

# **CHRONIC SUPPURATIVE OTITIS MEDIA**

## **Background**

### 1. Definition

- Chronic infection of the middle ear-cleft,
- A non-intact tympanic membrane
- Discharge (otorrhea) for at least the preceding two weeks
  - Chronic tympanic membrane perforation may develop after:
    - acute perforation fails to heal,
    - following resolution of chronic suppurative otitis media
    - during the course of chronic otitis media with effusion with intact membrane and fluid behind the middle ear

### 2. Clinical hallmark

- Purulent aural discharge (continuous or intermittent)

## **Pathophysiology**

### 1. Pathology

- Inflammation of Eustachian tube or sinuses secondary to allergic rhinitis, viral upper airway infections or blockage of Eustachian tube by swollen adenoids
- Occurs with continuing negative pressure within the middle ear:
  - Effusion becomes "trapped" in middle ear due to anatomy,
  - Impairment of both the mucociliary system<sup>1</sup>, and
  - Pumping action of tubal opening and closing
- Chronic tympanic membrane perforation may develop after acute perforation fails to heal, resolution of active chronic suppurative otitis media or during the course of chronic otitis media with effusion<sup>3</sup>
- Chronic suppurative otitis media occurs when acute drainage through non-intact tympanic membrane persists for 2 weeks to 3 months or longer
- Re-infection may occur by reflux of nasopharyngeal secretions into Eustachian tube.
- With chronic perforation, organisms may enter middle ear directly from external ear canal resulting in secondary infection, chronic otorrhea and chronic osteitis of the middle-ear cleft.
- May also occur through bathing and swimming
- Chronic erosion of ossicles and walls of the middle and inner ear may lead to loss of hearing, imbalance or facial weakness<sup>3</sup>
- Bacteriology is differentiated from acute otitis media, which is dominated by respiratory organisms. Chronic suppurative otitis media is characterized by aerobes and anaerobes (that gain access through a perforation)<sup>7</sup>, such as:
  - P. Aeruginosa
  - S. Pneumonia
  - Proteus spp
  - S. Aureus
  - Mixed anaerobic infections

### 2. Incidence, Prevalence

- Worldwide of chronic otitis media prevalence ranges from 1 - 46% in disadvantaged populations of developing and developed countries<sup>7</sup>

- Declining incidence from widespread antibiotic use for acute otitis media and routine vaccinations
- Most cases of otitis are acute otitis media or otitis media with effusion
- 3. Risk Factors
  - Craniofacial abnormalities including cleft palate
  - Chronic sinusitis or allergic rhinitis<sup>6</sup>
  - Poverty a major risk factor in developing countries and in certain neglected populations: (young age; overcrowded populations; inadequate housing; poor hygiene; lack of breastfeeding; poor nutrition; and, exposure to cigarette smoke and smoke from burning wood).
  - High rates of naso-pharyngeal colonization with potentially pathogenic bacteria, eustachian tube dysfunction and inadequate or unavailable health care
- 4. Morbidity/Mortality
  - Rare mortality but significant morbidity includes:
    - Hearing loss
    - Facial paralysis
    - Imbalance
    - Effects on social development and educational progress

## **Diagnostics**

1. History<sup>7</sup>
  - Usually chronic, long term infection that develops over months to years
  - Much less severe symptoms than an acute ear infection
  - Typically goes unnoticed and untreated for extended period
  - Patients typically deny pain or discomfort
  - Most common presenting symptom is hearing loss of the affected ear
  - Symptoms may be continuous or intermittent
  - May occur in one or both ears
  - Presenting symptoms may include the following:
    - Ear drainage may be purulent
    - Persistent blockage or feeling of pressure and fullness in ear
    - Vertigo / balance problems
    - Fever
    - Facial weakness
    - Drainage or swelling behind the ear
    - Confusion, increased fussiness or increased sleepiness
  - Concerns for intracranial or intra-temporal complications if reports of fever, vertigo and deep ear pain with headache
  - History of persistent chronic suppurative otitis media after appropriate medical treatment should raise suspicion for possible cholesteatoma<sup>1, 4, 5</sup>
2. Physical Exam
  - Otoscopy<sup>7</sup>
    - Pain is uncommon except during acute exacerbations
    - External auditory canal may or may not be edematous
    - Tympanic membrane may be dull, erythematous, bulging, retracted or perforated

- May have middle ear effusion with fluid and air bubbles behind the tympanic membrane
    - Not uncommon to see perforated ear drums with otorrhea from behind the tympanic membrane. The otorrhea can vary from fetid, purulent and cheese-like to clear or serous
    - Mucosa of middle ear visualized through perforation may be edematous, polypoid, pale or erythematous.
    - Ossicles may become eroded
  - Weber / Rinne Test: To distinguish type of hearing loss (conductive, sensorineural or mixed)
  - Post-auricular swelling/tenderness :Pathognomonic for subperiosteal abscess
- 3. Other Clinical Features
  - Depend upon the extent of local destruction and infection:
    - Nystagmus
    - Facial nerve paralysis
    - Meningeal signs
    - Cerebellar signs
    - Inner ear / labyrinthine signs
    - Cholesteatoma
    - Labyrinthine Fistula
    - Petrositis
    - Mastoiditis
    - Rare intracranial infections: Meningitis , epidural abscesses, temporal lobe abscess, cerebellar abscess, lateral sinus thrombosis, subdural empyema, and otitic hydrocephalus
    - Brain hernia or cerebrospinal fluid leakage
- 4. Diagnostic Testing
  - Cultures are not necessary before starting systemic treatment; if topical therapy fails, or drug resistance is suspected, then consider culture (SOR: C)<sup>7</sup>
  - Lab work needed if there is a suspicion of meningitis / sepsis:
    - CBC
    - CRP
    - BMP
    - Blood cultures (if indicated)
  - Rinne and Weber
  - Skull X-Ray or high resolution CT or MRI of the head or mastoids may show extension of the infection beyond the middle ear (SOR: B)<sup>3</sup>

### **Prevention**

1. Most chronic cases of otitis media are a progression of an untreated or undiagnosed acute infection. Prompt treatment necessary once infection is suspected.
2. Need follow-up exam after otitis media treatment to ensure complete resolution and cure.
3. HiB, Strep and Influenza immunizations may reduce risk of initial or recurrent infection; however, this is not proven fact.

## Differential Diagnosis

1. Myringitis
2. Otitis externa
3. Mastoiditis
4. Cholesteatoma
5. Otorrhea caused by a foreign body in the canal
6. Facial paralysis
7. Labyrinthitis
8. Subperiosteal abscess
9. Meningitis
10. Brain abscess
11. Extradural abscesses
12. Dural venous sinus thrombophlebitis
13. Petrous apicitis (Gardenigo's syndrome)

## Medical treatment

### Are topical antibiotics better than systemic antibiotics?

1. Cochrane review found that topical antibiotics were more effective than systemic antibiotics in resolving otorrhea and eradicating middle ear bacteria. (SOR: A)<sup>8</sup>
2. Topical antibiotic concentration reaches 100-1000 times that which can be achieved using systemic administration.
3. Because of the high concentrations of antimicrobial agents in the middle ear, topical therapy is more likely to be effective than systemic therapy. (SOR: A)<sup>2, 8</sup>
4. For successful topical therapy, need 3 important components :
  - Selection of an **appropriate antibiotic** drop based upon common micro-organisms,
  - Regular **aggressive aural toilet**,
  - Control of **granulation tissue**.
  - **Antibiotic**
    - Should have spectrum of activity that includes gram-negative organisms, especially pseudomonas, and gram-positive organisms, especially *S aureus*. Antibiotics that meet this criterion are aminoglycosides and fluoroquinolones. (SOR: B)<sup>2</sup>
    - All aminoglycosides (Gentamycin, Tobramycin, and Neomycin) have significant potential vestibular or cochlear toxicity.
    - Audiograms should be performed to assess type and extent of any hearing impairment.
  - **Aural toilet helps**
    - Removing mucoid exudates, desquamated epithelium aids in better penetration of topical preparations. (SOR: C)<sup>2</sup>
    - From Cochrane review, aural toilet combined with antimicrobial treatment appears to be more effective than aural toilet alone. (SOR: A)<sup>9</sup>
    - Aural toilet best performed 2 to 3 times/day by irrigating ear with cleaning solutions (half-strength povidone-iodine, 50% hydrogen peroxide, saline solution, half strength vinegar).

- Alternate compression and release of rubber bulb to instill and suck back solution could mechanically dislodge mucus and debris from the middle ear.
- This is repeated until the return is clear; dry mop the ear with cotton wool wisps.
- **Granulation tissue**
  - Prevents topically applied antimicrobials from penetrating site of infection.
  - **Ottopicals with steroids superior to steroid-free ottopicals in reducing granulation tissue** at days 11 and 18 of treatment in several studies because of anti-inflammatory effects. (SOR: C)<sup>2</sup>
  - **Cautery** reduces the amount of granulation tissue. Either micro bipolar cautery or chemical cautery can be used (chemical cautery more common).
  - Silver nitrate can be applied as silver nitrate sticks.
  - Caution: depth of chemical burn induced by application of chemical agents is uncontrolled

#### **Are topical quinolones better than topical non-quinolones?**

1. Cochrane review: topical fluoroquinolones (ofloxacin or ciprofloxacin) appear to be more effective than other types of topical antibiotics<sup>9</sup>

#### **Treatment Failures**

1. Topical antimicrobial therapy failures almost always failures of delivery (patient not using, obstruction, cannot reach infected tissues, etc)
2. Emergence of resistance to topical therapy extremely uncommon.
3. Rapid kill rates and high concentrations of topically administered drops prevent survival of strains with higher minimum inhibitory concentrations.
4. Culture and sensitivity of little benefit with topical therapy
5. When topical therapy fails, patient requires thorough evaluation for anatomic obstruction including microscopic examination and radiologic studies as indicated
6. Various elements may obstruct medication delivery including infectious debris, granulation tissue, cholesteatoma, neoplasia, cerumen, and others

#### **Systemic therapy**

1. Reserved for topical treatment failures.
2. Topical therapy fails when antibiotics cannot reach infected tissues, e.g. mastoid
3. Systemic therapy produces higher penetration of tissues.
4. Ottopical therapy usually continued once systemic therapy begun.
5. Cultures should be obtained before starting systemic therapy.
6. Parenteral antibiotics include Penicillin, Cephalosporins, Aminoglycosides and Macrolides.
7. Fluoroquinolones most useful antibiotics for treating chronic suppurative otitis media; not approved for children (<18 y/o) due to tendon rupture risk.
8. Systemic therapy should be continued for 3 to 4 weeks.
9. Oral therapy produces serum concentrations equivalent to parenteral therapy; intravenous delivery not required unless cannot take PO

## **Surgery**

1. Indications for surgery (SOR:C)<sup>2</sup> are:
  - Perforation persisting beyond 6 weeks
  - Otorrhea persisting longer than 6 weeks despite appropriate antibiotics
  - Cholesteatoma formation
  - Radiographic evidence of chronic mastoiditis
  - Conductive hearing loss
2. Contraindications (relative and absolute) to surgery for tubotympanic disease are :
  - Affected ear is the only hearing ear
  - Poor general condition, advanced age, or excessive general anesthesia risk from other debility/condition
  - Competent patient refusing surgery
  - Patients with unilateral vestibular ablation
3. With early or mild chronic suppurative otitis media with cholesteatoma, aural toilet and repeated suction clearance of the ear with watchful expectancy may be performed.
4. With advanced disease, exploration of the mastoid and tympanoplasty is recommended

## **When to refer to ENT**

1. Any child with 4 episodes of acute otitis media in a 6-12 month period
2. Any child with hearing loss
3. Bilateral otitis media with effusion persisting for more than 3 months
4. Patient with unilateral otitis media with effusion that persists longer than 6 months

## **Patient /Family education:**

1. Parents should be counseled on adverse effects of bottle propping, pacifier use after 6 months of age, and passive cigarette smoke exposure in the development of otitis media
2. Breast feeding for at least 6 months should be recommended to families whose children have recurrent otitis media
3. Day care attendance is also associated with an increased risk of Otitis media

## **Prognosis**

1. CSOM prognosis is good if infection is controlled promptly
2. Recovery of hearing loss depends on the cause.
3. Conductive hearing loss can be corrected partially with surgery

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#### **Evidence-Based Inquiry**

1. Are topical antibiotics better than systemic antibiotic?
2. Are topical quinolones better than non topical quinolones?
3. Are antibiotics with steroids better than steroid free Ototopicals?

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