Otologic Disease

Ear drops, indications and ototoxicity

Thursday June 24, 2008
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Case

- 5 year old female presents with ototorhea from left ear to my office.
- Patient otherwise well, no systemic complaints.
- Tubes placed 3 months ago for chronic otitis media.
- Seen recently at a walk in clinic and prescribed Amoxil.
- No improvement noted.
Ideal treatment?

- This patient should have been started on topical antibiotic drops.
- Ciprodex or Cipro HC with no oral antibiotics in this case.

- The Journal of Otolaryngology, Volume 34, Supplement 2, August 2005
Use of Ototopical vs Systemic Antibiotics

- Ototopical antibiotics
  - All cases of uncomplicated AOMT
- Systemic antibiotics
  - Systemic illness
  - Complicated otitis media (ie mastoiditis)
  - Associated strep pharyngitis
  - Diabetic and immunocompromized patients
  - Failure of topical therapy
Ototoxicity

- No reported ototoxicity in animal or human studies with fluoroquinolones.

- All other ototopical agents may be ototoxic in humans.

Topics for Review

- Anatomy and Physiology
- Cerumen
- Pathology
  - Inflammatory and Infectious
  - Neoplastic
- When and what to do?
Anatomy

- Only skin lined invagination in the body
- Outer 1/3 soft tissue and cartilage
- Inner 2/3 are boney with thin adherent tissue
- S shaped canal
Glandular elements

- Sebaceous glands
- Modified apocrine sweat glands
  - Both empty into hair follicle in ear canal
Cerumen

- Mixture of sebaceous, apocrine and epithelial cells
- For lubrication
- Waterproof
- Mechanical protection of the underlying tissue
- Anti-bacterial
  - Contains lysozyme
  - Fatty Acids
  - Maintains canal pH at 6.1
Cerumen and Hearing loss

- 80% occlusion leads to mild conductive hearing loss increasing to a 30-45 dB conductive loss at 100% occlusion of the canal by cerumen
Excess Cerumen

- Adults: 3-10%
- Geriatric: 34%
- Children 10%
Cerumen Removal

- **Mechanical**
- **Irrigation**
  - Syringe
  - Water pic
  - Earigate

- **Cerumenolytics**
  - Peroxide based
  - Ceruminex
  - NaHCO3
  - Colace
  - Use of mineral oil
Ear Candling
Infections of the external auditory canal

- Fungal
- Bacterial
- Chronic
Microbiology of Healthy EAC

- Normal Saprophytes
  - Corynebacterium sp
  - Micrococci
  - Non pathogenic Staph; ie Staph Alba
  - Various Fungi
Infections of the external auditory canal: Fungal

- Fungal External Otitis
- Uncommon as a primary disease. Fungal organisms do grow on desquamated epithelium or cerumen as saprophytes.
- True fungal otitis is either Aspergillus or Candida species.
Symptoms

- Generally complain of pruritis
- Protracted course
- Hearing loss
- Ottorhea less common
Treatment of Fungal Otitis

- Mechanical debridement
- Re-acidification of the canal, topical antiseptics: Gentian violet, Mercurochrome
- Very rare to require antifungal antibiotics
- Topical treatment with Ketoconazole, Clotrimazole
- Lococorten drops: Clioquinol and flumethasone
- Powder
Safety profile: Antimycotic preparations

- Clotrimazole, miconazole and tolnaftate appear safe in the middle ear.
- Nystatin appears safe, but carrier leaves a residue around the round window which may be ototoxic.
- Gentian Violet is significantly vestibulotoxic and may be ototoxic.

Lawrence W. C Tom, MD Layngoscope April 2000
Acute Bacterial Otitis Externa

- Acute
  - Diffuse “swimmers ear”
  - Furunculosis
  - Nectrotizing
- Malignant otitis externa
- Chronic
  - Hypertrophic sclerosing
AOE: Pathogenesis

- Temperature
- Humidity
- Seasonal
- pH
- Dermatitis
- Trauma
AOE: Diagnosis

- Swollen canal with narrow lumen
- Erythema may be present
- Exudate often present
- Tenderness is usually pronounced
  - Worse if tragus or auricle are palpated
Bacteriology of AOE

% Incidence

- Pseudomonas: 60%
- Staph: 20%
- Other Gram Negatives: 30%

Data represents the percentage incidence of different bacterial species associated with AOE.
AOE Treatment

- Removal of Debris
- Re-Acidification
- Appropriate antibiotics
  - Topical Fluoroquinolones
    - Ciprodex (Safe in the middle ear)
  - Aminoglycosides (not if there is a perforation)
- Wick
- Pain Management
- Rarely needs systemic antibiotics.
Prevention

- Water precautions
- Avoid canal trauma
- Maintain healthy canal pH
  - Diabetic canal pH 7.4 vs normal 6.1
Ototopical treatment

- Delivers a high concentration of antibiotic
  - Combined with steroid ie Dexamethasone reduced pain and swelling quickly allowing penetration of antibiotic to affected tissues
- Minimal systemic effect
- Very little resistance
  - Includes MRSA.
- Low cost
Ciprodex

- 3mg/mL of Ciprofloxacin
- 1mg/mL of Dexamethasone
- 0.1mg/mL of Benzalkonium chloride preservative
Antibiotic concentrations
CiproDex

- 3-5 drops is a dose of 90-150ug but at a concentration of 3000mcg/ml.
- This exceeds the MIC of any known relevant pathogen
- This includes MRSA
Middle ear fluid levels with systemic antibiotics

- Amoxil (90-100mg/kg/day)  
  - 8-10 mcg/ml

- Cefuroxime (Ceftin)  
  - 2-4 mcg/ml

- Ceftriaxone (Rocephin)  
  - 25-30 mcg/ml
Ototopicals: Disadvantages

- Local discomfort (warm up)
  - Ph
  - Alcohol
  - Temperature
- Requires direct contact with area involved
- Topical sensitization
- Minimal systemic effect
- Alter micro environment
Ototopical Choices

- No antibiotic
- Aminoglycoside vs Quinalone
- Single agent vs combined with steroid
Safety Profile: Topical Antibiotics

- Aminoglycoside antibiotics should not be used where there is a perforated tympanic membrane or an open mastoid cavity due to potential for ototoxicity and vestibulotoxicity.
Ototoxicity Data

- Neomycin
- Gentamycin
- Streptomycin
- Polymyxin
- Cortisporin
- Propylene glycol

- Hair Cell loss
- Hair Cell loss
- Hair Cell loss
- Hair Cell loss
- Severe middle ear inflammation with some hearing loss
Ciprofloxacin

- No evidence of ototoxicity or vestibulotoxicity in animal models
- No reported cases of clinical vestibulotoxicity or ototoxicity
Summary

- Topical therapy is the first choice for otitis externa, and uncomplicated acute otitis media with tubes.
- Ciprodex is safe and highly effective treatment for bacterial otitis externa and otitis media with tubes.
- Systemic therapy is not indicated in the majority of cases and should not be initiated as a first line therapy.
- If in doubt about the status of the tympanic membrane: Use Ciprodex.