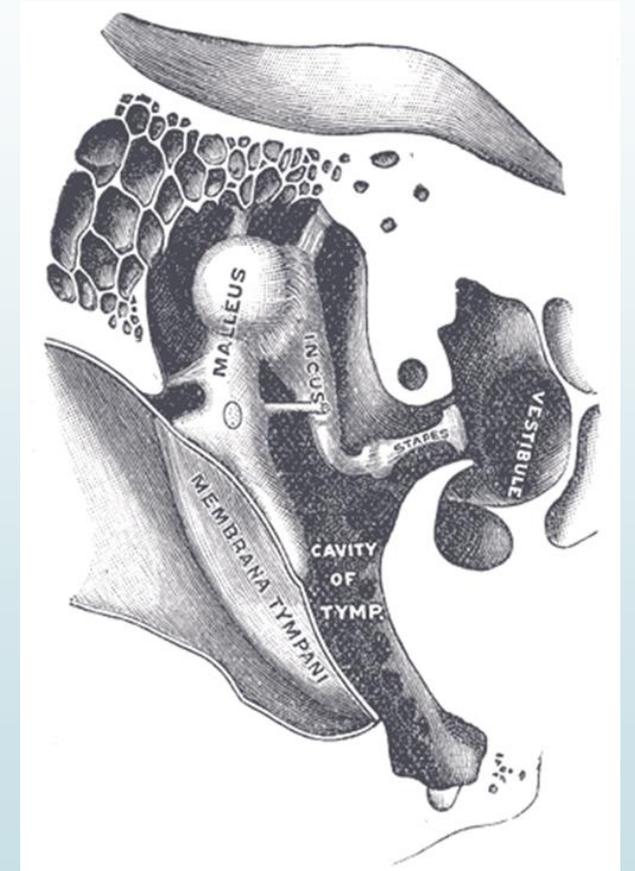
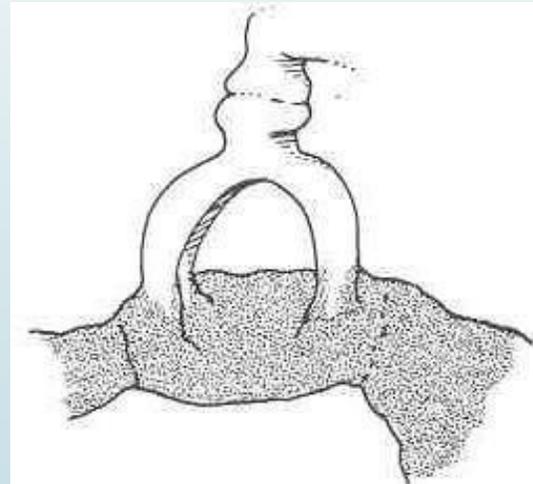
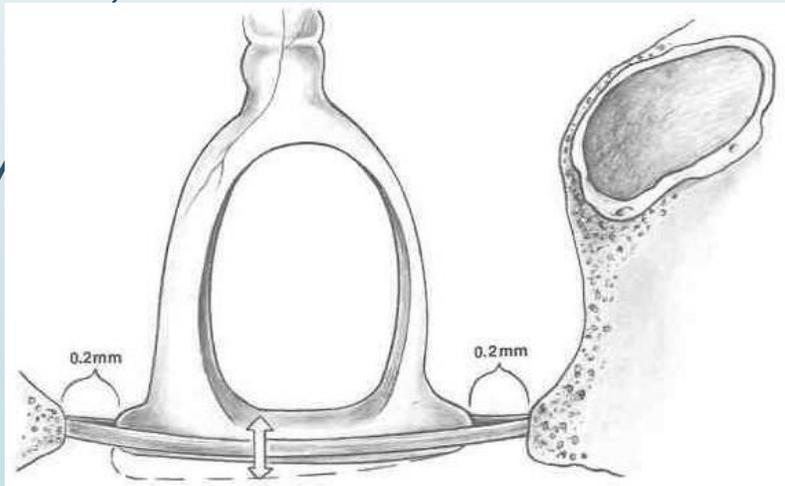
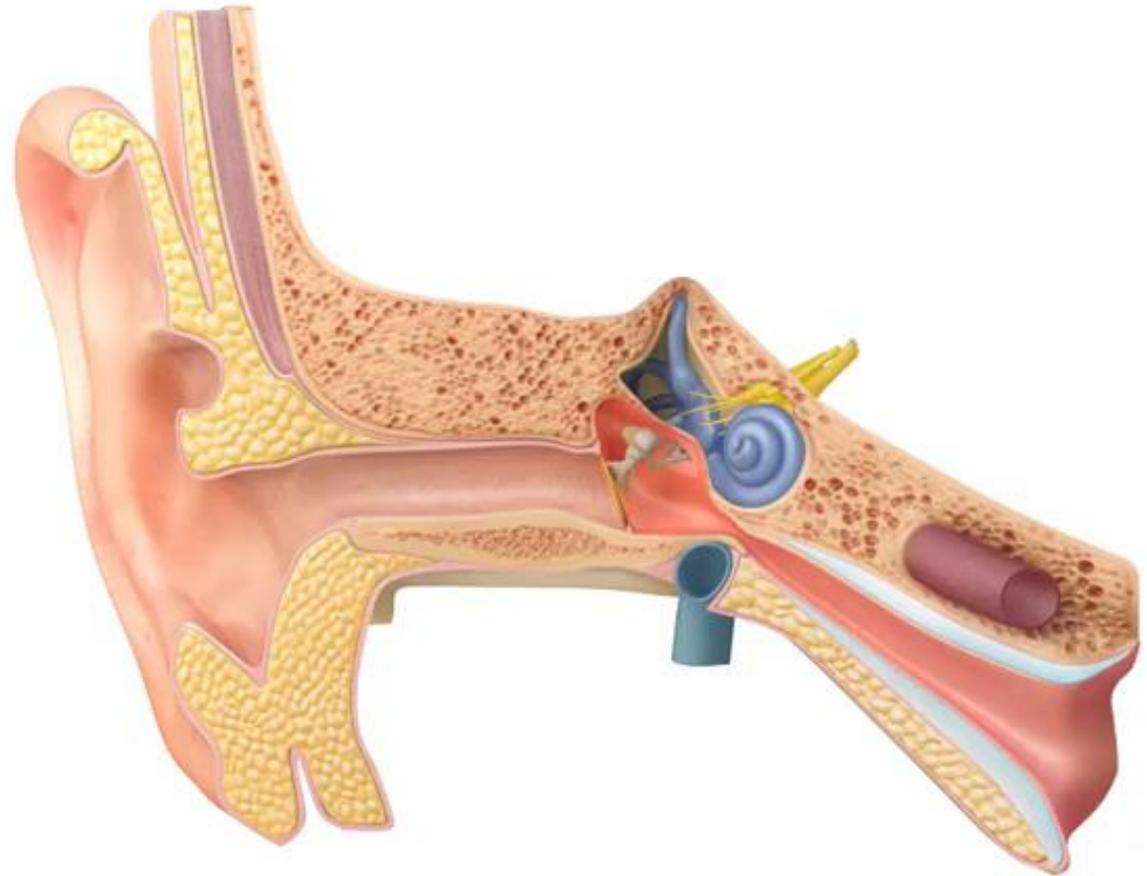


Otosclerosis

► Definition:

Sclerosis of the joints between the ossicles





Pathogenesis:

- Osteolysis followed by new osteogenesis. Unossified bone cause spongy bone (otospongiosis)

Most frequent between stapes footplate and oval window.

- Male: Female → 1:2
- Undergoes progression during pregnancy, suggesting hormonal factor as etiology.
- 50% hereditary, 50% sporadic.

Symptoms

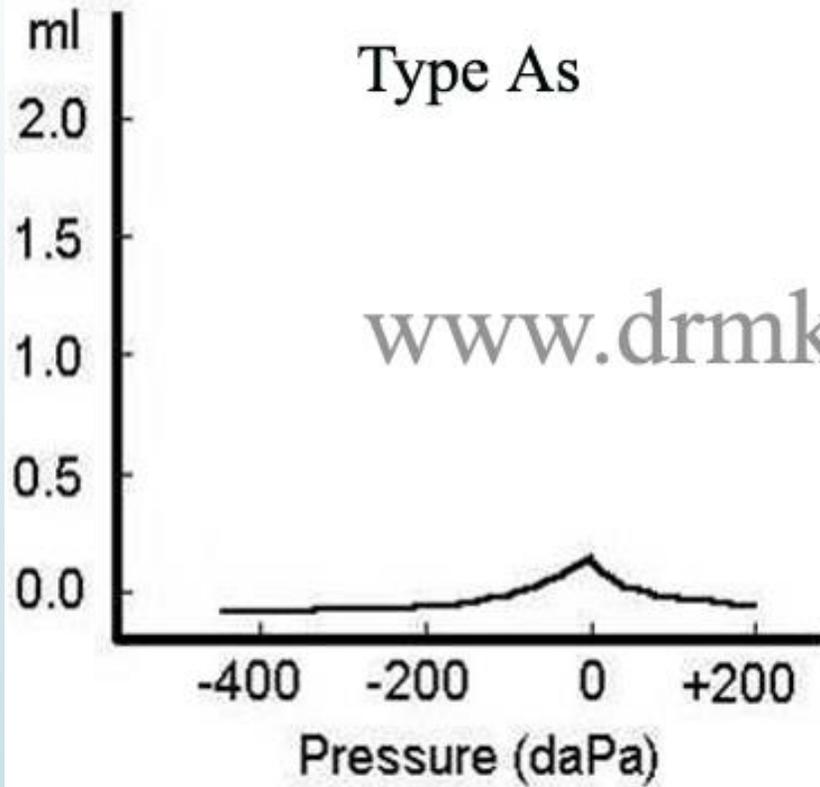
- **Tinnitus**
- **Vertigo and Dizziness**
- **Aural Fullness**
- **Otalgia (ear pain).**
- **Hyperacusis (an abnormal sensitivity to sound).**
- **Usually starts in one ear and then moves to the other. This loss may appear very gradually.**
- **Note:** a patient's audiogram who was diagnosed with otosclerosis always has a notch on 2000 Hz (cahart notch).

Diagnosis

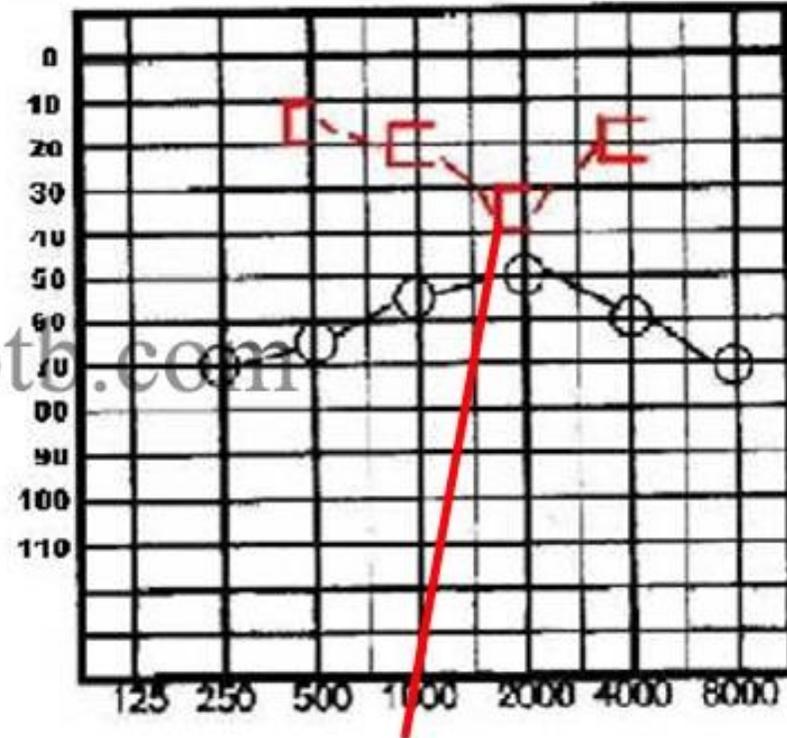
- Diagnosis is usually made by a combination of family history, progressive conductive hearing loss pattern.
- Hearing tests
- Acoustic reflexes may eventually be absent.
- Tympanometry often shows stiffening of the ossicular chain (A,As).
- Dizziness can occur in otosclerosis (in about 15% of patients).
- A CT scan may be the only way to document otosclerosis early in the disease.

- 
- In pure-tone audiometry, this manifests as air-bone gaps on the audiogram (i.e. a difference of more than 10 dB between the air-conduction and bone-conduction thresholds at a given test frequency).
 - the largest increase in bone-conduction threshold (around 15 dB) occurs at 2kHz frequency – the resultant notch is called *Carhart's notch* and is a useful clinical marker for medial ossicular-chain fixation.

Tympanogram



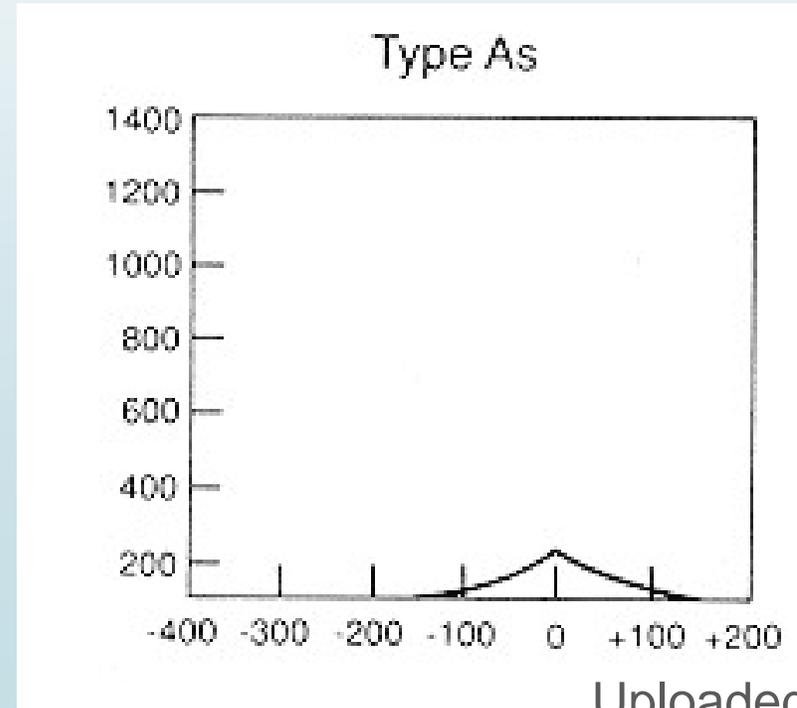
Audiogram



Carhart notch

Audiological investigations in Otosclerosis

- Therefore, otosclerosis may only slightly reduce the admittance, resulting in either a shallow tympanogram (type AS), or a normal tympanogram (type A). Otosclerosis increases in the stiffness of the middle-ear system, raising its resonant frequency.





acoustic reflex

- ▶ Also, a conductive pathology will attenuate the test stimuli, resulting in either elevated reflex thresholds or absent reflexes when the stimulus is presented in the affected ear and measured in the other ear.

Treatment

Treatment for hearing loss resulting from otosclerosis depends in general on the length and severity of the condition :

1. Medicine: sodium fluoride in conjunction with vitamin D is sometimes prescribed by a doctor to help slow the loss of hearing. There is some debate on the effectiveness of this treatment. Often a fluoride treatment will be given in conjunction with another treatment, a hearing aid or as after surgery care instructions.
2. Hormone Inhibition: A less known preventative treatment is to regulate female hormones thought to play a part in the worsening of this condition.

- 
3. Hearing aids: Although hearing aids cannot cure otosclerosis, they can help treat the largest symptom (hearing loss).
 4. Surgery : Surgical operations are widely performed, and it is a relatively simple procedure. Either the part of the stapes with the abnormal bone growth is removed in order to insert a tiny implant (stapedotomy), or the entire stapes bone is replaced by a small prosthesis (stapedectomy). Both surgeries can restore hearing. In many of the cases the symptoms of vertigo and tinnitus will also disappear.

- 
5. Do nothing (conservative approach)
Otosclerosis does not have to be treated. It is usually advisable to have a hearing test repeated once a year (or earlier if hearing worsens).
 6. Cochlear implants : Cochlear implants are used successfully in patients with otosclerosis. Patients with the best preoperative hearing levels are most likely to benefit. Cochlear implants are more difficult to position in otosclerosis due to sclerosis of the inner ear.

Middle ear surgery

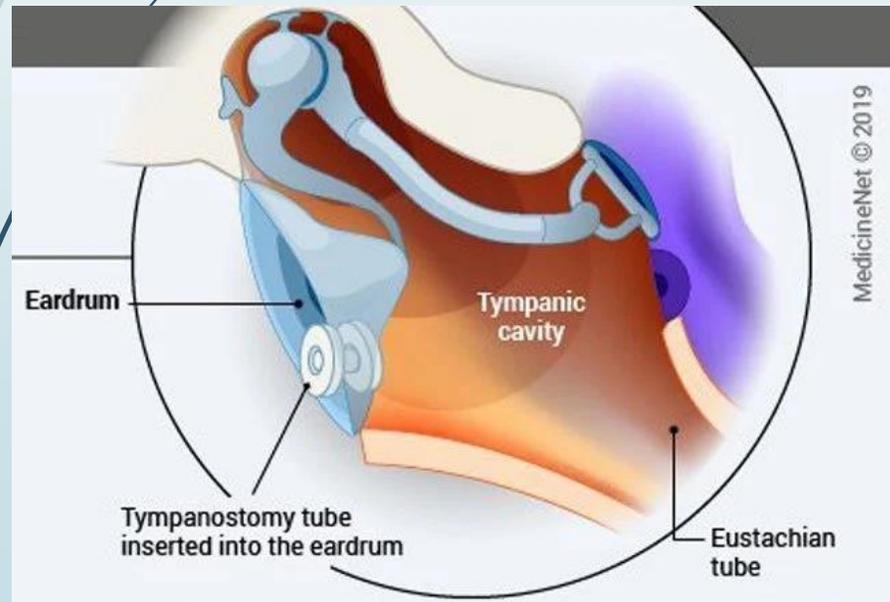
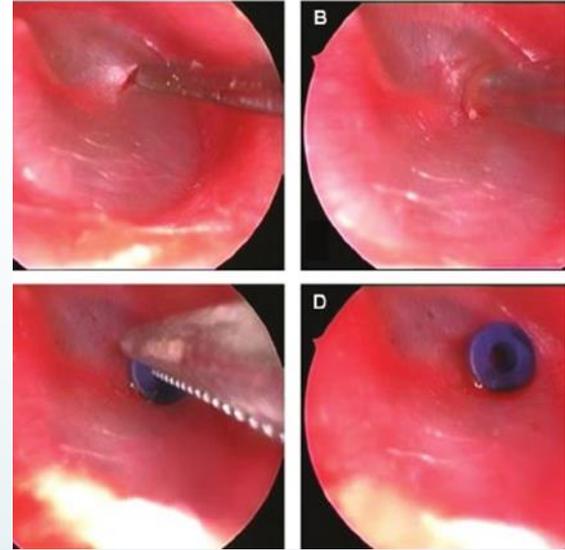
- ▶ **Myringotomy & Grommets (ventilation tubes):**

The most common middle ear surgery.

- ▶ *Myringotomy:*

It is a surgical procedure in which a small incision is made in the eardrum (the tympanic membrane)

- Indications of myringotomy:
1. Secretory OM.
 2. Acute mastoiditis.



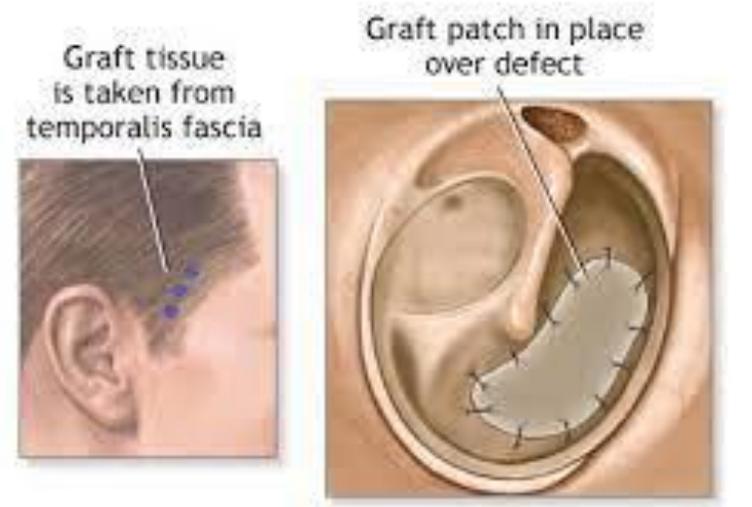
Indications of ventilation tubes

- 1. Secretory OM.
- 2. Recurrent OM, ≥ 3 times/6 months or ≥ 4 times/12 months.
- 3. Acute mastoiditis.
- 4. Retracted tympanic membrane.
- 5. Craniofacial anomalies that predispose to middle ear dysfunction (e.g. cleft Palate, which cause malfunction of the tensor veli palatine muscle).
- 6. Eustachian tube dysfunction.
- 7. Injection of gentamycin to treat vertigo such as in Ménière's disease, as gentamycine is vestibulotoxic.
- 8. Injection of steroids to treat sudden sensorineuronal hearing loss in patients with DM or HTN (can't use systemic steroids).

Tympanoplasty

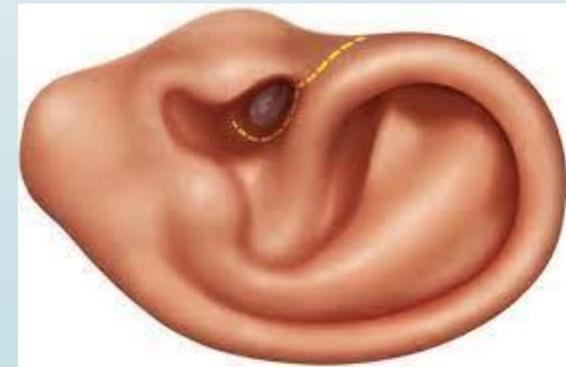
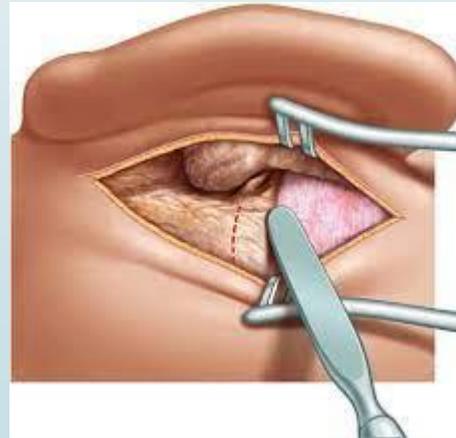
- ▶ ✓ Grafts used : fascia (temporalis fascia; the mostly used), cartilage, perichondrium, periosteum.
- ▶ *** Skin is **NOT** used as graft here because it causes cholesteatoma.

- ▶ ✓ Goals of surgery:
 - ▶ 1. Establish an intact TM.
 - ▶ 2. Eradicate middle ear disease and create an air containing middle ear space.
 - ▶ 3. Restore hearing by building a secure connection between the ear drum and the cochlea.



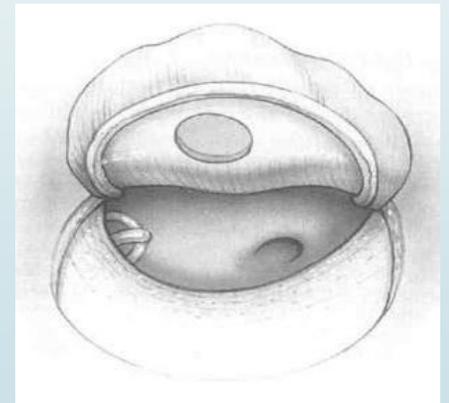
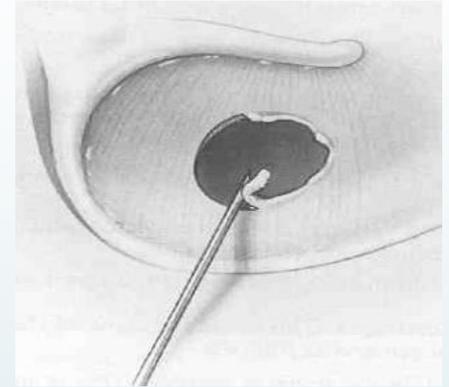
Types of incisions:

- ▶ 1. Retroauricular incision.
- ▶ 2. Endoaural incision.
- ▶ 3. Transmeatal incision: in the external auditory canal, 6 mm from the tympanic membrane. Incision is made from 12 o'clock to 6 o'clock.

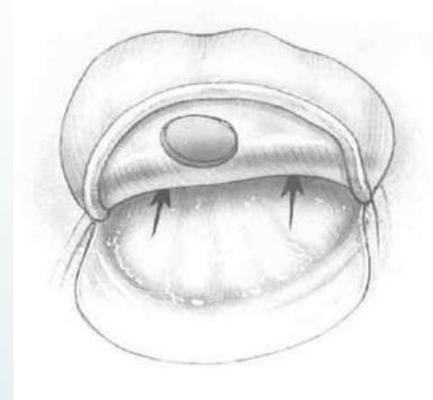


► Refreshment of edges of TM

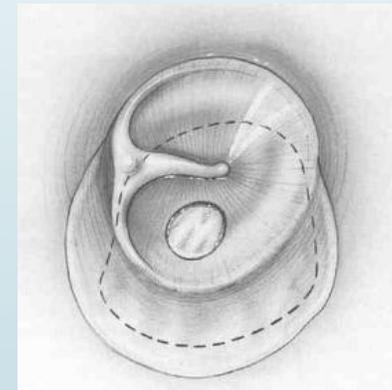
► Elevation of tympanomeatal flap



► Insertion of the graft below the flap



► Repositioning the tympanomeatal flap



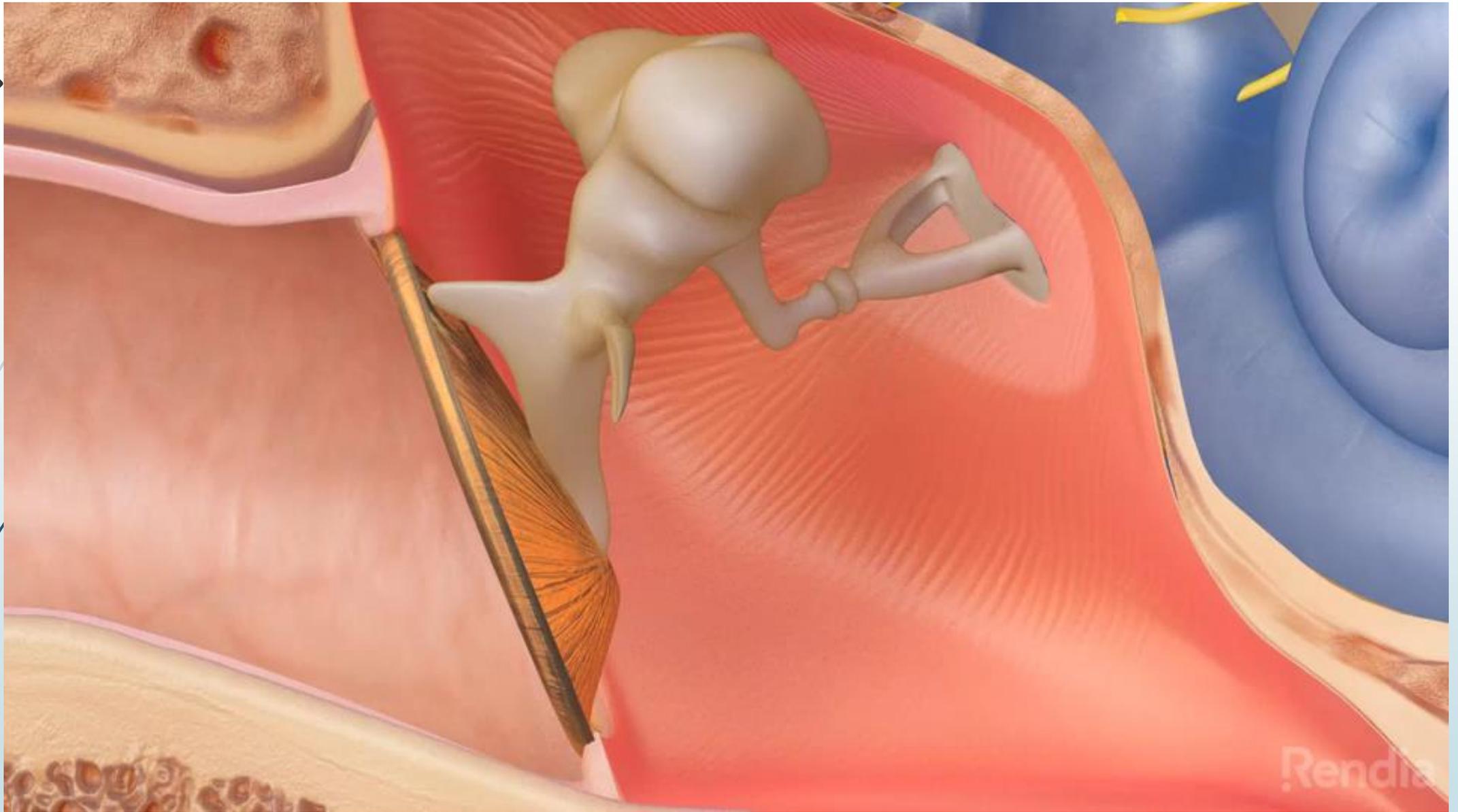
Mastoidectomy

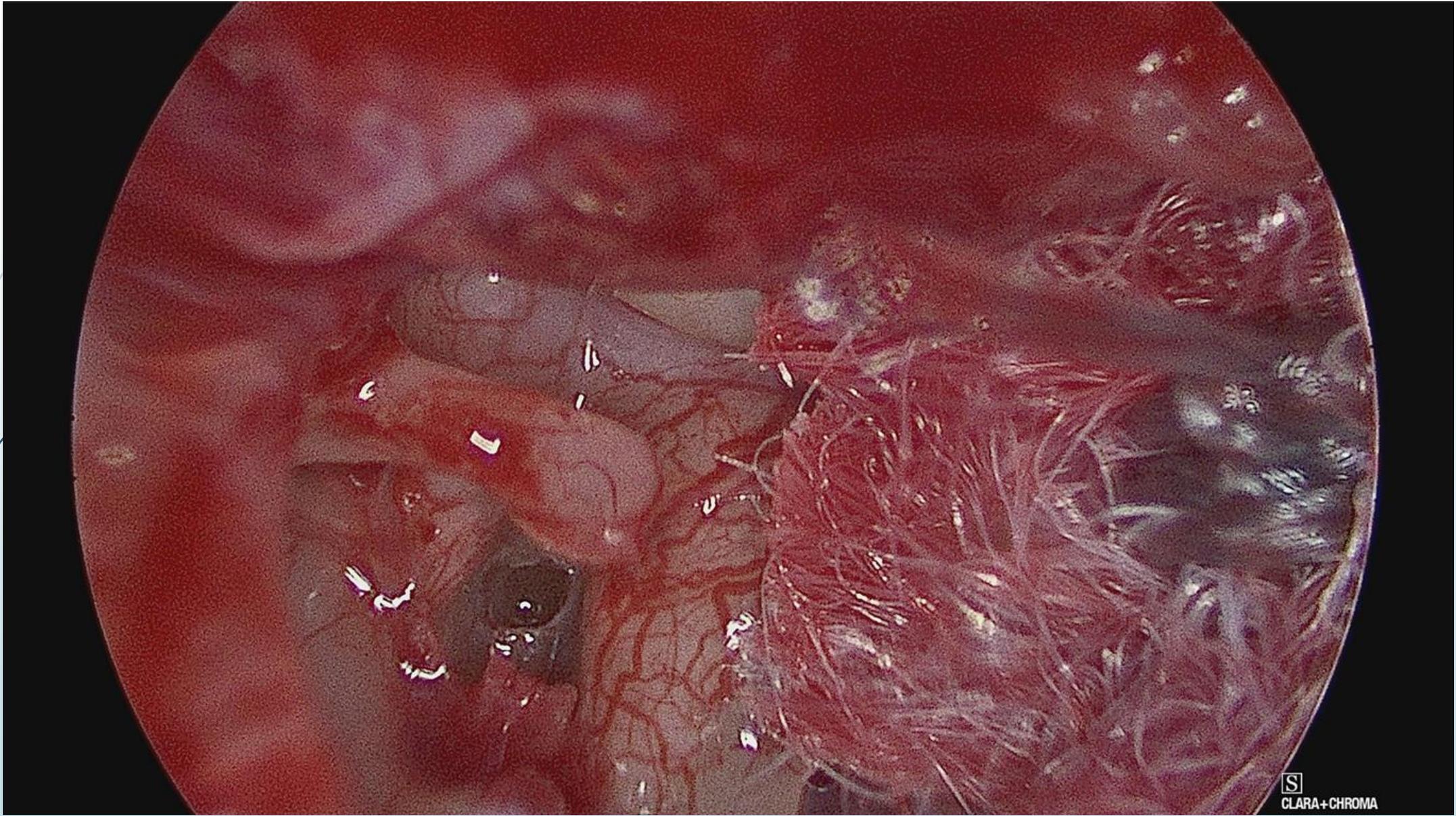
- • Simple mastoidectomy/ Cortical mastoidectomy/ Schwartz mastoidectomy: involves removal of the mastoid air cells only, done for acute mastoiditis.
- • Radical mastoidectomy: involves removal of the mastoid air cells, the TM, the ossicles and chorda tympani.
- • Modified radical mastoidectomy: involves removal of the mastoid air cells with reconstruction of the TM (Tympanoplasty) and preservation of the ossicles.
- • Combined approach tympanomastoidectomy

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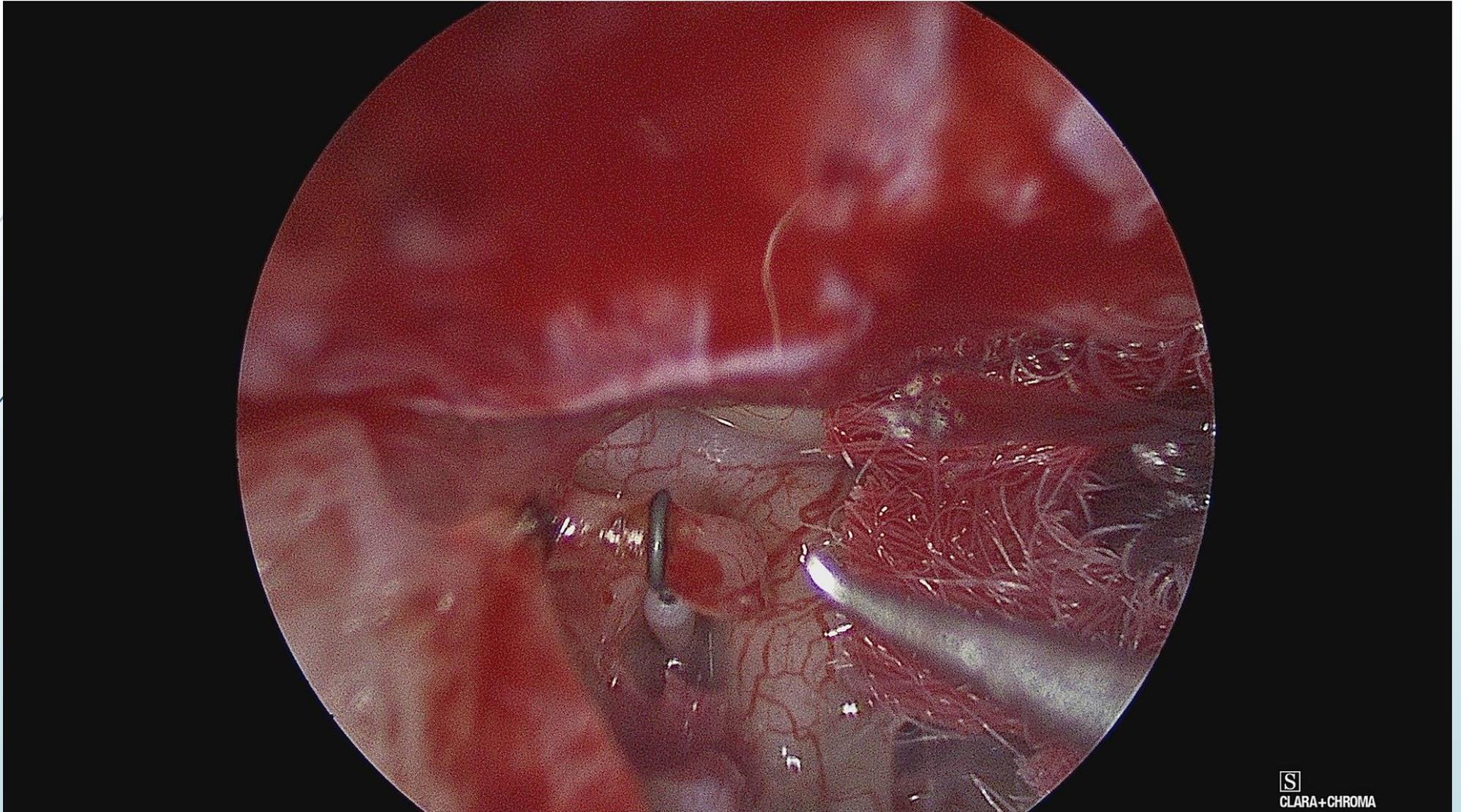
Stapedectomy

- ▶ Involves removal of the anterior and posterior crura of the stapes, replacing it with a
- ▶ prosthesis between the incus and footplate and creating fenestrations in the footplate.





CLARA+CHROMA



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CLARA+CHROMA

Diseases of the inner ear:

► ❖ Vertigo

► Epidemiology

- Dizziness and vertigo are among the most common symptoms causing patients to visit a physician (as common as back pain and headaches).
- The overall incidence of dizziness, vertigo, and imbalance is 5-10%.
- It reaches 40% in patients older than 40 years.

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Onset:

- Sudden onset of vertiginous episodes are often due to inner ear disease, especially if hearing loss, ear pressure, or tinnitus is also present.
- Gradual and ill defined symptoms are common in CNS, cardiac, and systemic diseases.

Time course:

- ▶ Episodic true vertigo that lasts for seconds and is associated with head or body position changes is probably due to benign paroxysmal positional vertigo (BPPV).
- ▶ Vertigo that lasts for hours or days is probably caused by Ménière disease (if associated with hydropic ear symptoms) or vestibular neuronitis (if hydropic ear symptoms are absent).
- ▶ Vertigo of sudden onset that lasts for minutes can be due to brain or vascular disease, especially if cerebrovascular risk factors are present



CNS symptoms:

- ▶ Brainstem characteristics, including diplopia, autonomic symptoms, nausea, dysarthria, dysphagia, or focal weakness.
- ▶ Patients with cerebellar disease are frequently unable to ambulate during acute episodes of vertigo. Patients with peripheral vertigo can usually ambulate during episodes and are consciously aware of their environment.
- ▶ A history of headaches, especially migraine headaches, can be associated with migrainerelated dizziness.

- 
- Previous viral illness, cold sores, or sensory changes in the cervical C2C3 or trigeminal distributions usually indicate vestibular neuronitis or recurrent episodes of Ménière disease.
 - head trauma
 - ear diseases, trauma, or surgery
 - History of prescription medicines, overthecounter medications, herbal medicines, and recreational drugs (including smoking and alcohol) can help to identify pharmacologically induced syndromes
 - DM, HTN, or any cardiovascular or cerebrovascular disease.



Physical examination

- ▶ Supine and standing bloodpressure measurement.
- ▶ Evaluation of the cardiovascular and neurologic systems.
- ▶ Examine the ears for visible infection or inflammation of the external or middle ear. Test hearing and discrimination by using a tuning fork and by whispering and asking the patient to repeat heard words.
- ▶ Examine the neck for range of motion and flexibility.
- ▶ Focused neurologic examination of the cranial nerves, motor and sensory modalities and gait.