NOTES
EAR PATHOLOGY

GENERALLY, WHAT IS IT?

PATHOLOGY & CAUSES

- Structural, functional pathology affecting different ear components
- *Outer ear:* auricle, pinna, ear canal
  - Inflammation/infection → otitis externa
- *Outer ear, middle ear:* separated by tympanic membrane (eardrum); normally no air passage/fluids between two compartments
  - Perforated eardrum → communication through tympanic membrane
- *Middle ear:* tiny chamber; contains functional ear bones (malleus, incus, stapes)
  - Inflammatory middle ear disease → otitis media
- *Eustachian tube:* connects middle ear to nasopharynx
  - Failure to open/close, remove secretions → Eustachian tube dysfunction

SIGNS & SYMPTOMS

- Hearing loss
- Ear pain
- Ear discharge

DIAGNOSIS

DIAGNOSTIC IMAGING

- Otoscopy
  - Tympanic membrane visualization

OTHER DIAGNOSTICS

- Outer ear inspection
- Hearing screening tests (Weber, Rinne tests)
  - Distinguishes between conductive, sensorineural hearing loss

TREATMENT

MEDICATIONS

- Topical otic drops/systemic agents
- Antihistamines/corticosteroids/decongestants (guided by specific diagnosis)

SURGERY

- Drain fluid accumulation/debride granulation tissue/repair defect

EUSTACHIAN TUBE DYSFUNCTION

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PATHOLOGY & CAUSES

- Any primary Eustachian tube function failure
- Failure to equalize/dilatory dysfunction
  - Eustachian tube may not open → tympanic membrane stretches → pain

Patulous dysfunction (chronic patency)

- Normal Eustachian tube is two-way valve (opens to equalize pressure, closed at rest)
- Persistent opening → irritant/bacteria entering middle ear

Ciliary dyskinesia

- Tiny cilia line Eustachian tube, clear out middle ear mucus secretion
- *Ciliary dysfunction/dyskinesia:* cilia fail to clear section → stagnant secretion → complications (e.g. otitis media)

CAUSES

Failure to equalize/dilatory dysfunction

- *Functional:* inflammation (viral infection—e.g. common cold, allergy) → Eustachian tube swelling, secretion accumulation → Eustachian tube mechanical blockage → equalization failure
- *Anatomical:* regional mass pressure (e.g. tumour) or previous trauma scar/medical procedure

Patulous dysfunction (chronic patency)

- Weight-loss (> 6 lbs/2.7 kg) → tissue atrophy (e.g. chronic illness)
- Chronic allergy/gastric-content reflux → mucosal atrophy
- Chronic gum-chewing → repeated muscle-facilitated Eustachian tube opening
- Short, floppy Eustachian tubes (in children) → provide little resistance against middle-ear reflux during ↑ positive pressure on nasopharyngeal end of tube (e.g. crying/nose blowing)

Ciliary dyskinesia

- *Acquired:* toxins → ciliary damage, paralysis → mucociliary elevator failure
  - Cilia can't flick back and forth (e.g. cigarette smoke)
- *Congenital:* cystic fibrosis → very thick secretions not adequately cleared

COMPLICATIONS

- Conductive hearing loss, otitis media, tympanic membrane perforation, cholesteatoma

SIGNS & SYMPTOMS

- Affected ear is clogged, muffled
- Ear pain
- Autophony (hearing one's own voice, breathing)
  - Encountered primarily in patulous dysfunction
- If inner ear affected → balance problems

DIAGNOSIS

DIAGNOSTIC IMAGING

CT scan / MRI

- Contrast in persistent effusion cases
  - Neoplasm may cause Eustachian tube obstruction

Nasal endoscopy

- Inflammation, secretion, allergic manifestation signs
  - Eustachian tube opening quality (assessed through yawn, swallowing maneuvers)

Otoscopic ear examination

- Normal tympanic membrane appears shiny, translucent

- Examine for abnormality (e.g. retraction, effusion, perforation)
  - Dull bluish-gray/yellowish coloration denotes effusion behind membrane; reddish coloration, engorged vessels signal inflammation
- Pneumatic examination
  - Fluid-filled ear minimizes tympanic membrane excursion with insufflation

OTHER DIAGNOSTICS

- Hearing tests for conductive hearing loss
  - *Weber test:* sound lateralized to affected ear
  - *Rinne test:* BC > AC

TREATMENT

MEDICATIONS

- Dilatory dysfunction
  - Upper respiratory tract inflammation (viral infection, allergy) → short intranasal/systemic decongestant, corticosteroid course
- Patulous dysfunction
  - Avoid decongestants/corticosteroids

SURGERY

- Dilatory dysfunction
  - *Tympanostomy tubes:* hollow tubes inserted into eardrum → create direct opening between middle, outer ear → allow easy pressure equilibration, accumulated debris drainage

OTHER INTERVENTIONS

- Patulous dysfunction
  - Hydration, nasal saline drops/irrigation

OTITIS EXTERNA

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PATHOLOGY & CAUSES

- AKA "swimmer's ear"
- Outer ear canal irritation

CAUSES

- Outer ear canal microbial infection (primary cause)
  - *Bacterial (90%):* *Pseudomonas aeruginosa*, *Pseudomonas vulgaris*, *E. coli*, *S. aureus*
  - *Fungal:* *Candida albicans*, *Aspergillus niger*
- Dermatological conditions
  - Allergic contact dermatitis, psoriasis, atopic dermatitis

RISK FACTORS

- Frequent swimming
- Mechanical cleaning/irritation (cotton swabs/scratching)
- Ear canal occlusion (hearing aid, headphone)
- Diabetes

SIGNS & SYMPTOMS

- Acute (< six weeks)
  - Pinna traction → aggravated pain
  - *Otorrea:* sticky yellow discharge)
  - Swelling, purulent debris → external canal obstruction → conductive hearing loss, +/- aural fullness
  - Posterior auricular lymphadenopathy

- *Complicated otitis externa:* periauricular soft tissue erythema, swelling
- Chronic (> three months)
  - External ear canal pruritus; epidermis atrophy, scaling; otorrhea; normal tympanic membrane

DIAGNOSIS

LAB RESULTS

- Discharge
  - Gram stain, culture

OTHER DIAGNOSTICS

- Note physical outer ear change (discharge, erythema, scaling)
- Hearing tests for conductive hearing loss
  - *Weber test:* sound lateralized to affected ear
  - *Rinne test:* BC > AC

Figure 73.1 An individual with otitis externa of the left ear.

TREATMENT

MEDICATIONS

- General
  - *Burow's solution:* topical drops application (buffered aluminum sulfate, acetic acid mixture)
- Bacterial
  - Antipseudomonal otic drops/topical steroid drops/combination
  - 3% acetic acid solution → acidify ear canal (bacteriostatic acidic pH)
  - Systemic antibiotics (lymphadenopathy/cellulitis)
- Fungal
  - Topical antifungal preparation (e.g. gentian violet, boric acid)
- Chronic otitis externa (pruritus without obvious infection)
  - Corticosteroid otic drops alone

OTHER INTERVENTIONS

- General
  - Clean ear under magnification → irrigation, suction, dry-swabbing
- Fungal
  - Debridement

OTITIS MEDIA

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PATHOLOGY & CAUSES

- Inflammatory middle ear diseases

TYPES

Acute otitis media

- Acute middle ear compartment infection (< three weeks)
- Acute infection/allergies → nasopharyngeal mucous membrane inflammation → Eustachian tube dysfunction → secretion reflux/aspiration from nasopharynx to middle ear (normally sterile) → infection

Otitis media with effusion

- Fluid presence in middle ear, with/without infection signs
- Eustachian tube dysfunction → trapped fixed gas volume in middle ear → surrounding tissue slowly absorbs gas → ↓ middle-ear pressure
  - Sufficient ↓ middle-ear pressure → surrounding tissue fluid drawn into middle ear cavity → middle-ear effusion (transudate)
- Most common pediatric hearing loss cause

Chronic suppurative otitis media

- Acute otitis media complication → chronic suppurative otitis media
- Perforated tympanic membrane with persistent drainage (> 6–12 weeks)
- Acute otitis media → prolonged inflammatory response → middle ear mucosal oedema; tympanic membrane ulceration, perforation → chronic middle ear, mastoid cavity inflammation → persistent discharge from middle ear through perforated tympanic membrane
- Persistent infection/inflammation → granulation tissue → polyps within middle-ear space → inflammation, ulceration, infection, granulation tissue formation cycle → eventual surrounding bony structure destruction

CAUSES

- Bacteria
  - *S. pneumoniae*, *H. influenzae*, *M. catarrhalis*, group A streptococcus, *S. aureus*)
- Virus
  - Respiratory syncytial virus, influenza, parainfluenza, adenovirus)
  - Often viral/bacterial coinfection

RISK FACTORS

- Smoke, air-pollution exposure
- Immunosuppression
- Pacifier use; daycare
- Down syndrome
- Recent upper-respiratory tract viral infection
- Craniofacial malformation (cleft lip/palate, microcephaly)
- Cystic fibrosis

Figure 73.2 A tympanic mebrane bulging as due to the accumulation of pus in the middle ear of an individual with otitis media.

COMPLICATIONS

- Tympanic membrane perforation, mastoiditis, cholesteatoma, bacterial meningitis, dural sinus thrombosis, conductive/sensorineural hearing loss

SIGNS & SYMPTOMS

- Acute otitis media
  - Otalgia, fever, conductive hearing loss (triad)
  - *Children:* ear pulling, crying, poor sleep, irritability
  - Crying → small blood vessel distension on tympanic membrane → mimics otitis media redness (confounds diagnosis)
- Otitis media with effusion
  - Ear fullness, conductive hearing loss +/- tinnitus, no pain/fever
- Chronic suppurative otitis media
  - Perforated tympanic membrane; otorrhea; hearing loss; no pain/discomfort; fever, vertigo, pain → danger signs (possible complications)

DIAGNOSIS

DIAGNOSTIC IMAGING

CT scan/MRI

- Acute otitis media
  - Severe cases with hearing loss/high fever)
  - Excludes more serious complications (e.g. bony destruction/meningitis)

Otoscopy

- Acute otitis media
  - Tympanic membrane ↓ mobility, hyperemia, bulging membrane (pus behind tympanic membrane), landmark loss (malleus handle, long process not visible)
- Otitis media with effusion
  - Amber/dull grey tympanic membrane discoloration; meniscus fluid level ↑ ↓, air bubbles behind tympanic membrane; air insufflation → immobile tympanic membrane
- Chronic suppurative otitis media
  - Perforated tympanic membrane; otorrhea; visible granulation tissue (medial canal/middle-ear space); middle ear mucosa (through perforation) may be edematous, polypoid, pale, erythematous

OTHER DIAGNOSTICS

Otitis media with effusion

- Hearing tests for conductive hearing loss
  - *Weber test:* sound lateralized to affected ear
  - *Rinne test:* BC > AC
- Audiological investigation
  - Flat audiogram, tympanogram

TREATMENT

MEDICATIONS

- Acute otitis media
  - Analgesics
  - Systemic antibiotics if severe/persistent (> three days)
- Otitis media with effusion
  - Avoid antihistamines, decongestants → secretions thicken
- Chronic suppurative otitis media
  - Corticosteroid drops → ↓ granulation tissue
  - Antibiotics (topical/drops)
  - *Granulation tissue control:* granulation tissue prevents affected-site topical medication penetration

SURGERY

- Acute otitis media
  - *Frequent recurrence:* tympanostomy tubes
- Otitis media with effusion
  - *Severe cases:* tympanostomy tubes, myringotomy (tiny eardrum incision) +/- ventilating-tube insertion

OTHER INTERVENTIONS

- Otitis media with effusion
  - *Watchful waiting:* 90% of children clear fluid in three months without intervention
  - *Minor cases:* may resolve spontaneously; manual autoinflation (manually pinch nasal passage, close back of pharynx → forceful diaphragm contraction)
- Chronic suppurative otitis media
  - *Mechanical/irrigative debris clearing:* aural toilet (mechanical removal of mucoid exudates, desquamated epithelium, associated debris prior to medication administration); aural irrigation (50% acetic acid/sterile water ear-rinse solution)

PERFORATED EARDRUM

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PATHOLOGY & CAUSES

- Tympanic membrane communication between middle ear, external environment

CAUSES

- Otitis media
- Trauma
- Explosive/percussive force, exceptionally loud noise
- Iatrogenic, sudden pressure ↑ ↓ (with blocked Eustachian tubes)

COMPLICATIONS

- Chronic infection → permanent hearing loss

SIGNS & SYMPTOMS

- Hearing loss
- Tinnitus
- Ear-ache (infection association)
- Otorrhea
- Nausea/vomiting

DIAGNOSIS

DIAGNOSTIC IMAGING

Otoscopy

- Perforation visualization

OTHER DIAGNOSTICS

- Hearing tests: conductive hearing loss
  - *Weber test:* sound lateralized to affected ear
  - *Rinne test:* BC > AC
- Audiometry: conductive hearing loss

TREATMENT

MEDICATIONS

- Avoid otic drops containing gentamicin, neomycin sulfate, tobramycin
  - Ototoxicity → permanent hearing loss
- Otorrhea control
  - *Topical:* fluoroquinolone otic drops
  - *Systemic:* antibiotics covering respiratory flora

SURGERY

- *Tympanoplasty:* surgical repair

OTHER INTERVENTIONS

- Watchful waiting
  - Perforations may heal in weeks/months

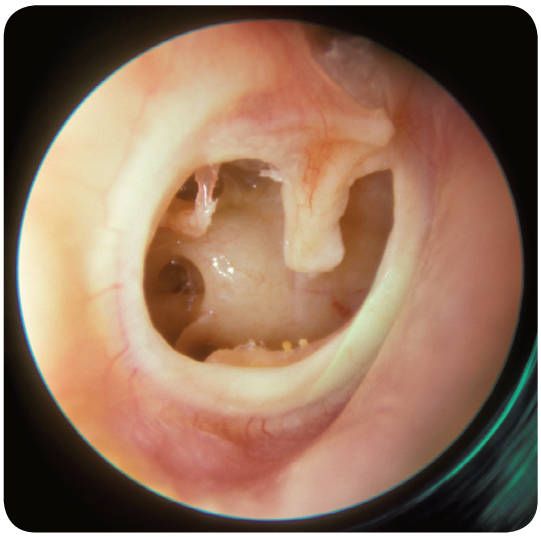

Figure 73.3 A partial perforation of the ear drum.