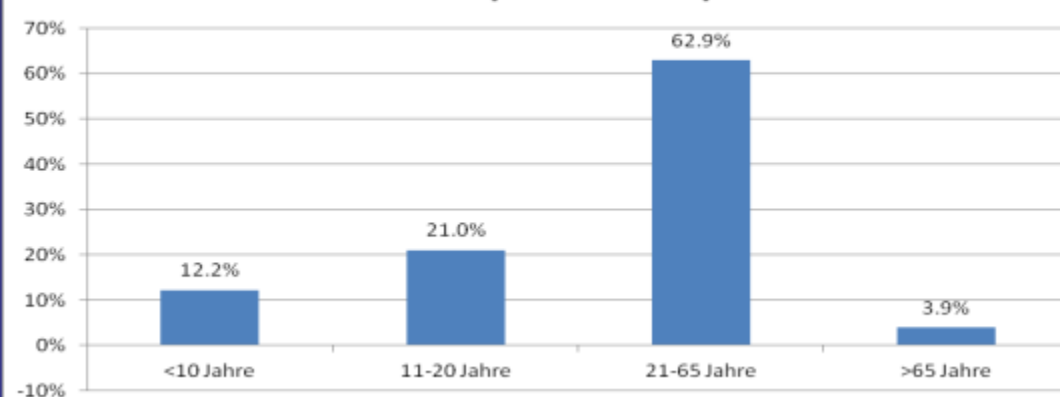


Results Luzern 2001 - 2009

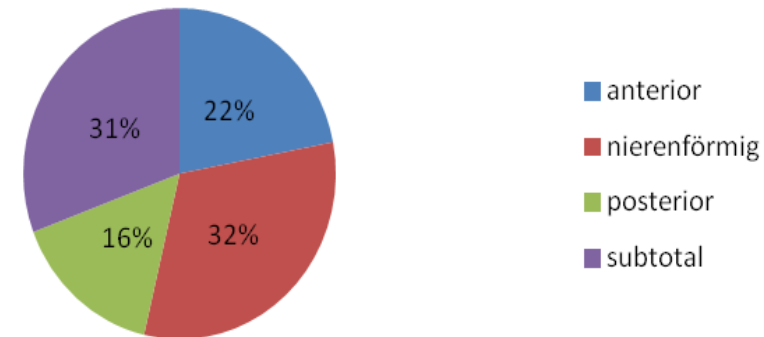
n = 289 Primary „Tympanoplasties“

n = **205** (189 patients) with follow-up > 12 mts (mean 2.7 yrs)

Alter zum Zeitpunkt der Operation

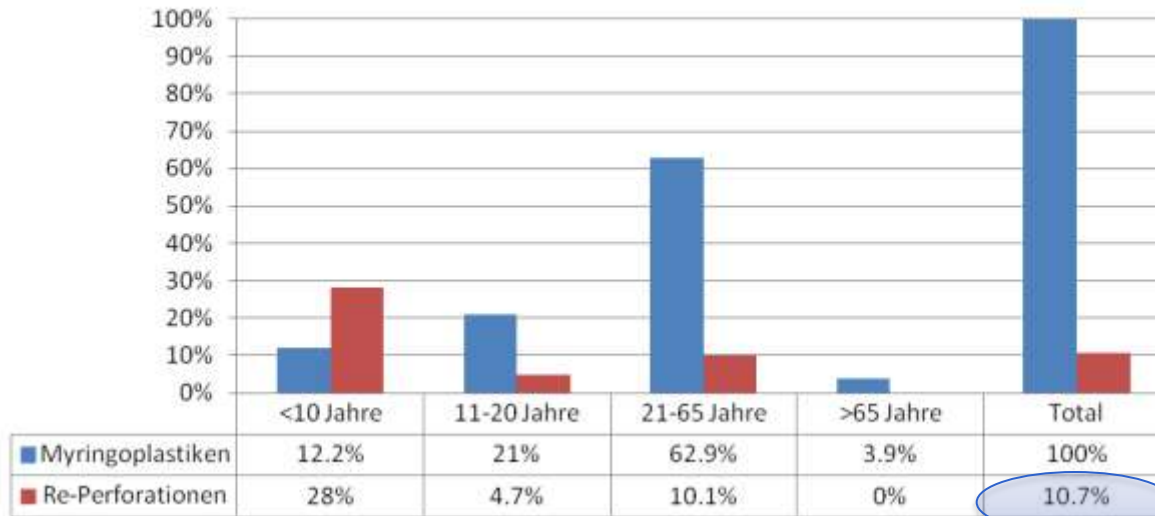


Lokalisation der Primär-Perforation



Age 4 – 82 (mean 33)

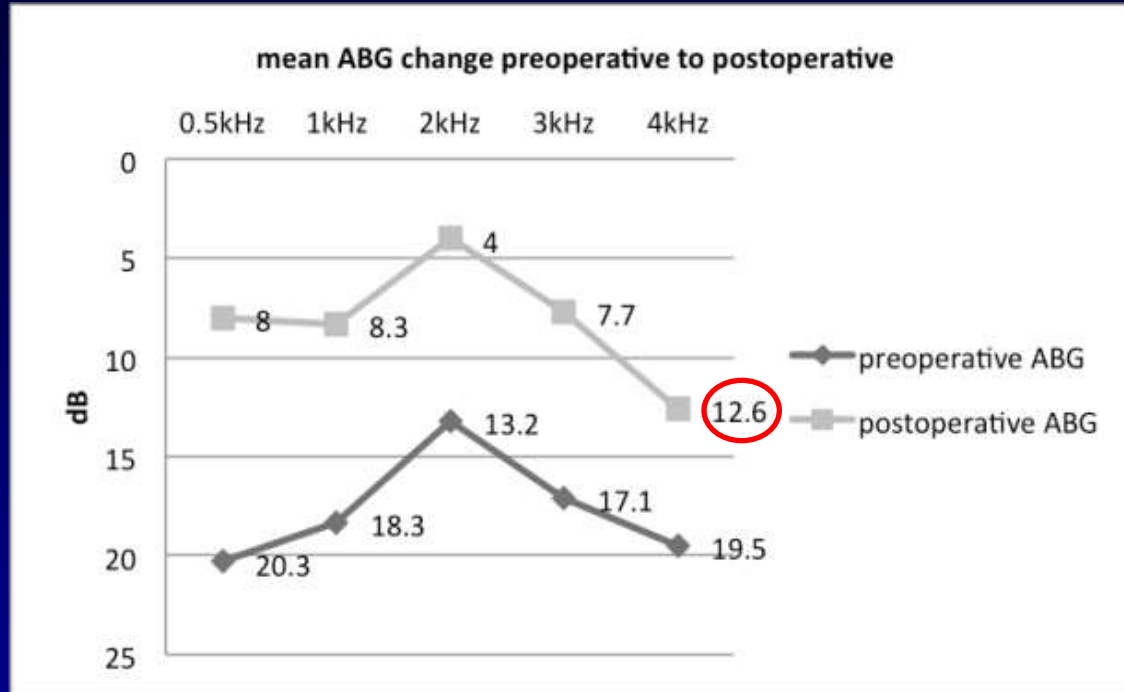
Re-Perforationen nach Altersgruppen



Age < 10 years sig.
higher rate

75% within
the first 3 months

Hearing Results (intact chain)



- mean postop. ABG 0.5-4kHz = 8.2dB
- ABG \leq 10dB : 78% (n=83)
- largest ABG postop. at 4kHz (12.6dB)

When is the patient allowed to fly?



Effects of Early Commercial Air Travel on Graft Healing Rates After Tympanoplasty

Masaya Konishi, MD; Shailendra Sivalingam, MD; Seung-Ho Shin, MD;
Francesca Vitullo, MD; Maurizio Falcioni, MD

n total = 169*	Flight Group (day 1 postop.) n = 69	Nonflight Group n = 100
Graft success at 1 mo	91%	88%
Graft failure at 1 mo	9%	12%



$p = 0.494$ (ns)

* Wet spongostan into tympanic cavity



How bright is our surgical future ?

Regenerative Treatment for Tympanic Membrane Perforation

*†Shin-Ichi Kanemaru, ‡Hiroo Umeda, †Yoshiharu Kitani, §Tatsuo Nakamura,
†Shigeru Hirano, and †Juichi Ito

**Department of Otolaryngology – Head and Neck Surgery, Medical Research Institute, Kitano Hospital, Osaka; †Department of Otolaryngology – Head and Neck Surgery, Graduate School of Medicine, Kyoto University, Kyoto; ‡Department of Otolaryngology, Shizuoka General Hospital, Shizuoka; and §Department of Bioartificial Organs, Institute for Frontier Medical Sciences, Kyoto University, Kyoto, Japan*

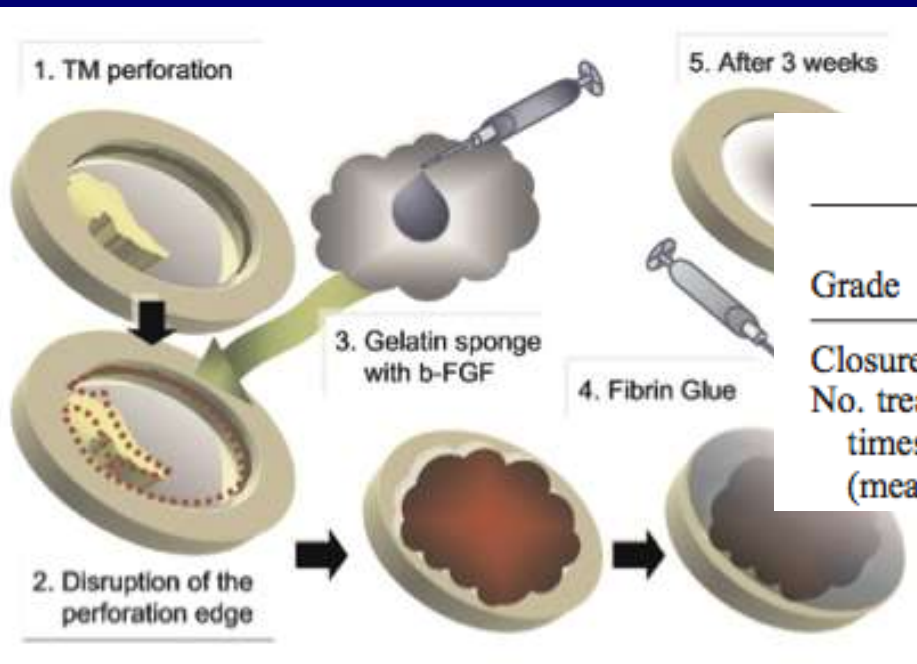
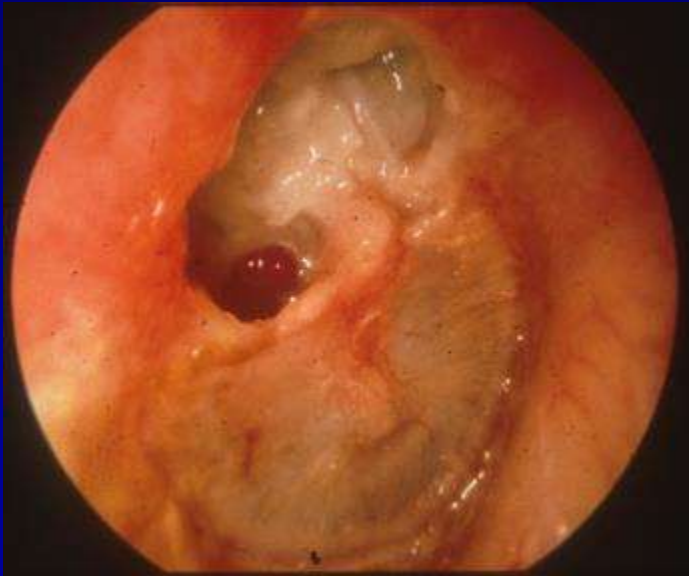


TABLE 2. *Results of the treatment*

Grade	Total (n = 53)	Grade I (n = 9)	Grade II (n = 25)	Grade III (n = 19)
Closure rates	98.1% (52/53)	100% (9/9)	100% (25/25)	94.7% (18/19)
No. treatment times, range (mean)	1–4 (1.4)	1–3 (1.3)	1–4 (1.4)	1–4 (1.6)



How do you define
“Cholesteatoma” ?

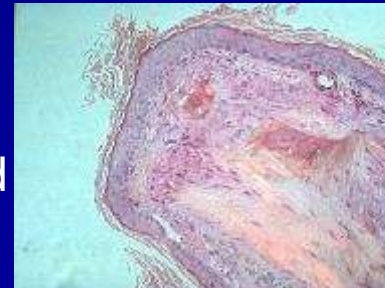


Definition

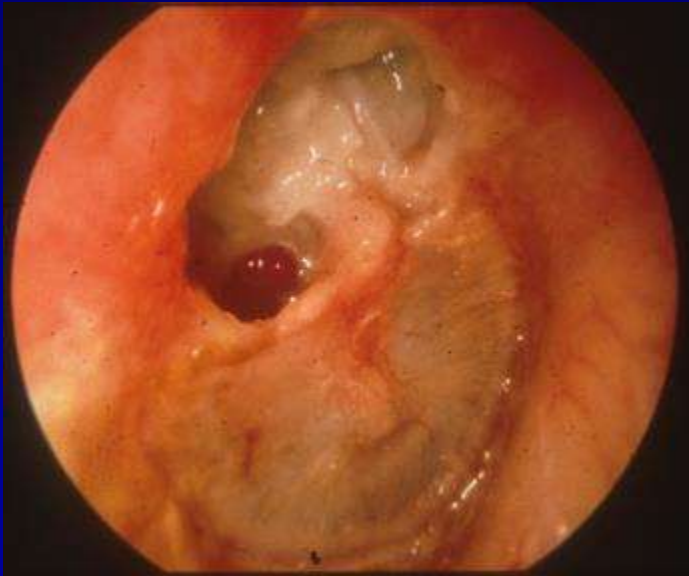
Skin and Retention of Keratin in the Middle Ear
and / or Temporal Bone with surrounding
inflammatory reaction & bone resorption

Cholesteatoma consists of

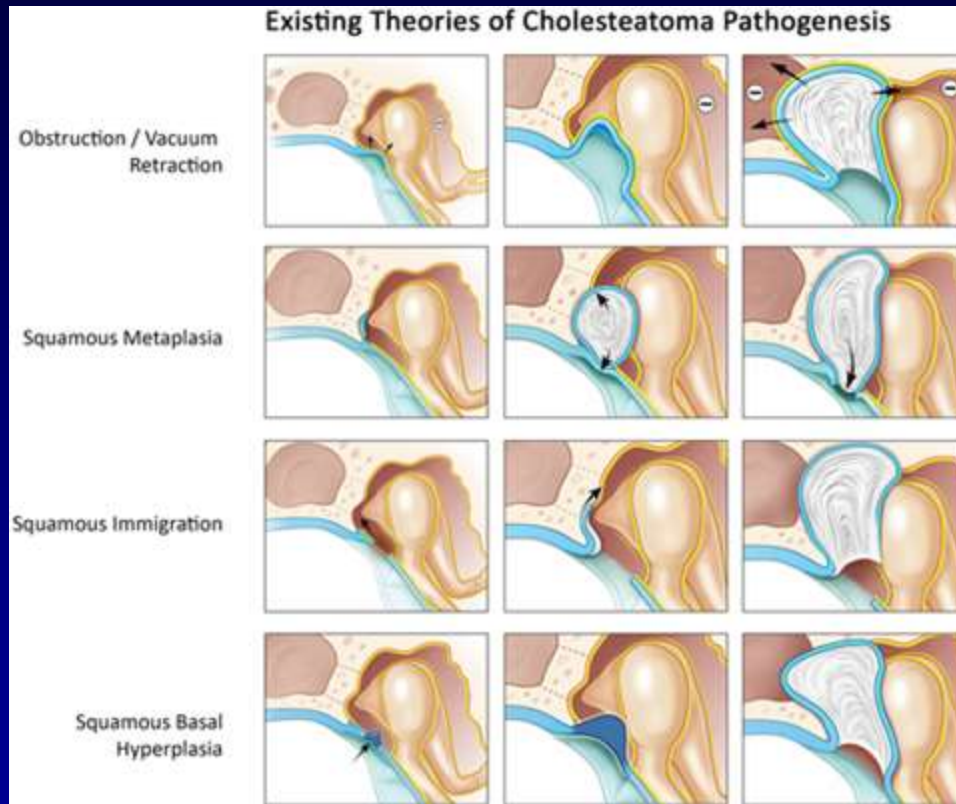
- matrix (keratinizing squamous epithelium,
- perimatrix (varying thickness of subepithelial connective tissue and
- keratin debris



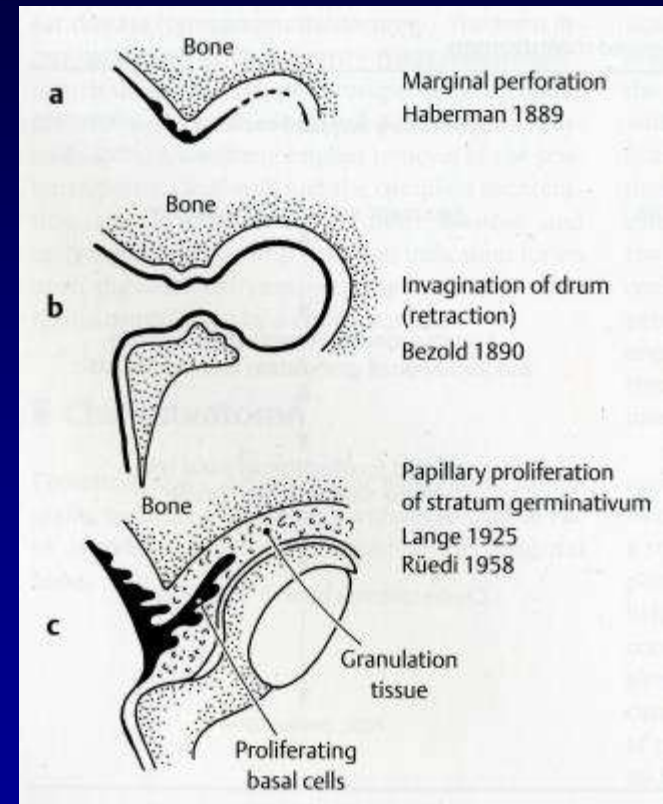
Both patients suffer from
“Cholesteatoma” ?



Pathogenesis: primary acquired cholesteatoma



Jackler et al.



Fisch et al.



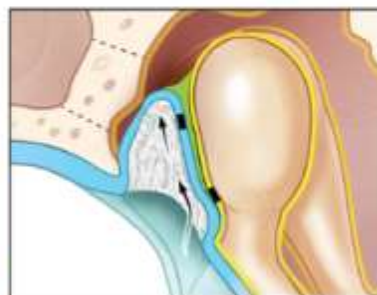
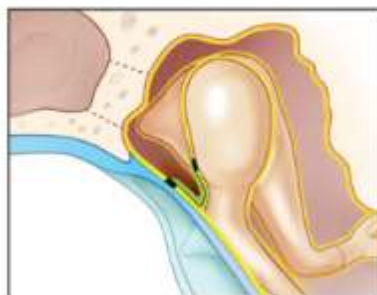


A New Theory on the Pathogenesis of Acquired Cholesteatoma: Mucosal Traction

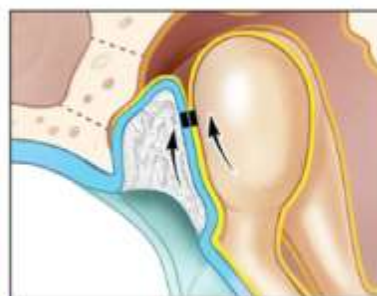
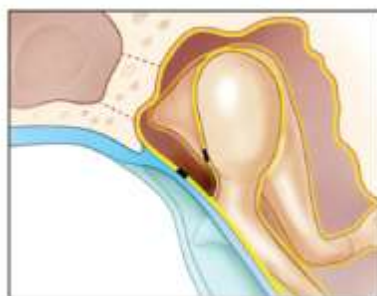
Robert K. Jackler, MD; Peter L. Santa Maria, MBBS, PhD; Yasin K. Varsak, MD; Anh Nguyen, MD, PhD;
Nikolas H. Blevins, MD

Mucosal Traction Theory

Mucous Blanket Migration



Mucosal Migration



Sequential Adhesion

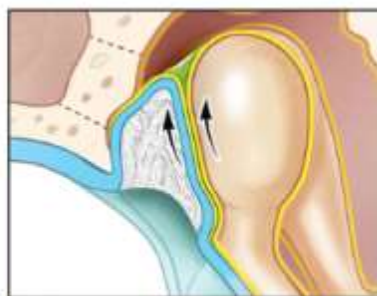


Fig. 7. Mucosal traction theory illustrating three potential types of mucosal interaction that drive cholesteatoma formation.

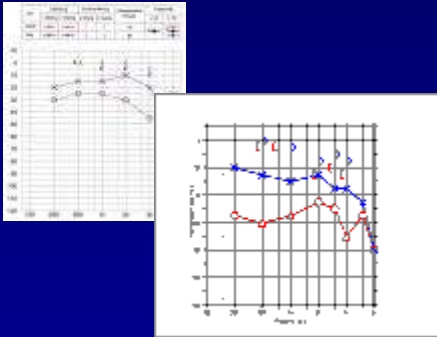
How to diagnose “Cholesteatoma” ?



Mandatory and optional testings to diagnose a Cholesteatoma



Otoscopy

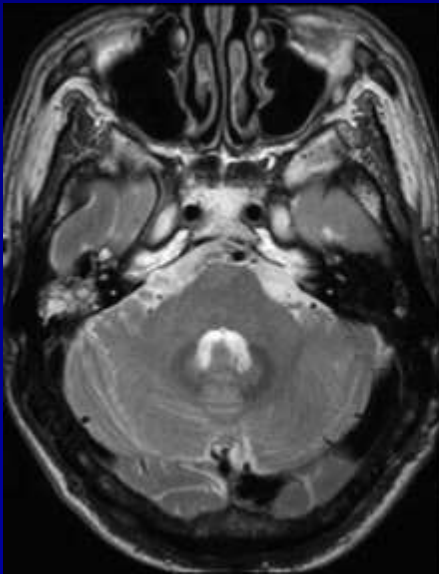
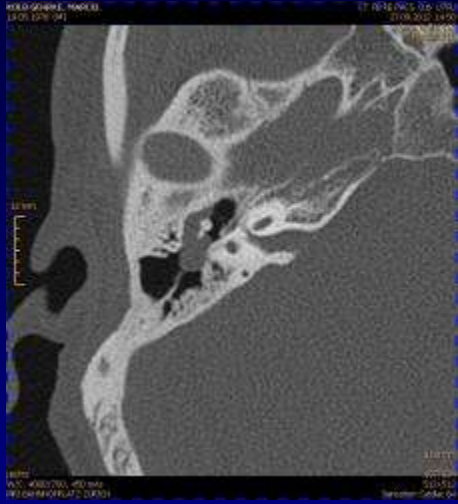


Hearing tests



CT (conventional or ConeBeam)

and MRI ?



T2 + non-EPI Diffusion Sequences

How big is a “Cholesteatoma” ?

Classification of Cholesteatoma (N743)

Chair: McKeith

Mod: Huber

*Speakers: Huber,
Caversaccio, Linder,
Roosli*

Organiser: Swiss Society
of Otolaryngology – Head
& Neck Surgery

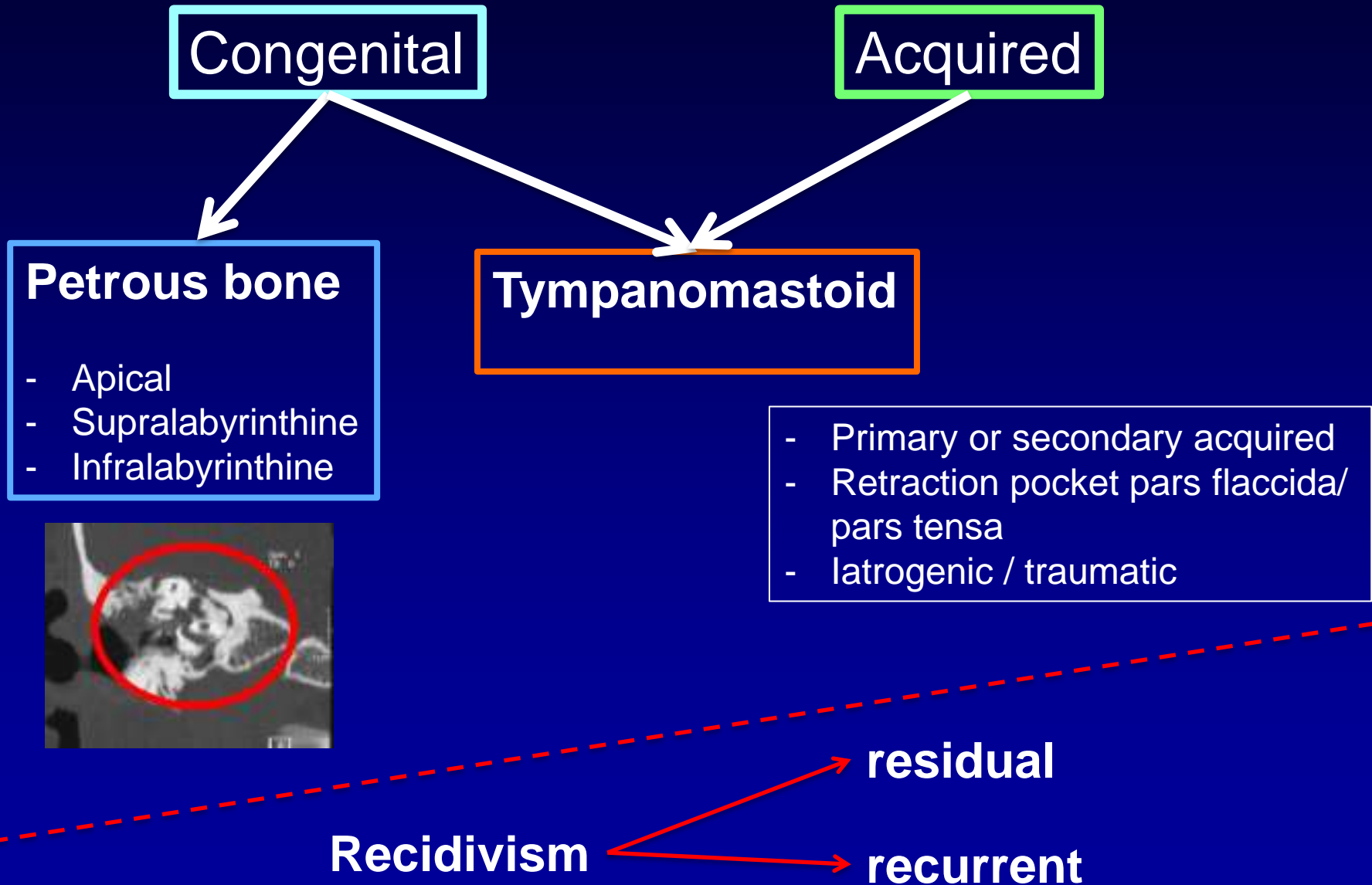
Consensus on Definition, Classification and Staging of Cholesteatoma (R771)

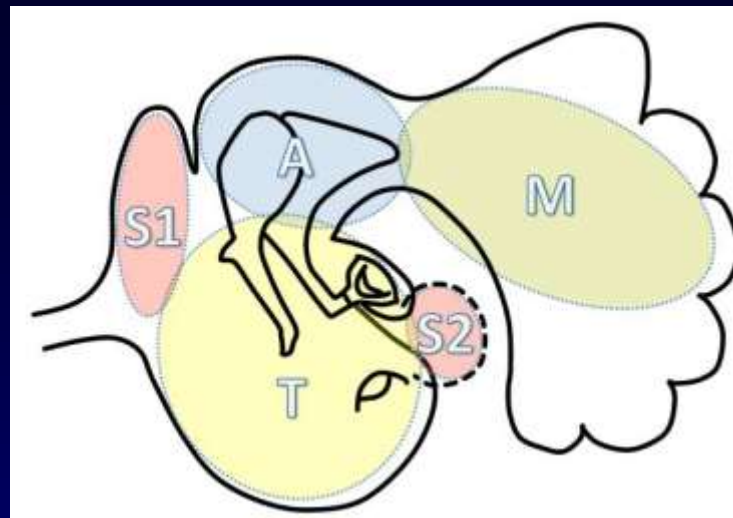
Chair: Yung

Mod: Ozgirgin

*Speakers: Sudhoff,
Olszewska, Tono,
Yamamoto, Incesulu,
Sakagami, Ozgirgin*

Overview Cholesteatoma





Stage I: Cholesteatoma localized in the primary site

Stage II: Cholesteatoma involving two or more sites

Stage III: Cholesteatoma with **extracranial complications or pathologic conditions :**

facial palsy (FP), labyrinthine fistula (LF), labyrinthitis, abscess

Stage IV: Cholesteatoma with **intracranial complications:**

purulent meningitis, epidural abscess, subdural or brain abscess, sinus thrombosis, brain herniation into mastoid cavity.

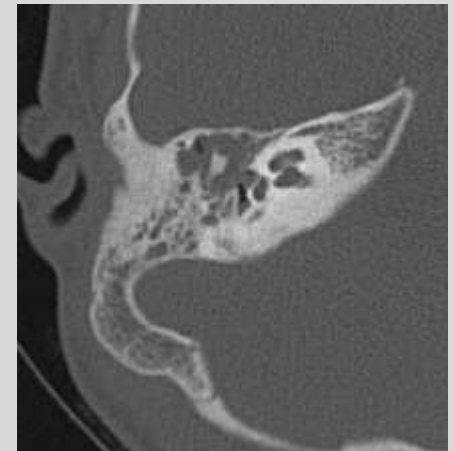
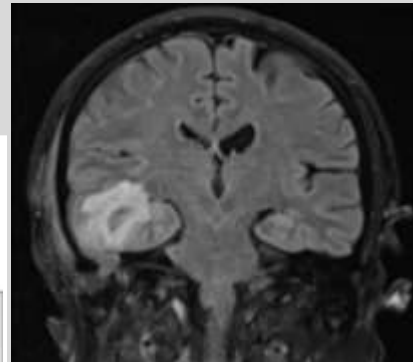
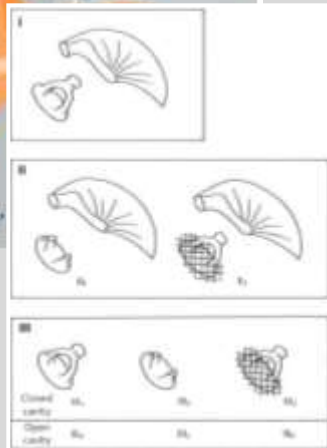
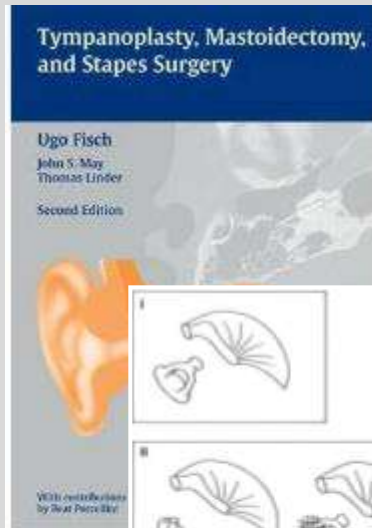
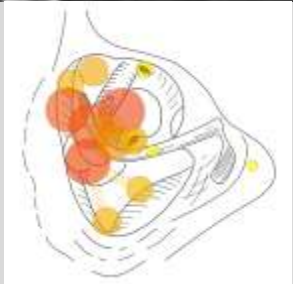
ChOLE - Classification of Tympanomastoid Cholesteatomas

Cholesteatoma extension

Ossicular chain involvement

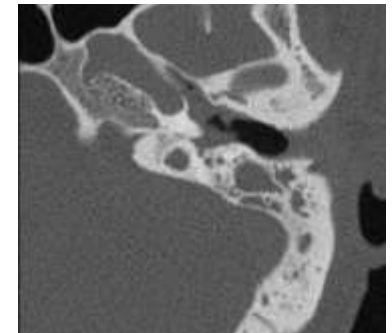
Life threatening complications

Eustachian tube ventilation and mastoid pneumatisation



ChOLE -Classification of Tympanomastoid Cholesteatomas – A Case Example

Cholesteatoma extension	Ossicular chain involvement	Life threatening complications	Eustachian tube ventilation and mastoid pneumatisation
1 Shrapnel cholesteatoma extending towards epitympanon OR cholesteatoma confined to the middle ear	0 Ossicular chain intact	0 None	0 Moderate to good pneumatisation, good ventilation (>50% of cells ventilated)
2 Cholesteatoma extending to the aditus and antrum	1 malleus and stapes present incus eroded or missing	1 Extracranial extratemporal complication: acute mastoiditis, abscess in relation to ear	1 Moderate to good pneumatisation, poor ventilation (<50% of cells ventilated)
3 Cholesteatoma extending to the anterior epitympanon, supratubal recess, sino-dural angle, sinus tympani, mastoid tip or dehiscent facial nerve with cholesteatoma matrix on the nerve	2 malleus present, incus eroded and fixed stapes footplate OR eroded / absent superstructure with mobile footplate	2 Extracranial intratemporal complication: sudden sensory hearing loss, Facial palsy, Labyrinthitis, Labyrinthine Fistula	2 Poor (sclerotic) pneumatisation, good or poor ventilation
4 Cholesteatoma exposing widely the dura OR sigmoid sinus OR erosion of the jugular bulb OR encephalocele (herniation of middle fossa dura into the middle ear or mastoid)	3 malleus diseased or absent, incus eroded, stapes footplate fixed or absent superstructure with mobile footplate	3 Intracranial complications: meningitis, brain abscess, seizures	
	4 Completely unidentifiable and eroded		



Ch1 O1 L0 E1

GOALS OF PRIMARY SURGERY



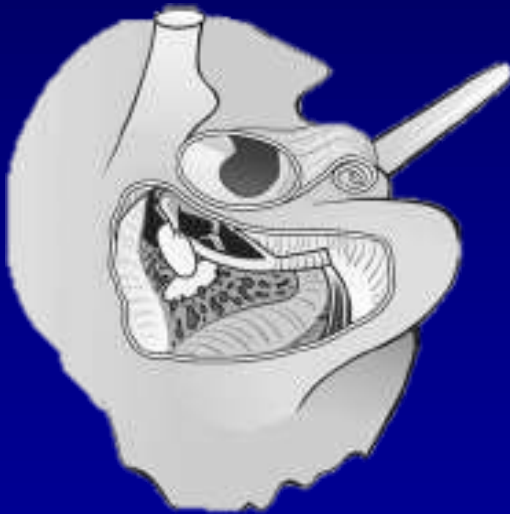


To start with

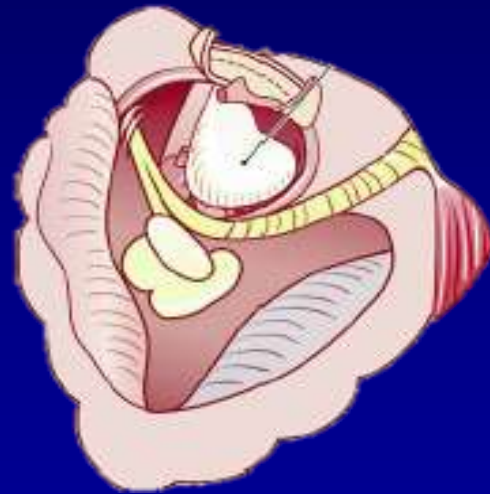


...but not how to end with !

Cholesteatoma Surgery: Closed or Open Technique ?



“Closed”

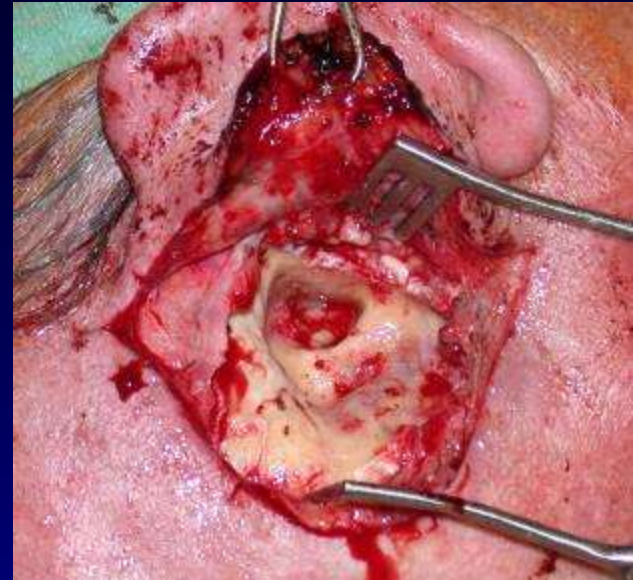
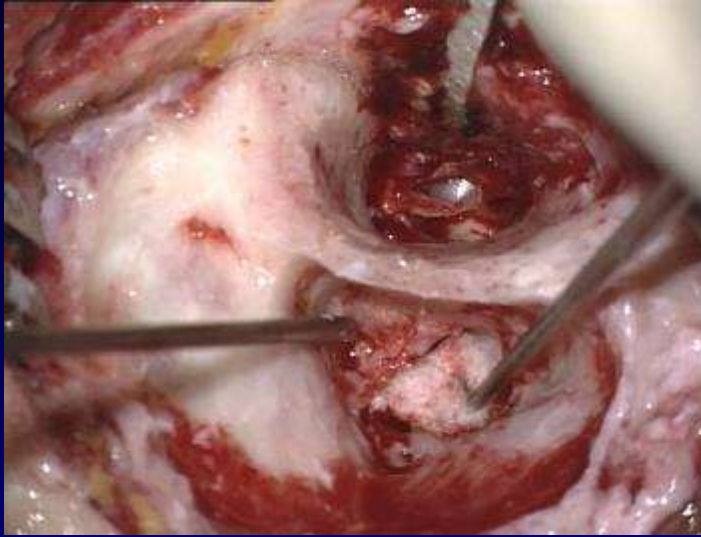


“Open”

Geschlossene MET

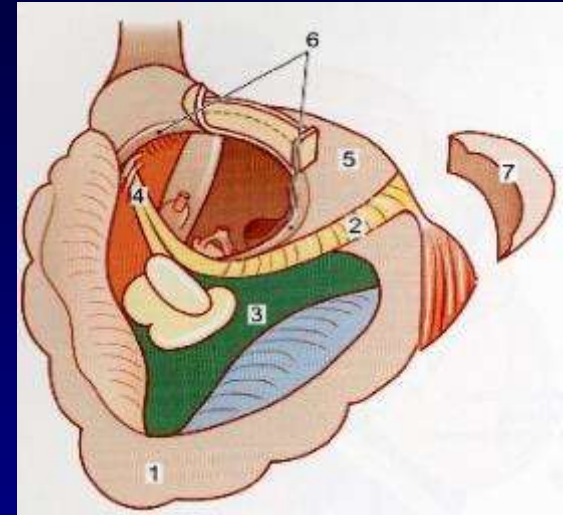
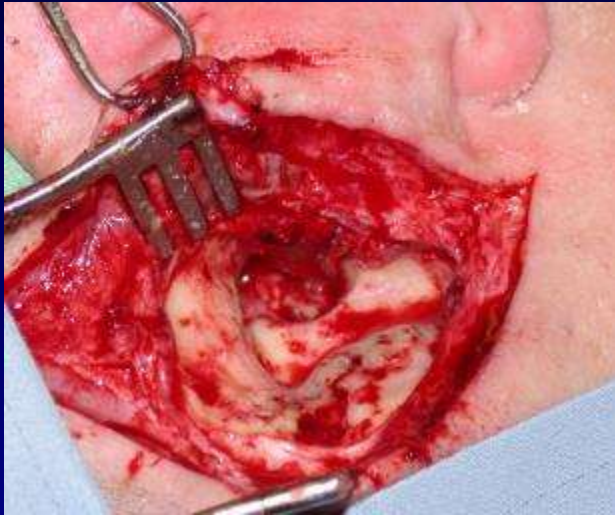
oder

offene MET



- Sufficient view to reach the goals?
- Adequate ventilation?
- Healthy mucosa ?
- Proper follow-up possible ?

open Mastoidoepitympanotomy with Tympanoplasty oMET

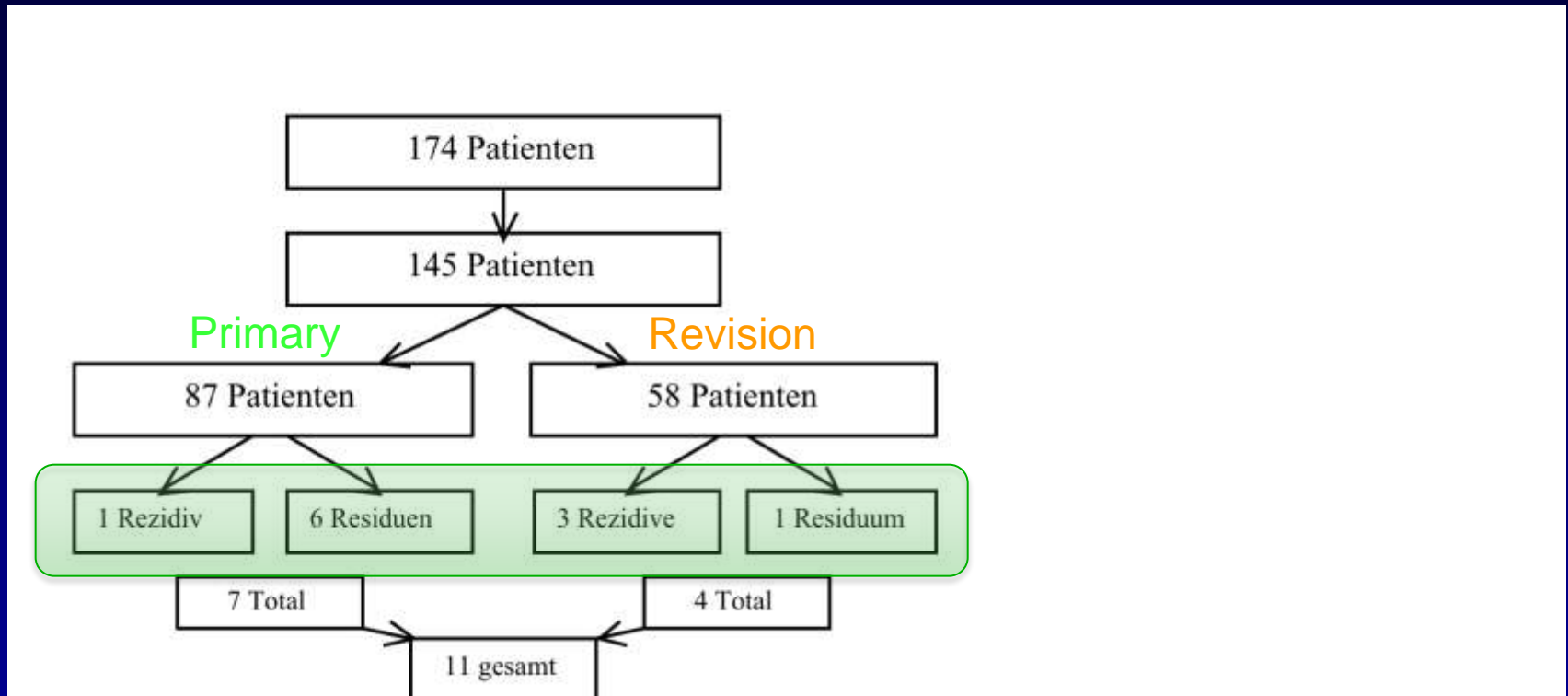


Poor ventilation



Good ventilation

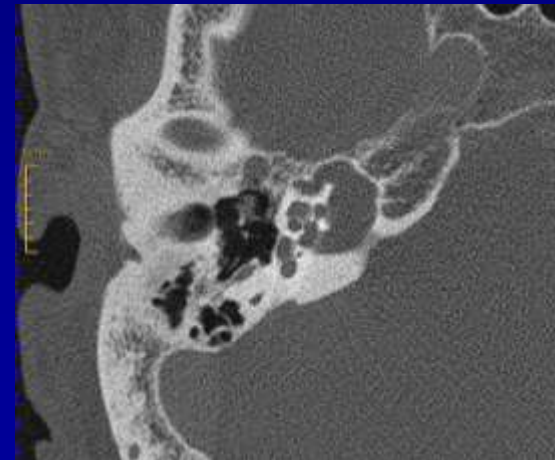
Patients 2001 - 2010



	n	Rezidiv	Residuum	gesamt
Primäroperation	87	1%	7%	8%
Revisionsoperation	58	5%	1%	7%
Total	145	3%	5%	8%

Congenital Cholesteatoma

- ✓ congenital middle ear cholesteatoma
- ✓ congenital temporal bone cholesteatoma
 - ✓ **supralabyrinthine**
 - infralabyrinthine
 - ✓ apical



Typical Presentation of supralabyrinthine Cholesteatoma



2 yrs. ago: slight facial weakness (right side)

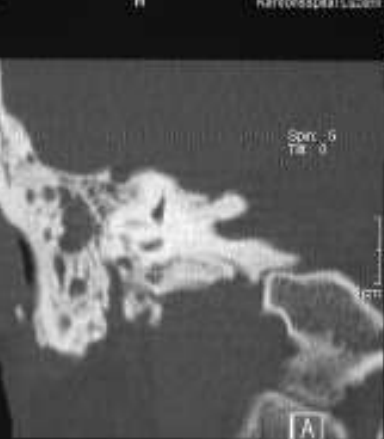
Exploratory surgery revealed cholesteatoma

Referral: Facial paralysis, chronic drainage, right deafness

Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 12



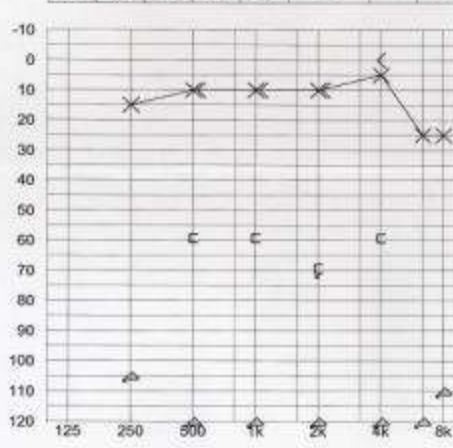
Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 13



Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 14



OVI	Luftgefüllung		Knochengefüllung		Mikrogefäßverteilung		Festigkeit (dB)	
	> Meßung	< Meßung	> Meßung	< Meßung	> Meßung	< Meßung	> Meßung	< Meßung
100%	→	←	→	←	→	←	→	←
10%	→	←	→	←	→	←	→	←



Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 17



Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 18



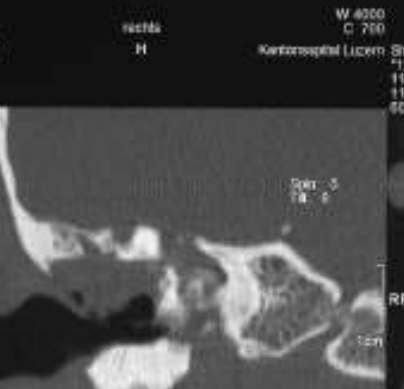
Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 19



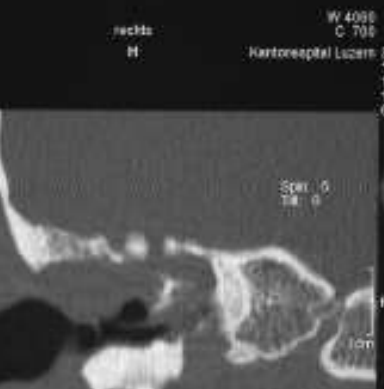
Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 20



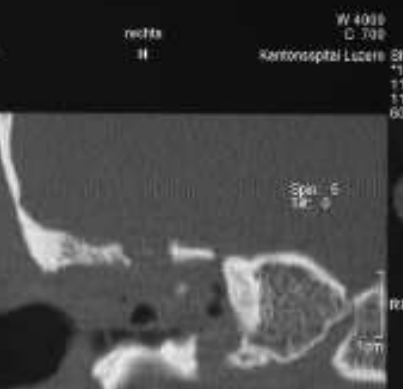
Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 22



Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 23



Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 24



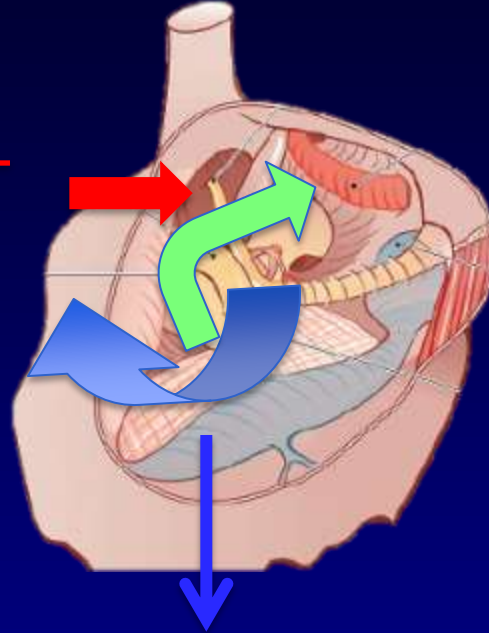
Sharma, Shaibal
12-Mar-1973
11-Oct-2004
11-13-55-22
605 IMA 25



PRIMARY SURGERY FOR SUPRALABYRINTHINE CHOL.



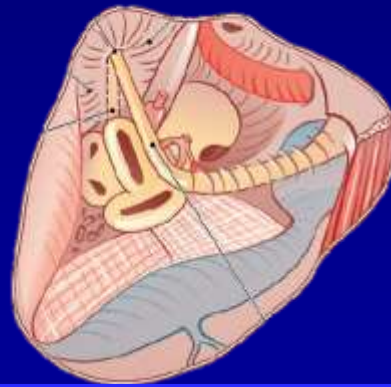
Removal of congenital supralabyrinthine-apical cholesteatomas



limited extension

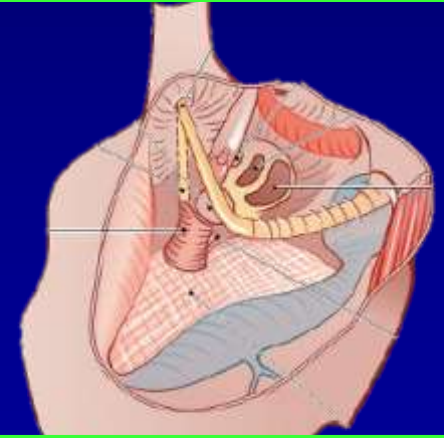


Combined approach
(transtemporal-transmastoid)



Subtotal Petrosectomy
& labyrinth/ transotic

Extension along Carotid/
Petrous Apex



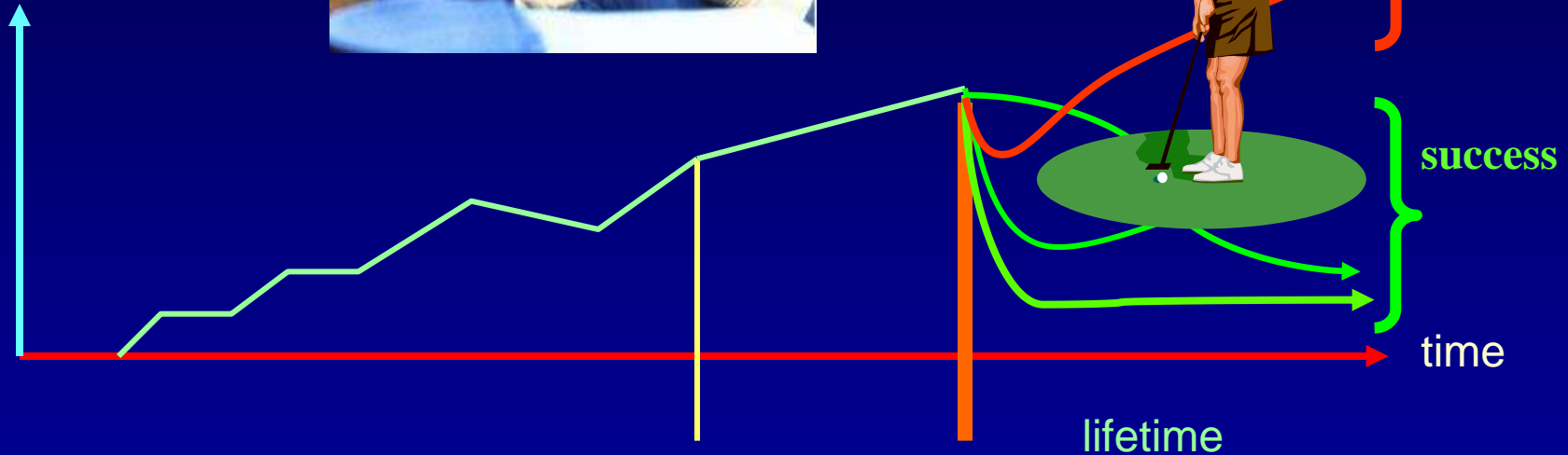
Infratemporal Fossa Type B
& transotic

What do we need to succeed ?



Passion

“Severity of
Disease”



Consultation for
surgery

Surgery

lifetime

Planning

Perfection



Temporal Bone Courses in Zürich/Luzern & Bern & Basel &.....



**Fisch International
Microsurgery Foundation**

Activities

**FIMF
Microsurgical Dissection Courses
2017, Zürich**

Introductory Course in Microsurgery
of the Temporal Bone (Otolaryngology)
February 09 – 10, 2017, Zurich
[>>> more information](#)

Advanced Course in Microsurgery
of the Temporal Bone (Otolaryngology)
The date of the course will be available by September 2016

Course in Microsurgery of the Skull Base
The date of the course will be available by September 2016

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and Divisions](#)
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Activities
2017
2016
2015

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