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Challenging Dermatology Presentations Mini Series

Session 3: Recurrent Otitis Externa

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Introduction

Otitis externa is a common presentation in small animal practice[1]. It is usually of multifactorial aetiology and may occur as part of a generalised skin disease or underlying systemic illness. Although initial symptomatic therapy may be appropriate for early, acute cases of otitis externa, a systematic and thorough approach is required when investigating and treating chronic otitis externa. Chronic otitis externa may be defined as clinical signs that have been present for more than 30 days and may be further subdivided into erythematous, erythematoceruminous and purulent depending on the nature of the clinical signs and discharge. Chronic otitis externa cases are complex, frustrating and common reasons for referral. Multiple aetiologies may be involved and a good understanding of what happens in a case of ear disease is required to achieve a successful outcome.

Ear canal physiology in health and disease

The ear is a cartilaginous structure lined by skin with hair follicles, sebaceous and ceruminous (modified apocrine glands). Cerumen coats the lining of the ear canal and is comprised of a complex mix of exfoliated cells, and glandular secretions consisting of waxes, oils, fatty acids, esters and proteins that form a protective and antimicrobial layer. **Epithelial cell migration**, a lateral movement of the stratum corneum, is a mechanism that facilitates the removal of cerumen and debris from the external ear canal. This process has recently been demonstrated in the canine ear[2]. Normal bacterial flora in the ears consist of mainly gram-positive bacteria and yeast whereas gram-negative bacteria are rarely identified.[3]

Otoscopic examination of a healthy ear should reveal a smooth, non-inflamed epithelium and an intact tympanic membrane.

Pathogenesis of otitis externa

It is clear that otitis externa is not simply the result of an infective process but that some of the problems arise from changes within the ear canal itself that lead to perpetuation of disease even when the infection has been treated. The aetiological causes of otitis externa may be divided up into primary and secondary causes of inflammation and perpetuating and predisposing factors. Factors contribute to ear disease but do not cause inflammation per se; predisposing factors make it more likely that the dog will develop otitis externa and perpetuating factors can both prevent effective initial treatment of ear disease as well as result in recrudescence.

Tables 1 and 2 list the well-recognised causes and factors involved in otitis externa.

Primary and secondary causes of inflammation

These are the agents that produce inflammation within the ear canal. As the ear canal is lined with skin, ear disease should be thought of as one manifestation of a concurrent dermatosis and many generalised skin diseases can act as primary causes of inflammation within the ear canal. Primary causes of inflammation are listed in table 1. Atopic dermatitis (including adverse food reactions) is the most common primary cause of otitis externa[4].
Secondary causes of inflammation (yeast and bacteria) do not result in disease in a healthy ear but occur because the environment in the ear has been altered and made more favourable for microbial overgrowth. This may be due to a combination of both primary causes of inflammation and predisposing and perpetuating factors.

Table 1 - Primary and secondary causes of inflammation in otitis externa

Primary	Secondary
Parasitic disease • Otodectes • Demodex • Harvest mites Allergies • Atopic dermatitis • Adverse food reactions • Contact allergies Auto-immune / immune mediated disease • Pemphigus foliaceus • Bullous pemphigoid • Lupus erythematosus • Erythema multiforme • Vasculitis • Drug reactions Keratinisation disorders • Sebaceous adenitis • Zinc responsive dermatosis • Primary idiopathic seborrhea Endocrine • Hypothyroidism • HAC Foreign body Idiopathic	Bacteria Yeasts Overcleaning Medication reaction

Table 2 – Predisposing and perpetuating factors in otitis externa

Predisposing	Perpetuating
Excessive moisture • Swimming • Increased environmental temperature Conformation • Excess hair • Stenosis • Pendulous pinnae Obstructive ear disease • Polyp • neoplasia Immunosuppression	Failure of epithelial migration Stenosis • Swelling /oedema • Glandular hyperplasia • Fibrosis / calcification Tympanic rupture Otitis media Overcleaning Contact dermatitis Cholesteatoma[5]

Perpetuating factors arise as the result of the changing environment within the ear canal and secondary pathological changes. They prevent resolution and result in continued disease and are a common reason for referral. Perpetuating factors are listed in table 2. Initial perpetuating factors can be subtle but can ultimately become the most severe component of chronic disease. Frequently, these factors provide microbial niches that perpetuate infection. Specific, aggressive and prolonged therapy may be required to resolve these factors. Failure to resolve perpetuating factor(s) is the one of the most common reasons otitis cases require surgery.

Inflammation of the ear canal often result in increased discharge within the ear canal. This is thought to occur as a result of increased cerumen production (glandular hyperplasia and increased desquamation) and failure of epithelial cell migration. The increased discharge within the ear canal favours further microbial colonization and can inhibit the action of topical medications. Thus, sebaceous and ceruminous gland hyperplasia and impairment of epithelial migration are important perpetuating factors in otitis externa. Severe ceruminous hyperplasia is a phenomenon that is most commonly seen in cocker spaniels (72.9% of chronic otitis cases) compared to only 28.1% of other breeds.[6]

Otitis media is considered to be an important perpetuating factor in otitis externa and presents significant challenges in both diagnosis and treatment. Otitis media is thought to mainly arise as a result of perforation of the tympanic membrane and the extension of infection into the middle ear cavity. The tympanic membrane may heal trapping infection within the middle ear cavity[7] which acts as a reservoir of infection resulting in recrudescence of otitis externa following apparently successful therapy. Chronicity and the presence of rods seems to be a major predictor for the development of otitis media.[4,7]

Clinical signs include depression, pain, head tilt, and pain on opening the mouth (including yawning and eating) but most cases are clinically indistinguishable from otitis externa.

Demonstration of a ruptured tympanic membrane (TM) is an indicator of otitis media but the tympanum can be difficult to visualise even with video-otoscopy. Additional methods for assessing the tympanum include the presence of air bubbles and palpation. Imaging may be used to demonstrate changes within the tympanic bulla although radiography has low sensitivity[4]. The simplest and most direct method of diagnosing otitis media is by demonstration of inflammation within the middle ear cavity but myringotomy may be required.

Cholesteatoma is a destructive and slowly expanding cystic growth consisting of layers of keratinizing epithelium that accumulates within the middle ear cavity. Middle ear cholesteatoma is a rare condition in dogs with chronic otitis. Otorrhea, otodinia, and pain on temporomandibular joint palpation are the most common clinical signs.

Predisposing factors

Predisposing factors do not cause inflammation by themselves but by altering the microclimate within the ear canal; place the patient at increased risk of developing ear disease. Predisposing factors are listed in table 2.

In one study, conformational abnormalities were the most common predisposing factors for otitis externa[8].

Findings vary but pure-bred dogs with pendulous pinnae and hirsute ear canals are more likely to develop otitis externa whereas dogs with erect pinnae are less likely to be affected[9]. The assumption was that pendulous pinnae and hirsute ear canals may raise temperature and humidity predisposing to infection. However, dogs with hirsute ears actually had lower ear canal temperatures and there was no difference in external ear canal temperature in dogs with upright or pendulous pinnae suggesting that the predisposition may be inherently to do with the breed of dog than any direct effect of the ear type and amount of hair on humidity or temperature within the ear canal[10]. Dogs with pendulous ears were twice as likely to have otitis externa as dogs with erect ears and dogs with lipid rich cerumen were more likely to have Malassezia otitis[11].

Clinical approach to otitis externa

History
It is worth spending some time taking a history as this can help to determine the primary cause. Questions worth asking include: age of onset, is the disease unilateral or bilateral, presence of other symptoms of skin disease or pruritus, lifestyle (is the dog a swimmer, does he run through dense undergrowth?) and whether there are signs suggestive of systemic involvement.

Examination
Examine the skin as well as the ears. Again this may be helpful in determining the primary cause. Examine the pinnae and external ear canals. Palpate the ear canals for evidence of fibrosis or calcification. The author does not attempt otoscopic examination in conscious animals with painful ears although most will tolerate digital examination with a gloved finger that may reveal stenosis, soft tissue swelling, fibrosis and calcification. Material thus collected is used for cytological examination.

Cytology
In otitis cases, the main value of cytology is in identification of microbial overgrowth/infection and has been covered in a previous lecture. If culture and sensitivity testing has been performed, the results should correlate with cytology findings.

As *Malassezia* spp, cocci and coryneform bacteria may all be found in healthy ear canals on cytological examination, the clinician has to make a judgment on what is an excessive number of micro-organisms. Various studied have tried to determine cutoff points but in the majority of cases, cytology assessment is not a problem because of the number of organisms present far exceeds any proposed cut-off values[4].

Culture and sensitivity testing
Opinions are divided as to the value of bacterial culture and sensitivity testing in otitis externa. The high concentrations of antibiotic achieved with topical therapy tend to overcome apparent *in vitro* bacterial resistance meaning that culture and sensitivity testing is of lesser value. However, the author will perform culture and sensitivity testing if there is a history of exposure to a possible source of resistance bacteria (such as an MRSA); if there is chronic, proliferative disease; when there have been multiple previous courses of antibiotic treatment; if unusual organisms such as rods are identified on cytology; and if systemic therapy is indicated for any reason for example in otitis media.

Otoscopic/ video-otoscopic examination
Otoscopic examination should be performed if this can be accomplished without causing the animal pain. Both ears should be examined even if unilateral disease is suspected. Examine the less severely affected ear first. Animals with painful ears will require sedation or anaesthesia to perform a thorough examination. Topical or systemic glucocorticoid therapy (prednisolone 1-3 mg/kg sid for 1-3 weeks) is indicated prior to otoscopic examination if the ears are markedly erythematous, proliferative, stenotic or ulcerated[12].

Video-otoscopy is a valuable technique allowing detailed examination of the ear canals and facilitates thorough cleaning; identification and removal of small foreign bodies; assessment of the integrity of the tympanic membrane and small surgical procedures[12].

On otoscopic or video-otoscopic examination, the ear canals should be evaluated for:

- The presence and nature of any discharge
- Presence of ectoparasites
- Presence of foreign bodies
- Ulceration
- Stenosis
- Space occupying lesions
- Patency of the tympanic membrane

Imaging
Radiography, CT or MRI imaging techniques may be of value in the investigation of otitis externa to assess both the external ear canals and tympanic bullae. Radiography is a relatively insensitive test for otitis media.

Treatment

The aims of therapy are to:

1. Thoroughly clean the ear
2. Resolve inflammation
3. Eliminate microbial infection
4. Manage primary cause(s) of inflammation
5. Prevent further episodes
    a. address perpetuating factors

Cleaning

Ear cleaning is probably the most important aspect of treating otitis externa and prevention of further episodes of otitis.

Ear cleaning:

- facilitates examination of the ear canal
- removes microbes, material that harbours microbes, small foreign bodies
- exposes the lining of the ear canal to topical therapy
- prevents inactivation of topical therapy
- improves barrier function
- cleaners have many beneficial effects including cerumenolytic, antimicrobial, astringent and acidifying

Ear cleaning may be done by the owner at home or by cleaning under sedation or general anaesthesia in the clinic.

Manual ear cleaning

There are many proprietary ear cleaners. It is important to choose an appropriate product for the individual case. A cerumenolytic ear cleaner is indicated if there is a waxy discharge. There are no studies to my knowledge that have shown a clear benefit of one cerumenolytic ear cleaner over another. A cleaner with aqueous properties (such as Tris-EDTA) would be indicated in a purulent otitis. Acidic cleaners should be avoided if the ear canal is eroded or ulcerated. Most cleaners (with the exception of tris-EDTA and perhaps squalene) are contraindicated if there is rupture of the tympanic membrane.

Please note: if the ear canals are inflamed and painful, ear cleaning should be delayed until the inflammation is resolved (probably with the use of systemic glucocorticoids). Using topical medications in very inflamed ears can cause marked discomfort and result in the dog become resistant to further topical therapy.

Whichever ear cleaner is being used, it is important to explain to the owner exactly how the preparation should be used. In our clinic this is done by demonstration but handouts can also be valuable. The aim is to fill the ear canal with the cleaner and massage the vertical canal for 30 to 60 seconds (although probably much longer is required for an effective cerumenolytic effect). Hopefully, this will create turbulence within the horizontal canal and break up any material that is present. The dog then shakes his head and material may be wiped away from the external canal. In reality, this sort of cleaning is effective in removing material from the distal third or half of the ear canal but is unlikely to remove material impacted within the horizontal canal and in these cases deep ear cleaning under sedation or general anaesthesia is likely to be required.

Deep ear cleaning under anaesthesia

Deep ear cleaning is indicated if there is significant material impacted within the horizontal canal or if home cleaning is ineffective or if the patient will not tolerate home ear cleaning. The author always performs this procedure under general anaesthesia using a retrograde flushing technique. [13] The video-otoscope greatly facilitates this procedure. At the same time, the tympanic membrane should be assessed and if otitis media is suspected, myringotomy performed and samples collected from the

middle ear cavity[12]. Water, saline, 0.25% chlorhexidine or 2.5% acetic acid have all been used. In the author's practice saline is used delivered via a giving set, three way tap, 20ml syringe and 4ga nasogastric feeding tube which passes through the working channel of the video-otoscope. Some people prefer much larger catheters which allow aspiration of larger clumps of material. Prior to the flushing, an appropriate cleaner is used to break up cerumen or purulent material within the canal. The ear is then flushed repeatedly until all material is removed and the tympanic membrane can be clearly visualized severe proliferative otitis may been this is not always possible.

The act of cleaning the ears is pro-inflammatory and can be painful. Post procedure analgesia is mandatory and systemic glucocorticoid therapy may be administered for up to five days after the procedure.

Following on from this procedure, the owner should be instructed on how to effectively clean the ears at home using an appropriate proprietary ear cleaner.

Antimicrobial therapy

Antimicrobial therapy is indicated if infection is identified on cytology. Topical therapy is the mainstay of treatment unless there is marked ear canal stenosis or otitis media in which case systemic therapy is indicated. Topical therapy achieves far higher levels of antibiotic within the ear canal compared to systemic treatment and can often overcome apparent *in vitro* resistance. Proprietary topical products all contain antifungals, antibiotics and a glucocorticoid. Choice of treatment should be based on the cytology results and with regard to good antibiotic stewardship. Products containing nystatin, miconazole and clotrimazole are effective for the treatment of *Malassezia* infections. Fusidic acid, the combination of miconazole and polymyxin B, gentamycin and fluoroquinolones would all be effective against gram-positive bacteria however there is a strong argument for reserving the fluoroquinolones for gram-negative infections.[13] Synergistic effects have been demonstrated between polymyxin B and miconazole in the treatment of yeast infection[14] and some strains of β-haemolytic streptococci[15] and framycetin/fusidic acid against some strains of β-haemolytic streptococci, *S. pseudintermedius* and *S. felis*[15].

The choice of topical therapy for *Pseudomonas* spp and other gram –ve (rod) infections should be also based on cytology, +/- culture and sensitivity, availability of a suitable product and potential ototoxicity. Many gram-negative infections are typically multidrug resistant but as already stated, culture and sensitivity testing is only a guide and the use of topical therapy usually overcomes apparent *in vitro* resistance. Polymyxin B, the aminoglycosides and fluoroquinolones are generally effective antibiotics.[16] Polymyxin B and the aminoglycosides are variably ototoxic and should probably be avoided if the tympanic membrane is perforated. As already stated, these antibiotics will only work effectively in a clean ear and in the author's experience apparent treatment failure is often due to an accumulation of purulent material within the ear canal.

Antiseptic therapies that may be useful for the treatment of Pseudomonas otitis include 1% silver sulfadiazine cream diluted in water (1.5ml of cream in 13.5ml water) and tris EDTA combined with chlorhexidine. The combination of tris-EDTA and 0.15% chlorhexidine has been shown to be effective against organisms commonly involved in otitis externa.[17]

Glucocorticoids

Glucocorticoids are very useful drugs for the treatment of otitis.[18] The majority of otitis cases benefit from treatment with glucocorticoids. Glucocorticoids may be administered topically, systemically or by intralesional injection.

Glucocorticoids may be useful in the following circumstances:

- to relieve pruritus and pain (facilitates examination, cleaning and topical therapy)
- treatment of ear canal stenosis due to soft tissue swelling and epithelial hyperplasia
- reduction of exudation production and glandular secretion
- treatment of stenosis preventing examination, cleaning and therapy of the external ear canal
- treatment of Pseudomonas otitis
- long term management of atopic otitis

For more severe clinical signs, systemic prednisolone or methylprednisolone should be used at 0.5-1mg/kg until resolution. Higher dosages may be required for resolution of severe stenosis due to fibrosis.

In cases of recurrent otitis externa due to atopic dermatitis simple ear cleaning alone can be effective in preventing further infections. However, if clinical signs are not sufficiently well controlled, soluble glucocorticoids added to the ear cleaning preparation or weekly applications of hydrocortisone aceponate to the external ear canal may be beneficial.

Follow up

Revisits should be scheduled for every one to two weeks. Otoscopic examination and repeat cytology should be part of the re-examination process. The ear should be carefully examined for signs of inflammation and discharge. Otoscopic examination should reveal a clean ear canal and it should be possible to visualize the tympanic membrane. Antimicrobial therapy should be continued until no micro-organisms are seen and also there should be no evidence of inflammation (neutrophils or neutrophilic debris).

Ongoing ear cleaning is usually required as epithelial cell migration may take a prolonged period of time to re-establish or may never recover. At the same time, over-cleaning should also be avoided as the continued maceration of the ear canal could predispose to further infection. A healthy, clean tympanic membrane is a sign that epithelial cell migration is returning to normal but some ears require lifelong cleaning, perhaps weekly or fortnightly.

Addressing primary and predisposing factors

As already discussed, underlying primary causes of inflammation should be identified and managed. This may involve dietary trials, intradermal testing, histopathological examination and blood work.

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