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# Otitis Externa and Surgery

by  
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Otitis is defined as an inflammation of the ear. There are three recognized types of otitis corresponding to inflammation in the various parts of the ear. Otitis externa is an inflammatory disease of the external ear canal. An inflammatory disease of the middle ear is otitis media and of the inner ear is otitis interna. These three diseases can be seen alone, but if left untreated or improperly treated, disease in one location will lead to involvement in the other areas, as they communicate.

The number of otology cases greatly exceeds the yearly number of cases in ophthalmology, orthopedic surgery, urology and neurology (13). Some dogs are more prone to ear problems because of their heredity, including breed and anatomy, their environment and their activities. Breed susceptibility is difficult to accurately determine because of varying breed popularity with location and time. The most commonly afflicted breeds are poodles, Spaniels, Retrievers, German Shepherds and terriers (5). Predisposition for otitis is associated with pendulous ears, long hair on the pinna and hair within and

around the external auditory meatus, a predisposition to various allergies or to those who enjoy being in the water and swimming.

The most frequently seen ear problem in dogs is otitis externa. It is most frequently seen in dogs from 1-2 years of age, but is common from 1-4 years (9). There is no apparent correlation of occurrence with sex, relative humidity or month of the year, although the highest number of cases are treated in the summer (9). The tendency to ignore dogs that scratch at their irritated ears results in more chronic than acute cases being presented which are usually bilateral.

## ***Etiology***

The causes of otitis externa are numerous but often go undiagnosed. Knowing the etiology speeds recovery because the proper treatment can be used initially. Causes include foreign bodies, parasites, trauma, allergic skin diseases, general infections, bacteria and fungi.

Grass awns, bugs, dirt, matted hair, water and dried wax are foreign objects commonly found in the ear canal. When the canal is occluded, a continuously moist, warm, dark chamber is created that is ideal for bacterial propagation. Shed epithelium, cerumen and other debris, especially in an ear canal filled with hair, are sources of

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irritation to the external ear and excellent media for bacterial growth.

Mites, primarily *Otodectes cyanotis*, and less commonly *Sarcoptes scabiei* var *canis*, *Notoedres cati*, *Demodex canis*, *Eutrombicula alfreddugesi*, and *Cheyletiella yasguri* have elicited otic irritation (17). *Otodectes cyanotis* feeds on cellular debris in the ear canal by puncturing the surface epithelial lining. During this gustatory activity, saliva and other secretions cause an inflammatory response. This irritation and allergic skin response initiates pruritus, increased ceruminous and sebaceous secretions and glandular hyperplasia, increased circulation producing hyperemia and then edema, and increased otitic epithelial thickening. A crumbly, dark tenacious waxy crust is formed by the accumulation of serum, cerumen, surface epithelium, mites, mite eggs and debris. Secondary bacterial invasion commonly occurs under these conditions resulting in microabscesses, ulcers, necrotic areas and often a purulent exudate.

Any species of tick can find shelter in the ear canal. It provides a rich blood supply under a thin layer of epithelium. Infestation by larvae and nymphs cause otitis externa by creating local-to-general hyperemia via secretions of toxin laden proteinaceous saliva and an anticoagulant. Secondary bacterial infection also adds to the irritation and pruritus, which is so severe that self-mutilation can result.

Almost any organism found on the skin of a dog or cat can at some time be isolated from the normal ear canal. Their presence as commensals of the ear is generally not recognized until conditions are proper and these organisms act as pathogens, however, they seldom cause primary otitis or copious purulent discharges. *Staphylococci* spp. and *Streptococci* spp. are common isolates in cases of acute otitis externa (13). The most frequently isolated pathogens in chronic otitis externa are *Proteus* spp., *Pseudomonas* spp. and *E. coli* (13), which are not normally in the outer or middle ear of healthy dogs, but prevalent in dogs with dermatitis. *Staph. aureus* is the most important agent of purulent otitis.

Otomycosis is often the result of prolonged antibacterial therapy to the

ears. *Candida albicans* is most frequently seen as a copious amount of purulent, creamy, yellow exudate in dogs that were on broad spectrum antibiotics in the ear canal. The most commonly isolated pathogens are *Candida albicans*, *Microsporium gypseum*, *Microsporium canis*, *Trichophyton mentagrophytes*, *Trichophyton rubrum*, and *Pityrosporum* (16). Common fungal contaminants include *Alternaria*, *Aspergillus*, *Penicillium*, *Rhizopus*, and yeast (16). These occasionally colonize in infected ears.

Indurative or proliferative otitis can develop if chronic otitis is not cured. The lining of the external ear becomes thickened, irregular and wart-like in appearance with tracts extending into the perichondrial tissue. The wart-like masses of glistening granulation tissue prevent drainage from the canal. A similar situation may develop after radical aural resection for chronic otitis externa (4). In this case the sebaceous glands undergo hyperplasia causing the rugae of the external ear canal to increase in size and thickness with a brown wax-like exudate in the fissures. The glandular hyperplasia may cause post-operative pruritus.

Ceruminous otitis externa is a functional condition with the sebaceous and tubular glands of the ear producing excess cerumen. This condition is a reflection of abnormal skin health all over the body, many times accompanying generalized seborrhea. Ceruminous otitis is also seen with hypogonadism, hypothyroidism, sertoli cell tumors, Cushings disease, distemper and a general lowering of body resistance. It is usually ignored until the general condition is overcome. If this condition is primary, the prognosis is questionable.

Atresia of the vertical ear canal can result from trauma and subsequent abnormal healing, or it may be a congenital or inherited anomaly. The escape of ceruminous secretions is prevented; these accumulate, producing chronic irritation, pressure on the tympanic membrane, painful swelling around the ear canal, and some hearing loss. Some cases of vertical canal atresia have fistulous tracts extending from the horizontal part of the canal to the outside. These should not be confused with

a sinus tract found at the base of the ear from a dentigerous cyst.

### **Clinical Signs**

The signs of ear infection vary depending on the stage and severity of the disease. The inside of the ear is normally dry and has a light pink color. Acute cases appear hot, swollen, red and ulcerated and exudate and odor may be present. In chronic cases the lining appears thickened and tough, discharge and odor may be present and the tympanic membrane may lose its transparency and darken with a perforation or be totally disintegrated. Otitis externa is painful and irritating, provoking the dog to paw at the ear, shake the head and/or to rub its head on the ground. This traumatic activity may produce a hematoma or marginal auricular dermatosis (ulceration of concha), which resembles "corn meal" on the ear. The condition is thought to be caused by ear shaking, frostbite, fungi, or seborrhea sicca. Epileptiform seizures with dilated pupils and wild running may be seen in hypersensitive animals with otocariasis (17).

If the tympanic membrane has perforated (usually at the pars tensa) or is disintegrated, the middle ear and the external ear are no longer separated and otitis media is found in conjunction with otitis externa. In longstanding cases treated for otitis externa, even though the tympanic membrane may be intact, otitis media should be suspected. In addition to the signs of otitis externa the dog with otitis media is lethargic, inappetent, and sometimes febrile, head shaking is finished slowly and stops with the head at a tilt.

Otitis interna may be seen with otitis externa and media or alone. With this condition, a vestibular syndrome (3) is seen: head tilt toward the affected side and, with increased severity, circling and rolling; horizontal nystagmus opposite the direction of the head tilt; ataxia from impingement of the proprioceptive apparatus. A dysfunction in the connections between the vestibular nuclei and nerves controlling the extrinsic muscles of the eye are responsible for the nystagmus seen in many vestibular disorders. In both otitis media and interna it may be noted that the dog does not open its mouth wide and shows pain on eating, especially hard food.

This is due to temporomandibular involvement.

### **Diagnosis**

Diagnosis is aided by a visual examination, history and signs, culture techniques and radiology. The ear should be examined grossly and with an otoscope for inflammation, epithelial hypertrophy and discharges. Both the vertical and horizontal canals should be examined.

Swabs should be taken from each ear canal before any ear cleaning or treatment has begun. The inner surface of the pinna should be scrubbed and disinfected, as for surgery, prior to culturing. Care must be used so that no water, soap or disinfectant enters the canal. Media can be streaked for bacterial (blood agar) and fungal (Sabouraud dextrose agar with cycloheximide and chloramphenicol) isolations and sensitivities. A microscopic exam of the discharges can reveal the presence of ear mites and of fungal infections. Exfoliative cytology can also be performed on the sample.

Radiographs can be taken to detect any change in bony density, fibrous tissue or the presence of exudate in the middle ear. There may be increased density of the ear canal or the petrous temporal bone, destruction and/or new bone formation in the wall of the tympanic bulla, and new bone formation around the temporomandibular joint. Oblique, dorsoventral, and openmouthed views are taken. To facilitate visualization of a ruptured tympanic membrane and to test the patency of the Eustachian tube 2-5ml. of oily contrast material (Lipiodal: May and Baker) may be injected into the external auditory canal (8).

### **Pathological Changes**

Irritation in the ear canal increases secretions from the sebaceous and deeper ceruminous glands which leads to hyperplasia of sebum producing glands. Blood circulation to the subcutaneous tissue is also increased, producing hyperemia and edema. Because the lining is more tightly adhered in the lower canal, slight edema causes excessive pressure and partially accounts for the intense pain associated with otitis. As the condition gradually

becomes chronic there is increased mitotic activity of the basilar epithelial cells and the thickness of the surface squamous cell epithelium is increased from 3 to 20 times or more and may become ulcerated. Hyperkeratosis of the hair follicles and proliferation of the fibrous tissue is seen with chronic cases. The number and size of the sebaceous glands decreases, being displaced by enlarged cyst-like ducts of ceruminous glands filled with colloidal material, bacteria and white blood cells. The cartilage of the ear canal can change to bone and form a stenosis of the ear canal. If calcification is present the tympanic membrane is usually involved. When the ear canal has narrowed and calcified surgery is performed to open up and dry out the canal.

The appearance of the normally translucent, pearly-gray and glistening tympanic membrane helps to characterize the type of otitis media present. Sometimes the tympanic membrane appears intact, but careful observation may reveal a small peripheral dark crust, indicating a minimal perforation. In chronic otitis the eardrum may lose its transparency and darken with a perforation or totally disintegrate. A perforated eardrum usually heals in 2 weeks and leaves a white scar when vascularization has disappeared. A bluish translucence indicates intra-tympanic hemorrhage; isolated hemorrhages may occur in the tympanic membrane (18). In acute otitis media the eardrum is red and may indicate the beginning retraction of the tympanic membrane (18). A diffuse opaque white area surrounded by red suggests pus within the tympanic cavity; the membrane may bulge (18). The presence of serous transudate and air bubbles may give the eardrum a translucent amber color (18). The tension on the tympanic membrane should be observed. Normally it is slightly concave, but it may bulge if exudate is present in the cavity. Any membrane thickening should also be noted.

An inflammation of the pharynx and tonsils may be related to otitis media. When the middle ear is infected via the Eustachian tube and before the exudate of otitis media becomes purulent, it can temporarily drain out thru the Eustachian tube. The mucosa of the Eustachian tube

eventually becomes inflamed and swollen, occluding its lumen. The inflammatory exudate then accumulates and may stretch the eardrum outward and cause it to rupture in acute cases. If the exudate does not escape it will organize and connective tissue often forms about the ossicles, restricting their movement and resulting in deafness (18). A more serious consequence in the extension of the inflammation thru the round window or oval window into the inner ear resulting in deafness, severe ataxia or paralysis of the seventh cranial nerve. Frequently, inner ear infection extends into the cranial cavity thru the internal acoustic meatus with the eighth cranial nerve resulting in meningitis or encephalitis with fatal consequences.

### *Treatment*

Treatment of otitis externa should begin after the ears have been cultured and a thorough otoscopic exam has been done. The treatment varies with the 1) sensitivity of the ear, 2) degree of erosion and inflammation, 3) nature of the exudate, 4) degree of impaction and/or 5) type of trauma or irritation (12).

Excessive gland secretions, pus and debris can markedly alter the effectiveness of topical medication. The ear canals should, therefore, be thoroughly cleaned prior to medical treatment. Cerumenolytics are used to soften debris and deposits. By externally massaging the ear canal for 3-5 minutes the cerumenolytic agent can make better contact with debris, be worked further into the canal and will mechanically help to breakdown deposits. After loosening the exudate in such a manner it should be flushed out with a bulb syringe or a water-pik. When using a bulb syringe the canal can be flushed with a solution containing a cerumenolytic or a solution of disinfectant soap (Philsohex®). Alcohol, ether, and other irritating solvents are contraindicated when cleaning the ear canal because they cause pain and may stimulate swelling of already edematous tissue. The use of a dental Water-Pik® (Aqua-Tec) (6) can be especially helpful in cases of chronic otitis externa and should be done under anesthesia. It is suggested that a solution of warm water and antiseptic [Novasan® (chlorhexidine) or Betadine®

(pyrrolidone-iodine)] be used with the Water-Pik® at its lowest pressure. Within minutes all the exudate and debris from the external acoustic meatus to the tympanic membrane are flushed from the canal. After using solutions to flush the canal a warm water flush is needed to rinse out any possible chemical irritation. Care must be taken when flushing or irrigating the canal so excessive force does not cause the eardrum to rupture. If a rupture does occur it will heal rapidly provided debris is not flushed into the middle ear and that infection is removed from the area of the eardrum. Flushing may cause nystagmus, ataxia or hearing loss for 7-14 days in cases where the tympanic membrane was perforated prior to or during flushing. Any stubborn deposits that may remain after the use of cerumenolytics and flushing can be broken up with ear loops or currets and then flushed again. The ear canals should then be dried with cotton and cotton swabs. Any excess hair in the canals should be removed with a depilatory agent or by pulling it with forceps.

Following this initial cleaning, ointments containing all or some of the following are usually employed: antibiotics, cortisone drugs, enzymes, insecticides, mineral oil and wax-dissolving agents. If the dog continues to scratch and abuse the ear, sedatives, pain killers and a restraint collar may be used.

The cause of otitis should be treated specifically. Systemic treatment should be used in chronic cases, those with ulceration or where otitis media or interna are involved. By cleaning and treating ears daily the condition is usually controlled in 5-7 days. If profuse bleeding occurs, clean the canals only every 2-3 days. Ear infections may become refractory to treatment; therefore, if little improvement is seen after using a product for 2 weeks, the ear should be recultured and another sensitivity test run. If the condition is nonresponsive to topical treatment for a month, otitis media is probably present. A follow-up culture should be done. Sometimes local instillation of nasal antibiotics has reduced the number of relapses and spread to the opposite ear. Assuring a patent Eustachian tube will provide a drainage route in cases of otitis media. Treatment is often enhanced by

exposing the ear canal to air and sunlight. This will help to dry out the canal and make it less suitable for microorganisms. It can be accomplished by taping the ears over the dog's head. If the dog habitually scratches at his ears an Elizabethan collar or similar device should be worn.

Overtreatment is hazardous. It may complicate the infection by creating a moist environment which favors opportunistic bacteria or fungi.

Overdosage of certain drugs, kanamycin, neomycin, dihydrostreptomycin, gentamicin and salicylates, can cause deafness and/or vestibular ataxia. These drugs produce a selective degeneration of the specialized epithelium in the cochlea, vestibule, or both. If there is mild vestibular damage, if overdosage is not excessive or prolonged, there may be a remission of clinical signs via brain compensation for aural lesions. Permanent deafness can result. Ototoxicity may occur more readily if the tympanic membrane is perforated and absorption into the inner ear occurs more quickly and easily.

Treatment of bacterial ear infections should be determined by the results of sensitivity testing. Chloramphenicol is one of the most effective antibiotics in *Proteus*, *Pseudomonas*, *Strep.* and *Staph.* infections. Neomycin is often effective in bacterial otitis. Fungi may be responsive to griseofulvin or undecylenic acid. *Candida albicans* is usually sensitive only to nystatin (in Panalog.®) Pityrosporum infections have been successfully treated with 1% Roccal solution.

Parasitic mites found in the ears are usually overcome by treating the ears once a week with Rotenone .25% in oil and/or with chlordane or lindane. Sometimes mineral oil alone will cause the mites to suffocate.

Foreign bodies, ticks, and other insects can be removed from the ear canal with alligator forceps or a wire loop passed thru the otoscope. Ticks should be killed after removal; alcohol is effective for this purpose. After removal, discomfort often disappears and no further treatment is necessary.

In cases where ulcers are present, 2-5% silver nitrate solution or tannic acid can be used for their astringent and antiseptic

action. If pain and swelling are extreme, a few drops of corticosteroid may be instilled before the antibiotic, until the acute phase has subsided. Corticosteroids may be found in combination with antibiotics in some products, i.e. Gentocin Otic® (3mg. gentamicin sulfate and 1mg. betamethasone valerate per 1ml given b.i.d.: 3 drops if less than 20#, 5 drops if 20-40# and 8 drops if greater than 40#) (19).

An unfavorable prognosis must be given in treatment of primary ceruminous otitis. Continuous treatment is necessary using cerumenolytics, astringents, 20% aluminum Cl, salicylic acid, sulfur, hexachlorophene and/or radiation.

When medical treatment has failed or was initiated too late in the course of the disease, surgery may be indicated. The purpose of surgery is to provide dryness, aeration, light, ease of administering medication and drainage. There are several techniques and modifications for exposing the ear canal to the outside by cutting away part or all of the canal. Ablation involves removal of the infection along with the ear canal. All signs are removed and there is rapid healing, but ablation does diminish hearing. Lateral resection of the ear canal is beneficial when there is severe induration or proliferation of tissue because it facilitates treatment.

To insure success a presurgical prep should be done at least 6-8 hours prior to surgery. The earflap and an area surrounding the base of the ear should be clipped. The clipped area and the ear canal are washed with soap and water and dried. An antibiotic is instilled in the canal and the skin is painted with antiseptic, a head bandage is used to hold a sterile dressing over the surgical field.

#### LaCroix-Zepp—Ear Draining Operation (20)

1. A sterile swab is introduced into the ear canal to indicate direction and depth.

2. The vertical ear canal is outlined and palpated to where it turns horizontally into the head. The skin rostral and caudal to the ear canal is incised, then connected by a transverse incision ventrally.

3. The skin flap is dissected away from the ear canal and the cartilage is isolated.

4. The ear canal is incised at the

posterior and then the anterior edge, diverging to make the cartilage flap wider toward the base of the ear. The incisions are continued to the beginning of the horizontal canal.

5. The skin lining the inside of this cartilage flap is dissected free in a transverse line at the point where a transverse incision will be made through the cartilage to make a hinge-like junction. The cartilage is then incised.

6. The cartilage flap is extended ventrally and cut to the desired length and shape to match the skin incision.

7. This "T" shaped incision is then sutured with simple interrupted sutures of 3-0 prolene or stainless steel going through both skin and cartilage.

8. If hyperplastic skin and subcutaneous tissue are partially blocking the orifice to the horizontal canal it can be excised.

The hinged piece of cartilage acts as a drainboard for discharges, prevents formation of granulation tissue and growth of hair that would block the canal.

Postoperatively, self-mutilation should be prevented by protective bandaging and sedation. To do this a head box or Elizabethan collar may be worn. The ears can be taped over the head; gauze soaked in antiseptic should cover the wound and the head should be fitted with a loose stockinet. The ears should be gently cleaned and medicated daily to remove discharges and exudate. Stitches are removed when healing seems complete, usually from 6-10 days. A small percentage, especially those with severe proliferative otitis, swell so much that some or all of the sutures slough by the 3rd or 4th day postoperatively. The area is then treated as an open wound, necrotic tissue is debrided as necessary and an antiseptic dressing is applied.

This procedure is most beneficial if no ulcers or constrictions are present in the deeper horizontal portion of the canal. It is most likely to be unsuccessful when longstanding cases of indurative hyperplastic otitis externa are complicated by ulceration of the annular cartilage in the horizontal canal.

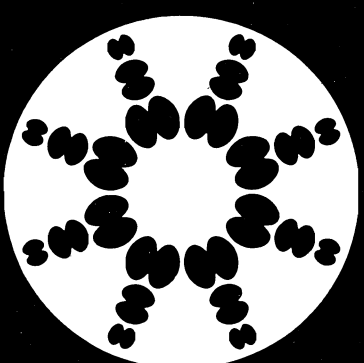
#### **Conclusion**

Otitis externa, together with neglect, can steadily progress to the point that the condition and its damage cannot be

reversed. The best approach to otitis externa is to prevent it. This can be attempted by educating dog owners and groomers. They should be informed of the importance of keeping the external acoustic meatus free from hairs, keeping water and irritants out of the ear canal and of keeping dirt and debris out of the canal. They should realize that a dog who scratches and paws at his ears and shakes his head is in discomfort and proper veterinary attention should be sought.

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