INFECTION OF EXTERNAL EAR
ANATOMY

AURICLE
+
EXTERNAL AUDITORY CANAL (EAC)
+
EPITHELIAL SURFACE TYMPANIC MB
Auricle

- Fibroelastic cartilage (except lobule) + perichondrium + keratinizing squamous epithelium
- Formed by ridges or grooves
- Elasticity
- Laterally, the skin is firmly attached to the cartilage
  - Painful when separated
  - Interference with perichondrium perfusion
- Medially, there is more subcutaneous tissue
- **Lobule:** NO cartilage + fatty tissue + fibrous tissue
EAC

- 2.5 cm length
- “S” shape
- Cartilaginous portion + Bony portion

**Isthmus:**
- Between both portions
- Narrowest part of EAC
EAC - Cartilaginous portion

- 1/3 lateral
- Hair follicles + sebaceous/apocrine glands
  - Predisposed to have more infections
  - Cerumen
- >>> thicker
- True subcutaneous layer
- Fissure of Santorini  →  infection spreads
EAC - Bony portion

- 2/3 medial
- Skin >>> thinner
- Epithelium closely adhered to periosteum
  - Easily traumatized!!!
- NO glands/hair follicles or subcutaneous layer
- Continuous with the epithelial layer of **tympanic membrane**
INNERVATION

Auriculotemporal nerve (Trigeminal) V₃

Conchal bowl supplied by VII, IX, X
(Facial nerve, Glossopharyngeal nerve, Vagus nerve)

Greater auricular nerve C₂, C₃
LYMPHATIC DRAINAGE

POSTAURICULAR LYMPHATICS
+ SUPERIOR DEEP CERVICAL NODES

PREAURICULAR LYMPHATICS

INFRAAURICULAR LYMPHATICS
DEFENSE MECHANISM

➢ EAC anatomy:
  - “S” shaped
  - Tragus and antitragus
  - Isthmus

➢ Cerumen
  - Hydrophobic + acid
  - Glandular secretions + epithelium

➢ Hair follicles

➢ Self-cleasing mechanism:
  - Centrifugal migration
  - From TM laterally
  - Joins to glandular secretions to be expelled as cerumen
INFECTIONS

➢ **BACTERIAL**
  - Furuncle
  - Erysipelas
  - Chondritis/Perichondritis
  - Bullous Myringitis
  - Diffuse Otitis Externa
  - Necrotizing Otitis Externa

➢ **VIRAL**
  - Herpes Zoster virus

➢ **FUNGAL**
  - Candida
  - Aspergillus
FURUNCLE

- Hair follicles infection
- Cartilaginous portion of EAC
- *S. aureus*
- Local trauma or contamination
- Localized pain (+ if swelling) + hearing loss (if occlusive abscess)
- Locally warm + topical and systemic antibiotics
- Drainage in case of abscess
ERYSIPELAS

- Acute cellulitis (epidermis + dermis)
- *Streptococcus pyogenes*
- Constitutional symptoms
- Auricle erythema + indurated and elevated plaque
- Well-demarcated spreading area
- Oral penicillin G (high doses)
  - Severe cases: intravenous
Perichondritis/Chondritis

- Perichondrium and/or cartilage inflammation
- Does NOT affect the lobule
- Penetrating trauma (surgical procedures, ear piercing, bites,...)
- *S. aureus, P. aeruginosa*

**Signs/Symptoms:**

1. Painful, erythematous and indurated auricle
2. Fluctuance ➔ Abscess
3. If not correctly treated ➔ “Cauliflower ear”
Perichondritis/Chondritis

Treatment:

- Incision and drainage (Penrose)
- Antibiotics:
  - Moderate: oral and topical
  - Severe: intravenous
- Pain control
Bullous Myringitis

- Infection of the tympanic membrane
- Upper respiratory infection
- Viral, *Mycoplasma pneumoniae*, *H. influenzae*, *S. Pneumoniae*
- Blisters on tympanic membrane
- Serosanguineous otorrhea + sensorineural hearing loss + otitis media
Bullous Myringitis

TREATMENT:
- Pain control
- Topical antibiotic + steroids ear drops (superinfection)
- Oral antibiotic + oral steroids (if hearing loss or otitis media)
Diffuse Otitis Externa (DOE)

- Infection of EAC
- + P. aeruginosa > Proteus mirabilis, S. aureus,...
- Break in the normal skin or cerumen protective barrier

Predisposing factors:
- Traumas
- Water exposure
- Humid climate
- Skin conditions (eczema, psoriasis,...)
- Narrowed canal
DOE - Signs/Symptoms

➢ Severe otalgia + painful auricle manipulation + otorrhea + EAC oedema
➢ Tragal sign +
➢ If the canal is obstructed: fullness + hearing loss
➢ Distinguished 3 phases:
  - Preinflammation
  - Acute inflammation: mild, moderate and severe
  - Chronic inflammation
DOE - Stages

 ➢ PREINFLAMMATION
  - Lipid layer removed
  - Oedema + itching

 ➢ MILD-MODERATE ACUTE INFLAMMATION
  - Invasion of bacteria
  - Mild erythema + minimal EAC oedema + discharge
DOE - Stages

➢ SEVERE ACUTE INFLAMMATION
  - Infection progresses if not adequately treated
  - ↑↑ pain and oedema + purulent otorrhea + obliteration of the EAC lumen
  - Surrounding soft tissues + cervical lymph nodes

➢ CHRONIC INFLAMMATION
  - ↓ pain + ↑ itching
  - Thickening of EAC
  - Auricle changes (eczema, lichenification, ulceration,...)
DOE - Treatment

➢ TREATMENT
- Cleaning of EAC
- Fluoroquinolone topic drops + steroids for 5 days
- Oedematous EAC: antibiotic + steroids impregnated gauze
- Severe cases: oral antibiotics (anti-Pseudomona)
- Avoid water entry

➢ PREVENTION
- Avoid any object or instrument into the canal
- Keep EAC Dry
- Alcohol and vinegar solution to acidify
Necrotizing Otitis Externa (NOE)

- Aggressive infection of EAC, mastoid and skull base
- “An acute external otitis that does not resolve despite medical therapy”
- Predisposing factors:
  - >>DM
  - Immunocompromised
  - Elderly
- *P. aeruginosa* (96-98%) !!! S.aureus, S.epidermis, Proteus mirabilis, Klebsiella oxytoca
- **Fungal MOE:** > *Aspergillus fumigatus* + >> immunocompromised + > aggressive
NOE - Pathophysiology

Predisposing factors + EAC trauma

Ischemic Tissue

Tissue Necrosis  \( \text{P. aeruginosa} \)  Scarce O2 necessity

Proliferation and Propagation
NOE - Signs/Symptoms

- Persistent otalgia
- Purulent otorrhea
- Granulation tissue at the isthmus
- VII + lower cranial nerves
- Severe EAC oedema + lumen obstruction
- Temporomandibular joint dysfunction
NOE - Diagnosis

- Clinical exploration
- Otoscopy
- Bacterial/fungal culture + biopsy
  - Suspicious of malignancy
  - DD: Wegener, severe acute otitis externa, cholesteatoma,...
NOE - Diagnosis

- **CT scan**
  - Bone erosion
  - Poor information about soft tissue
  - Does not distinguish infection vs malignancy

- **MRI**
  - Detects soft tissue changes
  - Evaluates soft tissue extension
  - NOT useful in clinical course follow-up
NOE - Diagnosis

- **Technetium-99m bone scan**
  - Unspecified osteoblastic activity
  - Detects acute and chronic osteomyelitis
  - Poor information about bone structure

- **Gallium-67 scan**
  - Unspecified inflammatory activity (polymorphonucleocytes)
  - Does not distinguish soft tissue from bone
  - To monitor the therapy’s response
NOE - Complications

- Skull base Osteomyelitis
- Cranial nerves palsy
  - VII ➔ Stylomastoid foramen
  - IX + X + XI ➔ Jugular foramen
  - VI, XII
- Optic neuritis
- TMJ osteomyelitis
- Meningitis
- Cerebral abscess
- Septic thrombophlebitis of the sigmoid sinus
NOE - Treatment

- **URGENCY**
- Hospitalization (intravenous treatment)
- Ciprofloxacin/Ceftazidime iv.
- For 8-6 weeks: until Gallium scan becomes negative
- **Fungal NEO** → Voriconazole / Amphotericin B
NOE - Treatment

➢ SURGERY
  - Remove necrotic tissue and replace it with vascularized tissue
  - Mastoidectomy in case of complications
  - Facial nerve decompression

➢ HYPERBARIC OXYGEN
  - Neovascularization
  - Osteoneogenesis
  - Advanced disease with significant skull base or intracranial involvement

➢ DIABETES management!!!!
Herpes Zoster

- Varicella zoster virus
- Virus affecting the external ear
- Sensory ganglion
- Reactivates when immune competence decreases
- Dermatome distribution
**Herpes Zoster - Signs/Symptoms**

- **Otalgia/burning**
- **Vesicular eruption** (Facial nerve sensorial area - Ramsay Hunt)
- **Crust** (when vesicles disrupt)
- **Ramsay Hunt syndrome** $\rightarrow$ VII palsy + vesicular rash
  - 2\textsuperscript{nd} cause of nontraumatic peripheral facial palsy
  - Ramsay Hunt area + anterior 2/3 of the tongue + soft palate
- **Cochlea-Vestibular affection:** tinnitus, sensorial hearing loss, dysacusis, vertigo,...
- **Postherpetic Neuralgia**
Herpes Zoster - Treatment

- Drying agents for vesicles
- Oral valacyclovir + oral corticosteroid
- Parenteral acyclovir in case of severe disease
- Eye care in case of facial palsy
- Gabapentin in case of postherpetic neuralgia
Otomycosis

➢ *Aspergillus, Candida*

➢ Patient with otitis externa treated with a antibiotic and steroid drops for a long time

➢ **SIGNS/SYMPTOMS**
  - Pruritus
  - Otorrhea + conductive hearing loss

➢ **DIAGNOSIS:**
  - Black, grey or white fungal growth on the canal skin

➢ **TREATMENT:**
  - Cleaning
  - Antimycotic (clotrimazole) ear drops
  - Drying agents
Merry Christmas