CLINICAL PRACTICE GUIDELINE: Emergency Department

Traumatic Tympanic Membrane Perforation

Description:

Perforation of tympanic membrane (TM) due to a direct or indirect trauma

Red Flags:

- Exclude significant head injury, including skull base fracture. If suspected, transfer patient to general emergency with trauma centre, e.g. Alfred Hospital, Royal Melbourne Hospital.
- Facial nerve palsy suggests transverse fracture of the temporal bone
- Sensorineural hearing loss (SNHL): if tuning fork tests suggest associated SNHL, the patient should have senior ENT input immediately
- Perilymph fistula (PLF) is a surgical emergency: if there is a suspicion of PLF, ENT opinion should be sought immediately. Characteristics to suggest the diagnosis can include:
    - SNHL (mild to profound or fluctuating hearing loss)
    - Tullio's phenomenon (sound induced vertigo/dizziness, nausea and/or nystagmus)
    - Vestibular symptoms (rotational vertigo, light headedness, dysequilibrium, motion intolerance)
    - Positive fistula test (Hennebert's sign: pneumatoscopy induces nystagmus or dizziness). Note: fistula test has low sensitivity so negative test does not preclude diagnosis
- Posterior perforation may indicate ossicular chain involvement

How to Assess:

History:

- Object entering the ear canal, (e.g., cotton swabs, plant spikes, twigs)
- Blast injury by an explosion
- Blunt force trauma, (e.g., open-handed slap across the ear)
- Head trauma (with or without skull base fracture)
- Barotrauma (e.g., during air travel or scuba diving)
- Iatrogenic perforation during irrigation, foreign body removal or strong suction applied to the ear canal

Examination:

- Document Glasgow Coma Scale (GCS) where indicated
- Perform otoscopy to assess tympanic membrane perforation (TMP)
    - Assess TMP location (posterior and superior perforations are more likely to be complicated by trauma to middle or inner ear structures)
    - Grade size of TMP (rule of quadrants: Grade 1 = loss of 1 TM quadrant → Grade 4 = total loss of TM)
    - If TMP is not certain, assess under microscope
    - Perform pneumatic otoscopy to assess the TM movement
- Perform tuning fork tests (repeat if equivocal)
- Assess for and exclude PLF (see red flags above)
- Document cranial nerve examination

Investigations:

- Audiology testing:
    - Perform urgently if features of SNHL or equivocal tuning fork tests, any clinical suspicion of PLF, single hearing ear, posterior-superior TMP, assault or iatrogenic injury, e.g., syringing
    - Maximal conductive hearing loss (patient unable to hear finger rubbing test, posterior-superior TMP) should raise concern of ossicular chain dislocation/trauma
    - Request in 1/52 if simple, central perforation
- Imaging: confirmed SNHL on audiogram and clinical suspicion of PLF warrants urgent thin-slice CT temporal bones (requires discussion with ENT consultant).

Acute Management:

- Give instructions to keep ear dry
- If simple central perforation, no specific treatment is needed
- If in case of dirty injury, Ciprofloxacin 0.3% ear drops 5 drops BD (until middle ear is discharge free for 3 days)
- If discharge suspect middle ear infection, require MCS and micro-suction then Ciprofloxacin 0.3% ear drops 5 drops BD, as well as Amoxicillin (15mg/kg) up to 500mg orally 8 hourly for 5 days
- If no response to amoxicillin within 48-72 hrs (suspect *Haemophilus influenzae* or *Moraxalla catarralis)* add clavulanate: Amoxicillin+Clavulanate 22.5+3.2mg/kg up to 875+125mg orally 12 hourly for 5 to 7 days
- If **delayed non-severe** penicillin allergy, Cefuroxime 15mg/kg up to 500mg 12 hourly for 5 days.
- If **immediate (severe or non-severe)** or **delayed (severe)** penicillin allergy, Trimethoprim+Sulfamethoxazole 4+20mg/kg up to 160/800mg orally 12 hourly for 5 days
- In case of PLF, patient should be admitted for management, which may include exploratory tympanotomy and fistula repair
- Patients with posterior perforation or equivocal features of PLF but reassuring conductive hearing loss (CHL) on tuning forks may be admitted for observation and audiogram and to ensure there is no symptom progression
- For SNHL with TMP treat with high dose weaning regimen oral prednisolone as per SSNHL Clinical Practice Guideline.

Follow up:

- Most patients with uncomplicated TMP (anterior inferior, small) with CHL would be followed up within 1/52 with an audiogram in AENT
- Although most perforations close spontaneously, surgery may be indicated for a perforation which persists longer than 4 months in adults and 6 months in children
- Persistent CHL suggests disruption of the ossicular chain, possibly requiring surgical exploration and repair. Refer to Otology Clinic in 2 months.

Evidence Table

Author(s)	Title	Source	Level of Evidence (I – VII)
Neuenschwander MC, Deutsch ES, Cornetta A, Willcox TO.	Penetrating middle ear trauma: a report of 2 cases.	Ear Nose Throat J. 2005;84(1):32.	IV
Kim SH, Kazahaya K, Handler SD.	Traumatic perilymphatic fistulas in children: etiology, diagnosis and management.	Int J Pediatr Otorhinolaryngol. 2001;60(2):147.	IV
Maitland CG.	Perilymphatic fistula	Curr Neurol Neurosci Rep. 2001;1(5):486.	V
Minor LB.	Labyrinthine fistulae: pathobiology and management.	Curr Opin Otolaryngol Head Neck Surg. 2003;11(5):340	V
Ludman H, Bradley PJ (eds)	ABC of Ear Nose and Throat, 6th edn.	Blackwell Publishing Ltd. 2013	V

The Hierarchy of Evidence

The Hierarchy of evidence is based on summaries from the National Health and Medical Research Council (2009), the Oxford Centre for Evidence-based Medicine Levels of Evidence (2011) and Melynk and Fineout-Overholt (2011).

I) Evidence obtained from a systematic review of all relevant randomised control trials.

II) Evidence obtained from at least one well designed randomised control trial.

III) Evidence obtained from well-designed controlled trials without randomisation.

IV) Evidence obtained from well-designed cohort studies, case control studies, interrupted time series with a control group, historically controlled studies, interrupted time series without a control group or with case series.

V) Evidence obtained from systematic reviews of descriptive and qualitative studies.

VI) Evidence obtained from single descriptive and qualitative studies.

VII) Expert opinion from clinician, authorities and/or reports of expert committees or based on physiology.

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