

External ear disease in dogs and cats



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Introduction

External ear diseases are particularly pertinent to dermatology, as the outer ear is formed by an invagination of skin within which various cutaneous disorders can occur. It is important to emphasize that the word *otitis* refers to an inflammatory sign, not a specific diagnosis; in other words, when treating otitis, the veterinarian is usually treating a sign rather than the primary or underlying disease that causes it. Ear disorders have a prevalence of about 15-20% in dogs and

6-7% in cats (1). There is no gender predilection but the condition is most common in dogs aged 5-8 years and cats aged 1-2 years (2).

Etiopathogenesis of otitis externa

When considering otitis externa, it is helpful to regard the outer ear as an L-shaped dermo-epidermal structure with follicles and ceruminous and sebaceous apocrine glands (1,3). Alterations to this anatomical structure produce a micro-environmental imbalance that can give rise to inflammation and consequent infection. The following are all important factors:

- The external ear conformation, which can impair ventilation.
- The vertical canal, which can impair natural drainage.
- The natural narrowing and bend of the canal, which favors stenosis.
- The presence of hairs, which can obliterate the canal lumen.
- The abundance of secretory glands, which can produce excess exudate.
- The relatively sealed compartment of the middle ear.

It is also important to emphasize three other points:

- The external ear glands secrete cerumen; this is important for homeostasis of the auditory canal, as it has bacteriostatic and fungistatic properties (2).
- The concept of epithelial migration (1), a self-cleaning mechanism whereby the epithelial cells lining the external auditory canal grow in a synchronized manner towards the exterior, eliminating detritus via a sweeping action. Any alteration of the epithelium, due to edema, hyperkeratosis or chronic inflammation, stops

KEY POINTS

- ➔ Otitis refers only to inflammation of the ear; it is not a full diagnosis.
- ➔ An intact eardrum or tympanic membrane does not exclude the presence of otitis media.
- ➔ Some systemic diseases can produce otitis; indeed this may be the only clinical sign.
- ➔ Failure to identify the primary or underlying cause of otitis may be one of the most important reasons for an owner to consult another veterinarian.
- ➔ A large proportion of all therapeutic failures are due to premature interruption of treatment.

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this migration, and detritus and waste accumulates. If the condition is allowed to continue, inflammation can lead to ossification of the external auditory canal and the associated cartilage elements (1,3).

- The integrity of the eardrum (tympanic membrane) is very important when considering otitis externa and media.

In order for otitis to develop, a number of factors and causes must be present (1-5). These can be considered under the headings of predisposing factors, primary causes, secondary factors and perpetuating factors. A combination of these affects the development of otitis and should be identified by the clinician via the history and clinical examination; the correct approach to otitis is not simply to treat the condition but to address these underlying factors. Predisposing factors and primary causes are set out in **Table 1**. These primary causes are thought to be direct inducers of otitis externa; many of them are suspected but are not definitively confirmed. Identification and control of the primary cause is essential in order to avoid otitis relapse. An animal may have a primary cause of otitis but no disease develops as secondary factors (e.g. bacteria, yeasts or drugs) are absent. Note that any hypersensitivity reaction can induce otitis (1), causing inflammation of the skin and adnexa in the external auditory canal; in fact any self-inflicted trauma, pruritus or itching can lead to otitis. In general the first symptoms are usually erythema of the pinna and vertical canal, with excess cerumen production; this alters the cutaneous ecosystem which is then taken advantage of by bacteria and/or yeasts. In many cases, no exudate is observed until the secondary agents appear.

Note that 80% of all dogs and 20% of all cats with adverse reactions to food are susceptible to otitis externa (1,5). The latest theories reinforce the notion that there may be a close relationship between atopy and adverse reactions to food; indeed a hypoallergenic or elimination diet may prove essential to control otitis externa induced by hypersensitivity phenomena (7).

Secondary and perpetuating factors – pathological changes produced by the combination of primary causes and secondary factors which make otitis chronic or prone to relapse – are shown in **Table 2**.

Failure to identify these factors can lead to ineffective treatment, and a subsequent loss of client confidence.

Persistent treatment is required to avoid relapse of ear problems – in some cases treatment may need to continue for many months. In advanced otitis externa the dermis surrounding the cartilage components undergoes calcification, requiring prolonged systemic antibiotic therapy. The tympanic membrane is also affected in these cases, with color change and a loss of transparency so that the insertion of the malleus is not visible. Note that accumulation of keratin or impacted exudates can be mistaken for an altered tympanic membrane.

🔍 Diagnosis

Otoscopic examination

It is good practice to first examine the healthy or less painful ear in order to avoid resistance on the part of the animal (4). However animal reluctance should not be used as an excuse to avoid a full examination and anesthesia should be employed if necessary. Should there be a ruptured eardrum the ear should first be cleaned using safe cleaning fluids such as warm saline. Drying of the canal is essential – fluid accumulation inhibits vision and will impede adequate exploration – and can be performed with a rubber medical pear, surgical aspirators or abundant gauze. A thorough examination is then possible and the integrity of the eardrum should be verified. This can be a true diagnostic challenge as damage may not be obvious – a ruptured membrane may develop adhesions which can form folds or pockets that mimic an intact membrane (1). If necessary one of the following may be required to confirm rupture:

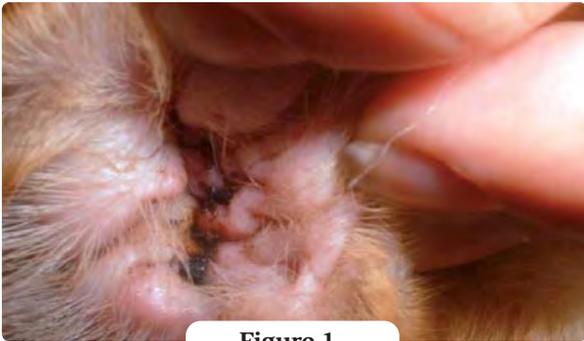
- Filling the canal with saline to check for bubbles, swallowing or coughing.
- Palpating and measuring the length of the canal compared with the contralateral canal, using a flexible probe (e.g. cat urinary catheter).
- Endoscopy.

There are a number of signs to be taken into account in diagnosing otitis and differentiating the affected part(s) of the ear (**Table 3**). The appearance, smell, texture and color of the auricular exudate may provide clues as to the underlying etiopathogenesis (**Table 4**).

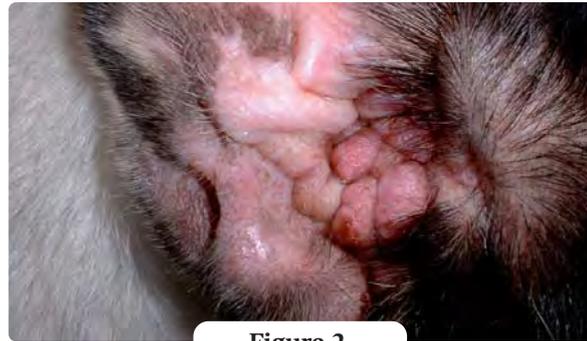
Table 1.

Factors that predispose to otitis externa.		
Factor	Detail	
Breeds with pendulant or drooping ears	Lack of ventilation	
Narrowing of the canal (Figure 1)	Impedes epithelial migration due to accumulation of debris	
Excessive humidity	Ecosystem alterations	
Auricular hypertrichosis*	All of the above	
Seborrheic tendency	Accumulation impedes epithelial migration	
Previous otitis episodes	Stenosis	
Nasopharyngeal polyps (6)	Predispose to otitis media in cats	
Ceruminous gland neoplasms	Lack of ventilation	
Apocrine cysts (dogs) and apocrine cystadenomatosis (cats)	Lack of ventilation and slows epithelial migration	
Narrowed and/or elongated horizontal canal	Can be breed-related, e.g. German shepherd	
Inappropriate care	Humidity due to insufficient drying Microtrauma secondary to tearing of hair* Inappropriate cotton stick application	
*In some breeds it is common to use tweezers to remove hairs from the external ear; in dogs prone to otitis this may be inadvisable because of the resulting microtrauma.		
Primary causes of otitis externa.		
Factor	Detail	Notes
Hypersensitivities	Atopy	80% of atopic dogs develop otitis; 5% have otitis as the sole symptom (1,5) (Figure 2).
	Adverse reactions to food (AFR)	In dogs otitis is seen in 80% of all AFR cases and 20% have otitis as sole symptom (1,5); in cats: 20% of all AFR cases have otitis (5).
	Flea allergic dermatitis	No influence in itself
Ear mites	<i>Otodectes</i>	Can initiate otitis; may go undetected in smear (Figure 3).
	<i>Notoedres, Demodex, Sarcoptes</i>	Infrequent (Figure 4)
Pyoderma	Local primary pyotraumatic dermatitis or intertrigo	
Epithelization and metabolic alterations	Endocrine disorders or primary seborrhea (Figure 5)	
Foreign bodies (typically grass seeds)	Commonly a seasonal incidence	
Pathogenic bacteria	<i>Pseudomonas</i> or <i>E. coli</i> , which can affect immune-compromised animals; may originate from contaminated water.	
Irritative contact dermatitis	The outermost section of the vertical zone of the canal and pinna are worst affected. Agents (e.g. propylene glycol ear cleaners) may be a primary cause, acting via allergic mechanisms; or secondary (e.g. neomycin) if otitis is already established, involving irritative mechanisms.	
Juvenile cellulitis	Sterile fistulized pyogranulomas	
Autoimmune conditions	Pustules, crusts and erythematous plaques (Figure 6)	
Viral diseases	Cause pharyngitis and inflammation of the eustachian tube (6).	Due to immune suppression or can induce polyps secondary to metaplasia of the middle ear mucosa (6).
Neoplasia	Polyps/adenomas/adenocarcinomas.	

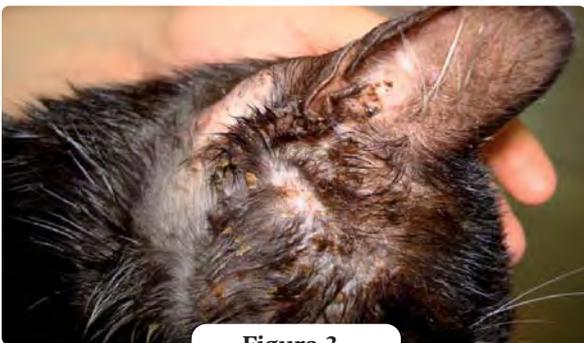
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**Figure 1.**

Narrowing of the auditory canal in a shar pei.

**Figure 2.**

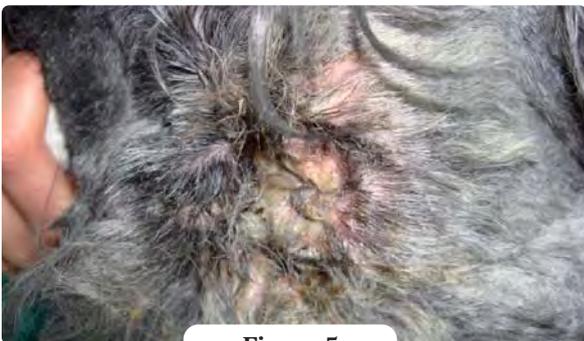
Hyperplasia of the auditory canal in an atopic dog.

**Figure 3.**

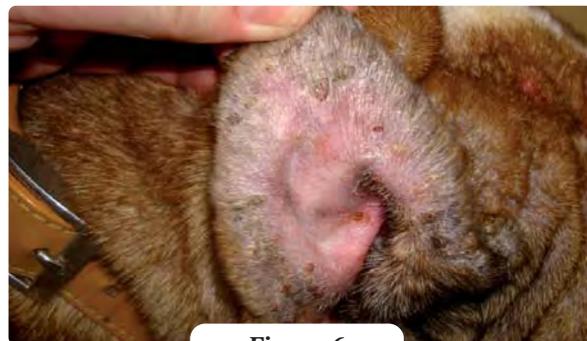
Feline otitis due to *Otodectes cynotis*.

**Figure 4.**

Canine otitis due to *Demodex*.

**Figure 5.**

Otitis externa secondary to primary seborrhea in a cocker spaniel.

**Figure 6.**

Otitis due to pemphigus foliaceus in a dog.

Cytology

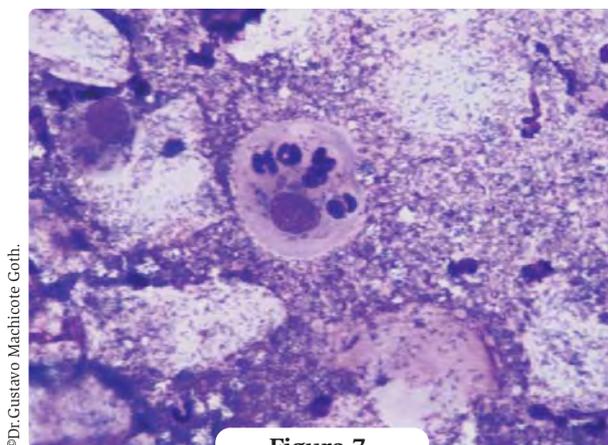
Cytology is an essential complementary technique for diagnosis and monitoring of treatment. It is the technique of choice – rather than culture – and should be performed before any empirical or first line therapy. Cultures and antibiograms are usually performed for recurrent otitis or if rods are present (5). Commercial kits for immediate staining are very useful (**Figure 7**) though cannot differentiate gram organisms. If the extracted sample is ceruminous it is advisable to flame-fix the preparation, otherwise the lipid content may be washed away by the alcohol in the kit. When

dealing with a case of complex otitis previously subjected to different treatments or which has failed to adequately respond to therapy, cytology and sample collection must be performed, differentiating between samples from the vertical canal and those obtained close to the eardrum. Myringotomy may prove necessary for obtaining samples from the middle ear.

With external canal cytology, a number of authors advocate that the presence of more than three *Malassezia* organisms, five cocci or one bacillus per immersion oil field is strongly suggestive of

Table 2.

Secondary factors in otitis externa.	
Factor	Detail
Bacteria	Almost always act following a primary cause.
Yeasts	Mainly <i>Malassezia pachydermatis</i> . Proliferate due to alterations of the flora and otic environment.
Topical drug reaction	Propylene glycol, neomycin and other components that act on already established otitis (Figure 8).
Factors that perpetuate otitis.	
Otitis media	Inflammation, mainly of the bulla, with or without an intact tympanic membrane.
Progressive pathological changes of the ear	Hyperkeratosis, stenosis, mineralization, hyperplasia, ruptured tympanic membrane.



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Figure 7.

A typical cytological preparation from a dog with severe otitis. Note the bacilli and a macrophage with nuclei of phagocytosed neutrophils.

infection (2,5). This is confirmed if neutrophils are also observed. In the middle ear, one bacterium per field, or alternatively the presence of neutrophils or nuclear remnants, is significant (5).

◇ Treatment

It is essential to determine as far as possible the various causative factor(s). Thorough ear cleaning is necessary not only for inspection but also as treatment.

Hygiene and cleaning techniques

Hygiene is essential to remove perpetuating elements and to ensure effective treatment. Washing seeks to eliminate exudates that interfere with therapy and bacterial toxins, cell detritus and free fatty acids that stimulate inflammation



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Figure 8.

Severe inflammation due to a topical drug reaction.

(8); washing also has an astringent effect which can inhibit ear fold dermatitis. It is important to soften the accumulated earwax using cerumenolytic agents (**Table 5**) - if possible eardrum integrity should be verified before performing the washings as this may determine which fluid should be used - and the agent should ideally be allowed to act for 5-15 minutes before being fully rinsed with saline (5,9). In otitis media, cleaning must extend to the middle ear.

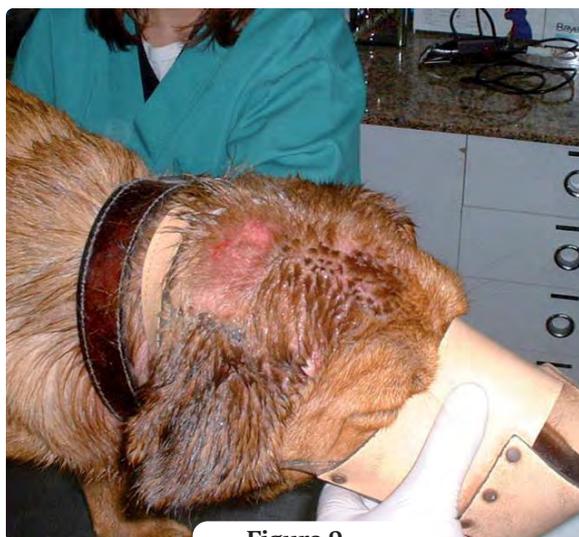
The clinician should be careful when dealing with otitis in cats; they are much more sensitive to irritative middle ear problems and whilst vestibular dysfunction in dogs can take from only hours to two days to recover, in cats recovery is slow, and the prognosis can be poorer. With a clean ear,

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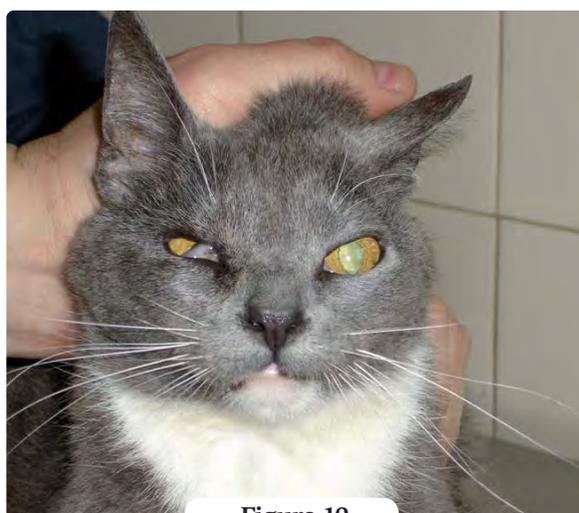
Table 3.

Signs of otitis.

Otitis externa	<ul style="list-style-type: none"> • Head-shaking • Pain, itching and lateralization • Erythema of the external ear • Foul odor • Hairs adhered by crusts and exudates • Aural hematoma • Lateral-dorsal facial pyotraumatic dermatitis (Figure 9)
Otitis media	<ul style="list-style-type: none"> • Thickened and/or ruptured eardrum, with opacity or color changes • Ruptured eardrum with debris in middle ear • Deformed and/or radio-opaque bulla on radiography • Head tilt due to vestibular involvement. • Facial nerve paralysis (drooping eyelid and abolished palpebral reflex) • Sympathetic system involvement (Horner's syndrome: miosis, enophthalmos and protrusion of the nictitating membrane) (Figure 10) • Parasympathetic system involvement (keratoconjunctivitis sicca) • Pain when opening mouth and/or palpating bulla • Head shaking, hearing defects, pain, odor and lethargy
Otitis interna	<ul style="list-style-type: none"> • Asymmetrical ataxia with wide-based stance • Head tilt • Walking in circles/falling • Horizontal or rotational nystagmus • Vomiting (in the acute stage)

**Figure 9.**

Pyotraumatic dermatitis of the forehead and dorsal surface of pinna.

**Figure 10.**

Horner's syndrome in a cat with otitis media.

a ruptured tympanic membrane can heal within 5-10 days (1). The use of cotton sticks or balls with tweezers is not advised for cleaning deep into the ear, since direct damage to the eardrum may result; alternatively, pressure and inward displacement of the luminal contents may cause membrane rupture, whereby detritus accumulates in the bulla, giving rise to otitis media.

Topical treatment

Topical formulations generally combine glucocorticoids/anti-inflammatory agents, antibiotics, antifungal agents and antiparasitic drugs. In some cases the products may contain one, two or

more components. The veterinarian should be aware of the vehicle in the drug formulation; oily vehicles or ointments should be chosen for dry otitis with scaling or crusts, while aqueous formulations (solutions or lotions) are used in exudative otitis. It is important for the medication to extend deep into the ear. Owners tend to be reluctant to use a cannula for administering a product and so should be instructed to spread the pinna upwards and then massage the ear after instilling the treatment. The amount to be administered depends logically on the size of the animal, and it is preferable to speak of a stream of liquid rather than droplets.

Table 4.

Types of exudate seen in otitis.

Appearance	Etiology
Dry coffee grains	Otocariasis
Humid brownish material	Cocci and yeasts
Purulent creamy yellow, foul odor (<i>Figure 12</i>)	Gram negative organisms
Yellow-brown, waxy-greasy material, stale odor	Ceruminous-seborrheic otitis
Gray caseous material, stale odor	Mycotic otitis

The first choice antibiotics are the amino-glycosides, since their spectrum of action covers most of the prevalent bacteria in ear disease. Fluoroquinolones may be a good choice in severe otitis produced by gram-negative organisms. In cases of intensely purulent otitis, polymyxin may be inactivated; as a result, it is best to select another antibiotic in those situations where good prior cleaning is not possible (5). When the antibiogram results suggest the administration of an antibiotic not available in eardrops, use can be made of eye-drops or injectable formulations that can be adapted for use in the ear.

For otitis due to *Malassezia* (*Figure 11*), the effective available agents are miconazole, posaconazole, clotrimazole, nystatin or ketoconazole, 0.05% chlorhexidine, or 2% acetic acid + 2% boric acid. When considering aural antiparasitic agents, it must be remembered that *Otodectes cynotis* is a primary cause of otitis. The most commonly used drugs against *Otodectes* are pyrethrins, macrocyclic lactones (ivermectin, selamectin, moxidectin), amitraz (not in cats), fipronyl (intra-auricular drops in the presence of an intact eardrum) or the oily components of different eardrops. In acute cases with major inflammation and pain, a potent corticosteroid is indicated (e.g. betamethasone, mometasone, fluocinolone); once the process has been controlled, or in cases where treatment is prolonged, a less potent agent such as hydrocortisone should be used. In some cases cutaneous hyperplasia can occlude the entrance to the ear to the point where an otoscope cannot be inserted. In these cases systemic medication with immunosuppressive levels of corticosteroid may be required (10) for 3-14 days, followed by halving of the dose every 48-72 hours as maintenance treatment. Corticosteroids not only reduce the inflammation but also lessen the viscosity of the ear contents, thus facilitating their expulsion.

Tacrolimus as an ointment or solution for topical application can be used as long-term maintenance

Table 5.

Ceruminolytic agents

Agent	Action	Components
Surfactants	Reduce surface tension and act as humectants or detergents	Docusate sodium
Detergents	Emulsify waxes and lipids	Sodium laurylsulfate
Humectants	Humidify and stabilize water content	Propylene glycol - Glycerin - Mineral or vegetable oils - Urea - Triethanolamine - Squalane (*) - Physiological saline (*)
Regenerating agents	Skin barrier maintenance	Phytosphingosines
Acids and alcohols	Act as desiccants	Isopropyl alcohol - Boric acid - Benzoic acid - Salicylic acid - Acetic acid - Lactic acid
Proteolytic enzymes	Protein degradation	Proteases
Antiseptics	Antibacterial and antimycotic effects	0.05% chlorhexidine (*) - Boric acid - 2% acetic acid (+/- 2% boric acid) (*)
Alkalinizing agents/antiseptics	Bactericidal and enhancement of antibiotic action	Tromethamine-EDTA (*)

*: safe for use with ruptured eardrum.

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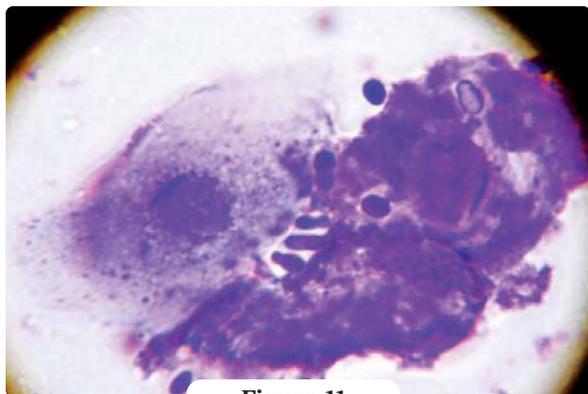


Figure 11.

Malassezia pachydermatis obtained by cytology in a case of otitis externa



Figure 12.

Severe purulent otitis.

where the ear has a tendency towards hyperplasia and inflammation (11) and may be an option in cases of feline necrotizing otitis (12).

When there is severe otitis, it may be necessary to administer anti-inflammatory drugs and antibiotics systemically. Systemic therapy should also be considered where topical treatment is not possible (e.g. canal obstruction, poor owner compliance).

Conclusion

All clinicians have had the disagreeable experience of being unable to control or resolve otitis, viewing surgery as a valid treatment option in such situations. However, it must be emphasized that if the primary causes are not detected and avoided, surgery can also be condemned to failure. In the more serious cases where the morphological changes prove irreversible and the resolution of

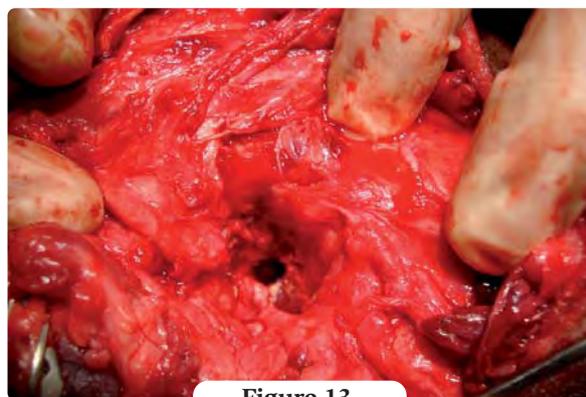


Figure 13.

Intra-operative view of lateral bulla osteotomy with total duct ablation.

otitis becomes impossible, total canal ablation with drainage of the bulla contents may be the only solution (Figure 13).

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