Otitis

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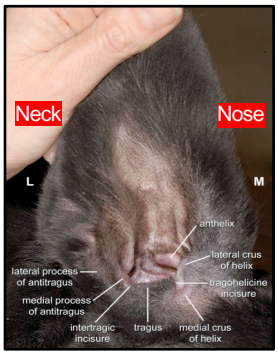
Learning Objectives

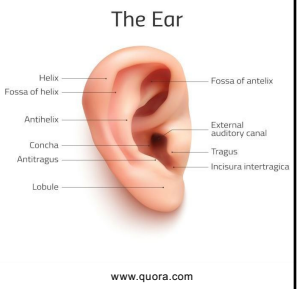
- Clinically relevant anatomy
- Predisposing, primary and perpetuating factors of otitis
- Diagnostic approach
- Management
- Chronic/recurrent otitis externa

Otitis Externa

- Acute or chronic inflammation of the external ear canal
- 10-20% of canine population; 2-5% of feline population
- Most common diagnosis after dental disease in general veterinary practice
- Consider a clinical sign, not a final diagnosis!

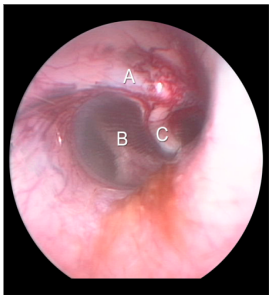
Anatomy: Right External Ear





Tympanic Membrane (TM)

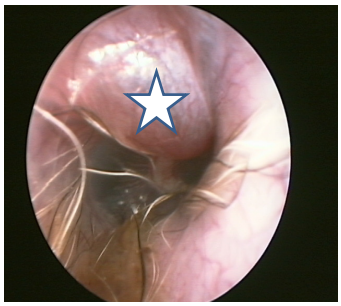
- Two parts
  - A = Pars flaccida
  - B = Pars tensa
- Stria mallearis (C)
  - Attachment of the malleus to the TM
- Origin of epithelial migration

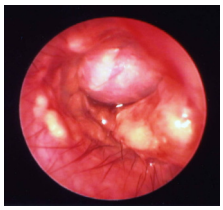


Epithelial Migration

- Outward radial migration of canal epithelium removes
  - Cornified keratinocytes
  - Cerumen
  - Trapped debris
  - Trapped organisms

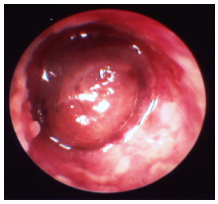
Some dogs will have a very large, bulging pars flaccida – do not mistake this for a pathologic structure!



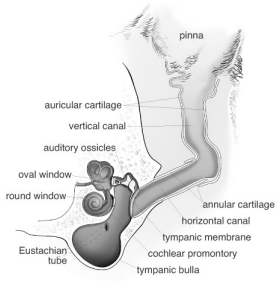


Polyp

Edematous pars flaccida

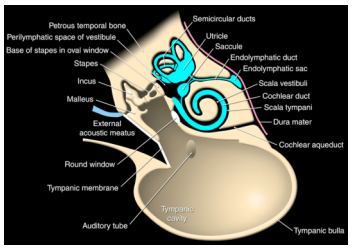


Anatomy of the External Ear Canal



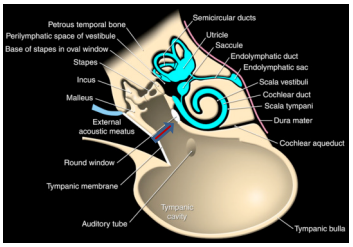
Anatomy of the Middle Ear

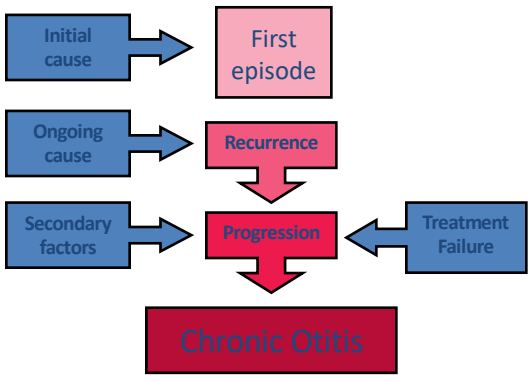
- Tympanic membrane separates external ear canal from middle ear
- Three auditory ossicles dorsally located
- Auditory (Eustachian) tube connects middle ear to oropharyngeal region



Anatomy of the Inner Ear

- Dorsal aspect
  - Semicircular ducts: balance center
  - Cochlear ducts: hearing center
    - Housed in a bony structure: promontory
  - Second "tympanic membrane" is the round window





Successful Management

Early and aggressive identification and management of both primary and secondary factors

Otitis Externa

- Predisposing factors
  - Increase the risk of developing otitis but do not directly cause it
- Primary factors
  - Cause otitis on their own
- Perpetuating (secondary) factors
  - Prevent the resolution of otitis

The 3 P's!

- Predisposing factors
  - Conformation
  - Behavior
  - Environment
  - Trauma
- Primary factors
  - Parasites
  - Foreign bodies
  - Allergies and contact reactions
  - Endocrine diseases
  - Keratinization disorders
  - Immune-mediated diseases
  - Tumors
  - Other
- Perpetuating factors
  - Bacteria
  - Yeast/fungi
  - Otitis media
  - Chronic changes
    - Proliferation
    - Calcification

Predisposing Factors

Conformation of the pinnae and exernal ear canal

- Pendulous pinnae
- Tortuous ear canals
- Narrow ear canals

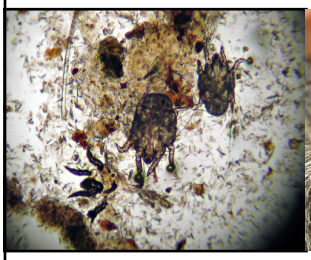
Stenosis

Hair

Predisposing Factors

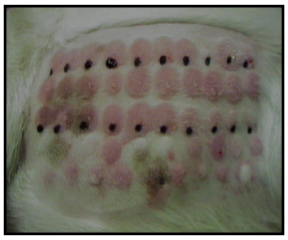
- Excess moisture
  - Swimming, water based ear cleaners
- Environment
  - High humidity
  - High temperature
- Trauma
  - Aggressive over cleaning
  - Hair plucking

Primary Factors – Parasites

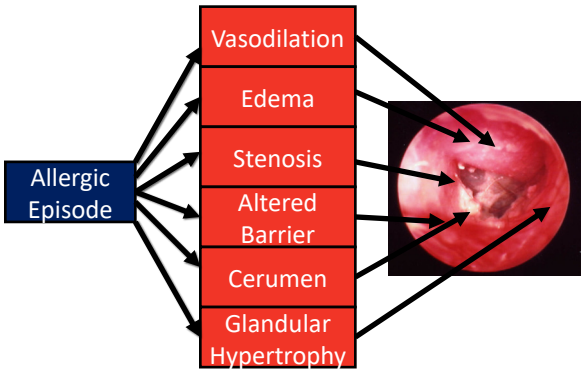


Primary Factors – Foreign Bodies

10% of canine population has atopy



50-80% of dogs with CAD have otitis



Atopy or Adverse Reaction to Food?

Primary Factors Contact Hypersensitivity

- Erosive, ulcerative and painful
- Often higher on pinna

Primary Factors

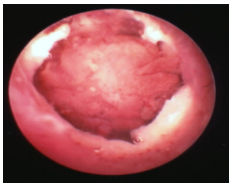
- Endocrinopathies
  - Hypothyroidism
  - Hyperadrenocorticism
- Keratinization disorders
  - Idiopathic seborrhea
  - Sebaceous adenitis

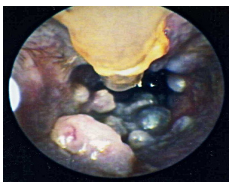
Primary Factors – Immune-Mediated

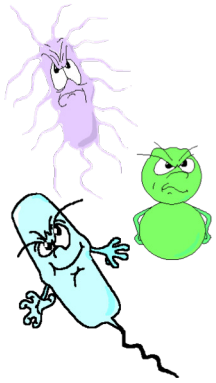
- Pemphigus foliaceus/vulgaris
- Erythema multiforme
- Drug eruption
- Distemper
- Juvenile cellulitis

Primary Factors - Tumors

- Non-neoplastic
  - Inflammatory polyp
  - Ceruminous cysts
- Neoplastic
  - Ceruminous gland adenoma or adenocarcinoma
  - Squamous cell carcinoma

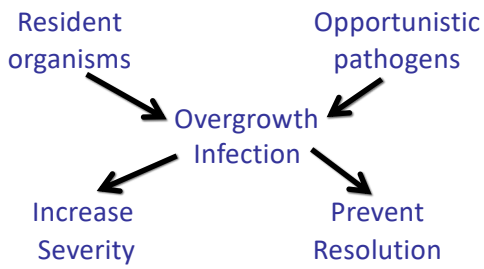






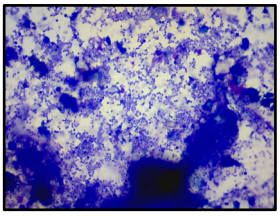
What About Bacteria And Yeast?

Perpetuating Factors



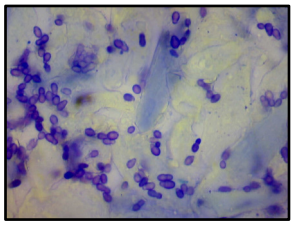
Perpetuating Factors - Bacteria

- Bacteria
  - *Staphylococcus pseudointermedius*
  - *Staphylococcus schleiferi*
  - *Proteus* sp
  - *Pseudomonas* sp
  - *Escherichia coli*
  - *Klebsiella* sp

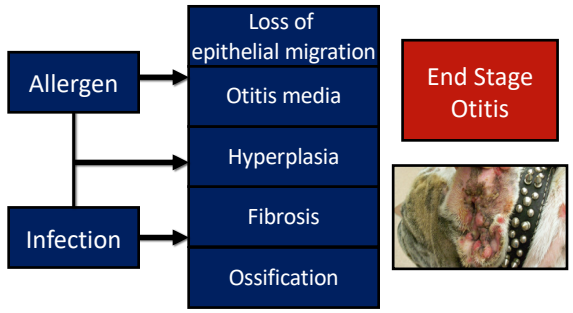


Perpetuating Factors - Yeast

- Yeast
  - *Malassezia pachydermatis*
  - *Candida albicans* (rare)



What Happens When Primary Factors and Secondary Infections Aren't Well Controlled?



Otitis Externa - Diagnostic Approach

- Because the ear canal is lined by skin, otitis externa should be considered a dermatological disease
- The approach to otitis externa should be similar to all other dermatological conditions

Initial Visit

- History
  - Unilateral vs. bilateral?
  - Acute vs. chronic vs. recurrent?
  - Seasonal?
  - Other dermatologic signs?
- Complete otoscopic exam coupled with physical and dermatologic exam
- Cytology +/- ear mite prep
- +/- Culture and sensitivity
- Evaluate for primary cause

Examination

Palpate and evaluate

- Proliferative changes
- Firmness/ calcification
- Pruritus or pain
- Horner's syndrome

Observe behavior

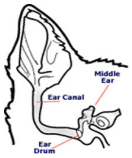
- Head shaking or scratching
- Head tilt or vestibular signs

Examination

- Pruritus
  - Allergic diseases
  - Parasitic diseases
  - Malassezia > bacterial infection
- Pain
  - Severe bacterial infections (*Pseudomonas*)
  - Foreign bodies or neoplasia
- Pinnal-pedal reflex
  - Positive in ~70% of scabies cases

Otic Diagnostics

- Otoscopy (good restraint)
- Cytology
- Culture/sensitivity
- Imaging (radiographs or CT)
- Otoscopic ear flush (anesthesia)



Otic Diagnostics

- Otoscopy
  - Hand-held otoscope
  - Video otoscope
- May not be possible due to pain or poor patient cooperation
- Evaluate stenosis and status of tympanic membrane

Otic Diagnostics - Cytology
Essential Diagnostic Test

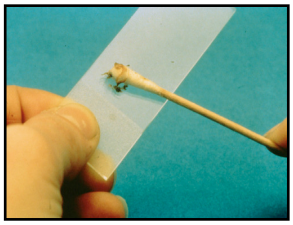
- Simple, practical and inexpensive way to establish infection
- Immediate results
- Identification of infectious organisms
  - Best diagnostic test for identification of yeast
- Performed at initial exam and all re-evaluations
  - Monitor response to therapy

Sample Collection

- Cotton-tipped applicator (Q-tip)
- Obtain sample from the horizontal ear canal

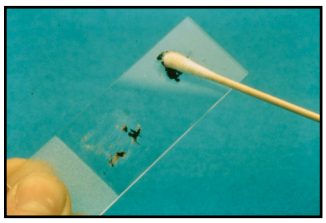
Sample Preparation

- Roll sample onto microscope slide
- Left ear sample near the frosted edge



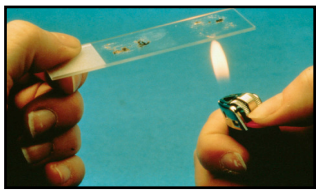
Sample Preparation

- Roll sample from right ear onto opposite side



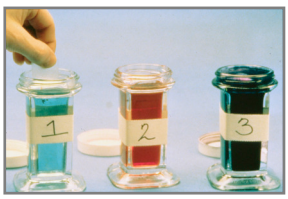
Sample Preparation

- Heat-fix underside of the slide



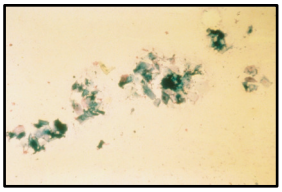
Sample Preparation

- Stain slide
- Diff-Quik®
- Dip in each stain 5-7 times
- Rinse only after the last stain
- Air, blow-dry or blot with bibulous paper



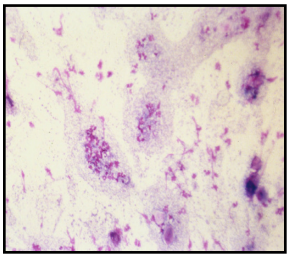
Sample Evaluation

- Scan slide at low mag (10X)
- Look for keratinocytes
  - Basophilic staining folded cells (skin cells)



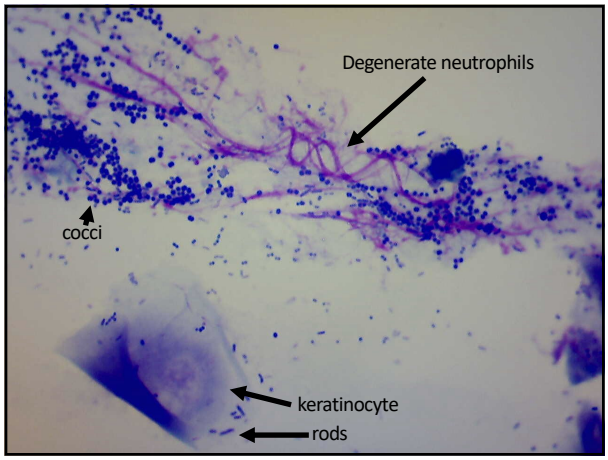
Sample Evaluation

- Look for inflammatory cells
- Then switch to oil immersion magnification to look for organisms

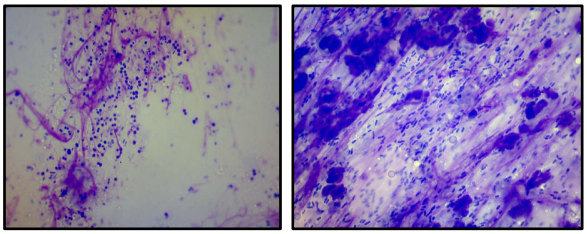


Otic Diagnostics - Cytology

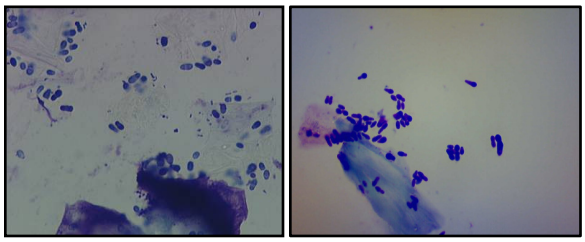
- Yeast
  - Presence and number
- Bacteria
  - Presence, morphology and number
- Leukocytes
  - Presence and evidence of phagocytosis
- Normal vs. overgrowth vs. infection
- Rank significance



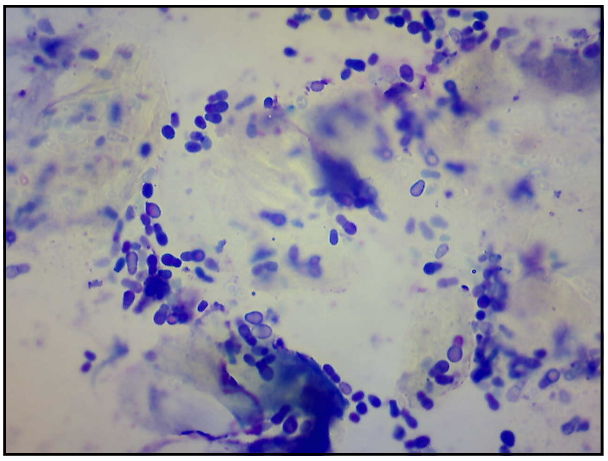
Bacteria

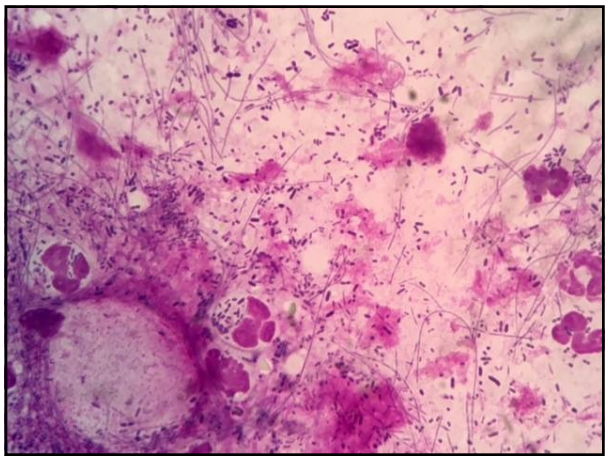


Malassezia



> 5 per 40x field is abnormal





Normal vs. Abnormal

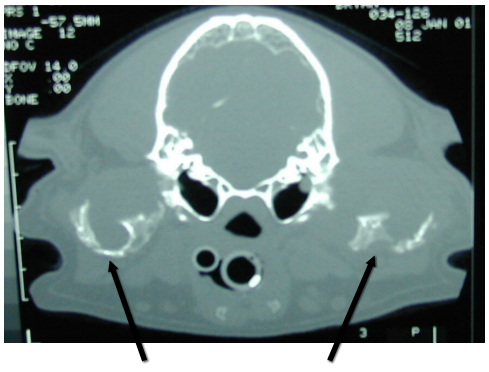
- Evaluate 5-10 100x fields
- Normal is < 2 bacteria per field
- Grey zone 2 - 10
- Abnormal is > 10 bacteria per 100x field
- Any bacteria engulfed by WBC is abnormal

Otic Diagnostics

- Bacterial culture and sensitivity
- Indications
  - Rods present on cytology
  - Chronic, recurrent or unresponsive ear infection
  - When otitis media is suspected
  - Determines antibiotic susceptibility *not* significance of isolates
  - Organisms cultured from middle ear may be different than those in the horizontal canal

Otic Diagnostics - Imaging

- Indications
  - Evaluate for middle ear disease and neoplasia
- Bulla radiographs
  - General anesthesia required
  - Superimposition of structures makes region difficult to assess
  - 25% of dogs with OM have normal findings
- Computed tomography (CT)
  - Sedation or general anesthesia required
  - Higher sensitivity due to cross sectional images and use of contrast

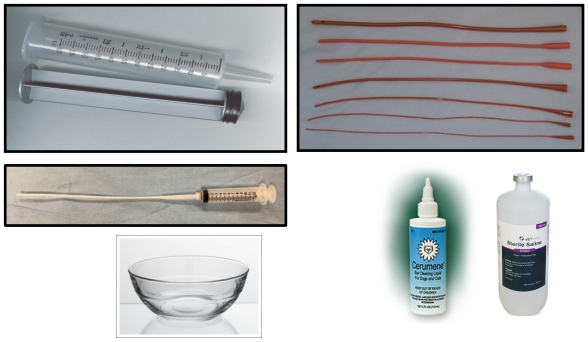


Abnormal mineralization of external canals

Otic Diagnostics – Otic Flush Indications

- Suspected foreign object or neoplasia
- Severe acute or purulent otitis
- Vestibular symptoms
- Horner's syndrome
- Chronic or recurrent otitis (> 3 months)
- Suspected otitis media
- Failure to respond to appropriate therapy
- Therapeutic flush of tympanic cavity

Otic Flush



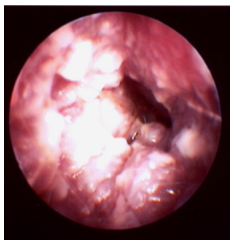
Management

- Try and clean ear at initial presentation even if sedation is required
  - Exudate may inactivate topical therapy
- If too stenotic or painful, consider starting oral glucocorticoids for 5-7 days before initiating cleaning
  - Reduces pain, stenosis (narrowing) and glandular hyperplasia
  - Reduces exudate and toxin production (especially *Pseudomonas* sp)
- Schedule a re-examination in two weeks

Virtually all inflammatory otitis should be treated with glucocorticoids

In cases of mild acute otitis externa → topical glucocorticoids may be enough

In more chronic cases → systemic glucocorticoids



Management

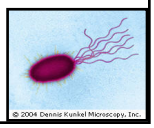
- Selection of glucocorticoids
  - Topical
    - Fluocinolone in DMSO (Synotic®), dexamethasone or triamcinolone
  - Oral
    - Prednisone, prednisolone or methylprednisolone at 1 mg/kg PO q 24 hours x 10-14 days, then taper

Management

- Selection of topical antibiotic based on cytology
  - Cocci – most likely *Staphylococcus pseudintermedius* or *schleiferi*
  - Rods – most likely *Pseudomonas aeruginosa* > *Proteus*
- If C&S was performed, delay until or modify therapy when results received
- Add systemic antibiotics based on C&S if otitis media is present
  - OM may require 8-12 weeks of systemic therapy
- Perform cytology at initial examination and at all re-evaluations
- Treat for a minimum of two weeks followed by re-exam

Management

- Selection of topical antibiotic
  - C&S results are based on plasma concentrations of antibiotic
  - If resistance reported, may still be effective topically, as concentrations in the ear may be 100-500x higher vs. systemic administration*
  - High volume is important – flood the canal!



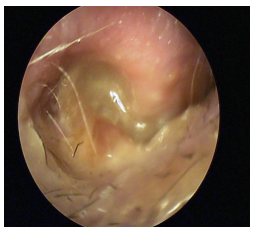
There are few ototoxicity studies on topical otic preparations, therefore use caution if the animal has a compromised tympanic membrane

Acute Otitis – Bacteria Only

- Many choices for treatment
  - Neomycin
  - Polymyxin +/- neomycin
  - Combination products
- Chronic, relapsing otitis
  - Gentamicin
  - Tobramycin
  - Enrofloxacin, marbofloxacin
  - Silver sulfadiazine (compounded)

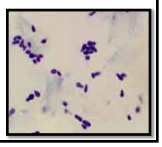
Topical Antibiotics

- Require high concentration and volume
- Less effective in debris or pus
- Some are less effective at low pH



Acute Otitis – Yeast Only

- Miconazole nitrate +/- fluocinolone or dexamethasone
  - Fluocinolone or other steroid preparation may offset irritancy of miconazole
  - Treatment of choice; low level of resistance
- Clotrimazole > thiabendazole
- TrisEDTA + ketoconazole



Selection of a Cleaner

- Demonstrate proper ear cleaning whenever possible
  - Ear cleaning may not be possible at initial visit due to pain and/or stenosis
- Product selection
  - Malassezia and cocci bacteria – use an acidifying or neutral solution
  - Rod bacteria – Tris-EDTA product
  - Cerumen – squalene based product
- Clean twice weekly initially

Chronic or Recurrent Otitis Externa

- More investigation and follow up required
  - Culture and sensitivity
  - Anesthetic ear flush/myringotomy to evaluate for middle ear disease and culture bulla
  - Several weeks of topical and systemic therapy to completely resolve
  - Close follow up for repeat cytology
  - Important to identify primary/underlying cause and perpetuating factors in these cases

Otitis Media

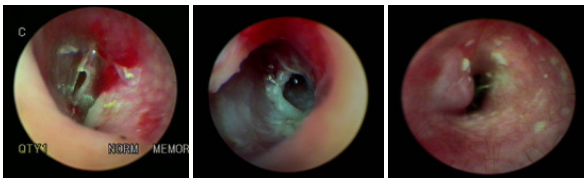
- Inflammation of the middle ear
  - Difficult to manage with topical therapy alone
- Perpetuating factor in otitis externa

Tympanic perforation

Otitis Media

- Present in >50% of cases of chronic otitis externa
- Initial diagnosis
  - Clinical signs
  - Examination of tympanic membrane
  - Pain on palpation of temporomandibular joint

Ruptured Tympanic Membrane



Acute Chronic Permanent

Otitis Media – Clinical Signs

- Chronic recurrent otitis externa
- Head tilt
- Horner's syndrome
- Facial nerve paralysis
- Peripheral vestibular syndrome (uncommon)

Otitis Media - Diagnosis

- Imaging if available
- Cytology +/- culture external ear canal
- Flush external ear canal and examine tympanic membrane (general anesthesia)
- Myringotomy if necessary
- Cytology +/- culture from middle ear
- Flush middle ear

Otic Flushing – Why?

- The presence of exudate
  - Adds to the irritation already present in the canal
  - Masks a foreign body or neoplasm
  - Provides the perfect growth medium for bacteria and yeast
  - Prevents medication from contacting the epithelium and may inactivate therapy
  - Prevents proper evaluation of the tympanic membrane and otitis media

Otic Flushing – Patient Preparation

- Most patients are started on oral prednisone at 1 mg/kg PO q 24 hours x 10-14 days prior to the flush
- Decreases erythema, pain, inflammation and stenosis

Otic Flushing – Patient Preparation

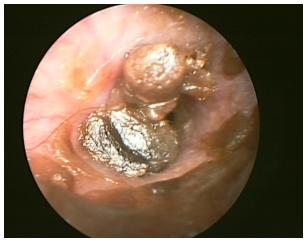
If after glucocorticoid therapy, you are unable to pass the otoscope into the ear canal, consider surgical management of the ear disease

Otic Flushing – Patient Preparation

- General anesthesia is required!
  - To prevent patient from waking prematurely
  - To protect the airway from the possibility of aspiration
  - The eustachian tube may be open during anesthesia, and if the tympanic membrane is ruptured, fluid may enter the oral cavity

Otic Flushing - Manual

- First use a ceruminolytic agent to dissolve the exudate in the ear
- Most ceruminolytic agents are ototoxic



Otic Flushing - Manual

Use ceruminolytic agent with massage and repeated wiping with gauze for 10 minutes

Otic Flushing - Manual

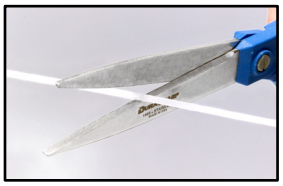
- Then use a bulb syringe to remove the larger debris from the ear canal
- Discard syringe after use, as *Pseudomonas* has been cultured even after gas sterilization!

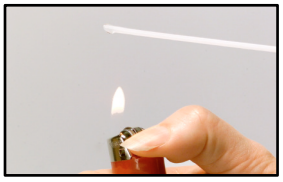
Otic Flushing - Manual

- Next, remove the medium-sized debris using a polypropylene urinary catheter or a red-rubber feeding tube
- The manual cleaning, including the 10 minute soak, is important to the success of a thorough cleaning and visualization of the tympanic membrane

Otic Flushing - Manual

- 8 French rigid polypropylene urinary catheter
- Cut about half of the length and quickly blunt the cut end with a lighter to dull the point; attach the other end to a 12 cc syringe





Otic Flushing - Manual

- Fill the syringe with 1 cc of 0.9% Na Cl irrigation fluid that is luke warm
- Important to warm the fluids to prevent heat loss and a decrease in body temperature during the procedure

Otic Flushing - Manual

- Place a hand-held otoscope at the junction of the vertical and horizontal canal
- Feed catheter through the hand-held otoscope until the tip extends just past the end of the otoscopic cone
- Further insertion may rupture the tympanic membrane

Otic Flushing - Manual

- Flush 1 cc of the irrigation fluid into the ear canal, aspirate back, and discard
- Advance the otoscopic cone further down the canal and repeat the flushing
- Repeat these steps until you reach the level of the tympanic membrane and the ear canal is clean

Important Points

- Establish the nature of the infection
- Use glucocorticoids in most cases
- Sedation for exam and cleaning
- Topical +/- systemic antibiotics
- If otitis media, image and culture the middle ear via anesthetic otic flush
- Identify and manage the primary factor
- Once resolved, continue weekly maintenance ear cleaning