Surgical Diseases of the Ear

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Diseases of the ear canal and middle ear are common in dogs and cats and are often associated with or exacerbated by generalized allergic skin disorders (e.g., atopy). Attention to medical and allergic aspects of generalized diseases that affect the ear is important to overall success when surgery is necessary. It is rare for ear disease to require an immediate surgical procedure, but some traumatic injuries may benefit from early treatment. The pinna of the ear is most commonly affected by trauma, aural hematomas, and tumors. The external ear canal is more commonly affected by ear infections in dogs (and to a lesser extent in cats), but trauma (ear canal avulsion or bite wound injuries) and neoplastic processes do occur. Infectious, inflammatory, and neoplastic conditions of the external ear canal may devitalize and rupture the tympanum if obstruction of the canal lumen occurs. The result is secondary otitis media and persistent drainage from the ear.

Diseases of the middle ear are usually secondary to processes involving the external ear canal; however, in cats and very rarely in dogs, inflammatory polyps arise in the middle ear, extend either through the tympanic membrane or down the eustachian tube on a stalk, and grow within the nasopharyngeal tube, resulting in partial or complete nasopharyngeal obstruction. Cholesteatomas produce keratinous debris, which accumulates, and the cystic mass can eventually expand within the middle ear from a location adjacent to the tympanum (e.g., prolapsing into the middle ear cavity from the external ear canal). Neoplastic diseases such as squamous cell carcinoma and ceruminous gland carcinoma can invade the middle ear and surrounding structures, producing specific clinical signs, including facial nerve paralysis and Horner’s syndrome.

Surgical procedures are used adjunctively to treat external ear canal disease (e.g., lateral ear resection, vertical canal resection), resolve end-stage otitis, or aggressively excise neoplastic conditions (total ear canal ablation [TECA]). Otitis externa or obstruction associated with congenital or traumatic stenosis of the ear canal may be resolved by modifying the canal structure or by vertical ear canal ablation or TECA. Procedures that enter the middle ear include lateral bulla osteotomy (LBO), performed in association with TECA, or a ventral bulla approach. Various techniques may be performed to achieve drainage from the pinna to resolve aural hematomas.

Diagnostic Criteria

Historical Information

Gender Predisposition
• None.

Age Predisposition
• Congenital stenosis (dogs): Clinical signs that relate to stenosis of the ear canal usually begin early in life (<18 months).
• Otitis externa: Breeds that are predisposed to otitis externa, such as cocker spaniels, may develop end-stage otitis (obstruction) very early in life (2–3 years), but obstruction more commonly occurs after years of chronic otitis.

Also in this issue:

8 Primary Hyperparathyroidism
• **Inflammatory polyps** (cats): Clinical signs are most common in young cats (<3 years).
• **Traumatic injury**: Can occur in animals of any age.
• **Neoplastic disease**: Usually occurs in aged dogs and cats, although histiocytomas on the pinna may occur in young animals.

**Breed Predisposition**

**Otitis Externa**
- Floppy-eared breeds, especially cocker spaniels.
- Beagles and Irish setters are underrepresented.
- German shepherds are overrepresented among the erect-eared breeds.

**Congenital Ear Canal Stenosis**
- Chinese shar-pei (vertical ear canal).
- Chow chows also have narrow ear canals.

**Inflammatory Polyps**
- Cats.
- Very rarely reported in dogs (Chinese shar-pei).

**Neoplasia**
- Ceruminous gland carcinoma: Cocker spaniels.
- Squamous cell carcinoma: Cats (especially in areas with less pigmentation).

**Owner Observations**
- Head shaking or head tilt.
- Scratching the ear.
- Drainage from the ear (purulent or bloody).
- Pain response when the ear is touched.
- Pain on opening mouth.
- Foul odor from the ear.
- Obvious growth (mass) in or around the ear.
- Inability to hear or diminished hearing ability.
- Occasionally dysphagia or respiratory noise.
- Nasal discharge.
- Drooping facial structures (ipsilateral facial paralysis); absent blink reflex.
- Ocular changes (Horner’s syndrome).

**Other Historical Considerations/Predispositions**
- Generalized skin disease; allergic conditions such as atopy and food allergy.
- Humid, warm climates (e.g., as occurs in the southeastern United States).
- Moisture and maceration of the ear canal.
- Excessive ear cleaning.
- Presence of systemic disease that affects cell-mediated immunity.
- Long-term use of ear medication; topical allergy to medications.

**KEY TO COSTS**

$ indicates relative costs of any diagnostic and treatment regimens listed.
- $ costs under $250
- $$ costs between $250 and $500
- $$ costs between $500 and $1,000
- $$ costs over $1,000

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To provide busy practitioners with concise, peer-reviewed recommendations on current treatment standards drawn from published veterinary medical literature.

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Physical Examination Findings

**Traumatic Injury**
- Swelling with bleeding or obvious trauma (lacerations, bruises).
- Systemic signs of shock depending on type of trauma (e.g., head trauma).
- Hemorrhage in ear canal with avulsion.
- May be other injuries unrelated to the ear.
- Chronic avulsion with stenosis: Absence of canal or stenosis with swelling peripheral to the base of the ear canal.

**Otitis Externa**
- Head shaking.
- Pain response when ear is examined.
- Foul odor or drainage, which may be blood tinged, from the external ear canal.
- Varying degree of head tilt on the side of the infection.
- Varying degree of hearing loss.
- Decreased ear canal pliability (the ear canal becomes more rigid) as the inflammatory response is more chronic.
- Obstruction of the ear canal.
- Mass (neoplasia or polyp) may be noted.
- Draining fistulae (abscess rupture with obstruction; i.e., infection within the obstructed ear canal perforates or breaks out through the canal wall, causing abscessation peripheral to the ear canal; a sinus tract develops when this situation becomes chronic).

**Otitis Media**
Many of the signs listed for otitis externa may also be present in patients with otitis media, as the latter is commonly an extension of the former; however, otitis media may occur without external evidence of external ear canal disease.
- Bulging or discolored tympanic membrane.
- Dysphagia or pain on opening the mouth (if mass is near the temporomandibular joint or palate).
- Hearing impairment.
- Horner’s syndrome (more common in cats); indicated by miosis, ptosis, and protrusion of the third eyelid.
- Visible mass in the dorsolateral aspect of the oropharynx (cholesteatoma).
- Facial paralysis (if neoplasia is invasive near the facial nerve).
- Otitis interna may be concurrent; clinical signs include:
  — Head tilt.
  — Circling.
  — Falling.
  — Rolling toward the affected side.
- Chronic or chronic recurrent otitis media sympotms: Horizontal nystagmus.
- Asymmetric ataxia with strength preserved.

**Inflammatory Polyps**
- Head shaking.
- Drainage from the external ear canal.
- Mass observed in the external ear canal (aural polyp).
- Abnormal appearing or thickened tympanum.
- Stertorous respiration with nasal discharge (nasopharyngeal polyp).
- Mass observed or palpated above soft palate (depression of palate, nasopharyngeal polyp).

**Congenital Ear Canal Stenosis**
- Similar signs as for otitis externa depending on chronicity of condition.
- Purulent discharge from the ear.
- Stenosis evident with otoscopic examination.
- Swelling peripheral to ear or draining fistulae with abscessation.

**Laboratory Findings**
- Complete blood count: Usually normal, although leukocytosis may be noted in some animals with periaural abscessation.
- Serum chemistry: Usually normal.
- Urinalysis: Usually normal.
- Cytology: Varies depending on the etiology; often multiple types of inflammatory cells (usually neutrophils) with a mixed population of bacteria and/or yeast (Malassezia spp); cells with neoplastic characteristics may be seen in needle aspiration biopsies or swab or touch preps.

**Other Diagnostic Findings**
- Thoracic radiography: Three views (right and left lateral and ventrodorsal projections); indicated in aged patients or when neoplasia is suspected to assess for evidence of metastatic pulmonary disease.
- Tympanic bulla series: Requires anesthesia for lateral, ventrodorsal, oblique, and open mouth views to allow assessment of new bone production, lysis of bone, bulla expansion, or soft tissue density within the bulla. Survey radiographic studies miss 25% of otitis media in dogs (when end-stage otitis externa is the primary problem).
- Computed tomography (CT) or magnetic resonance imaging: Allows similar evaluations to a tympanic bulla series but provides much better detail, especially regarding the integrity of the bone separating the calvarium and the middle ear. The ability to use contrast to highlight or differentiate soft tissue masses from fluid can be helpful. Excellent detail to assess bone lysis and intracavitary spread of neoplasia.
• **Videotoscopy**: Allows for lavage and visualization of otic structures, especially the integrity of the eardrum, with biopsy ports for myringotomy, specimen collection for culture and susceptibility testing, histopathologic examination, and middle ear lavage.

• **Exploratory surgery**: May be necessary for definitive diagnosis of middle ear disease but is less commonly performed since the advent of videotoscopy.

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### Summary of Diagnostic Criteria

- History consistent with ear disease.
- Physical examination reveals ear abnormalities or asymmetric oropharyngeal masses referable to the region of the tympanic bulla.
- Cytologic data from swabs or aspirates (biopsy).
- Imaging studies (plain radiography and CT) of aural structures and the middle ear.
- Histopathologic evaluations reveal definitive diagnosis and aid surgical planning.
- Exploratory surgery and histopathology to define specific diagnosis.

### Diagnostic Differentials

- Otitis externa, aural neoplasia, aural trauma, inflammatory polyps, aural hematoma, and otitis media can be differentiated through historical findings, physical examination, cytology, radiography, CT imaging, or biopsy as described above. Underlying conditions should not be overlooked and must be treated to prevent recurrence of otitis.
- Dogs with a history of seasonal pruritus, feet biting, and facial pawing can be referred to a veterinary dermatologist for skin and allergy testing.
- Skin scraping can be done to rule out demodectic or sarcoptic mange.
- Food allergy should be ruled out in dogs with generalized pruritus and otitis externa by instituting a food trial with a hypoallergenic diet for at least 2 months to see if pruritus improves.

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### Treatment Recommendations

#### Initial Treatment

Most dogs and cats suffering from ear disease are not severely ill, and, thus, preparation for anesthesia and surgery is routine. Anesthetic choice is based on physical examination and minimum database assessment.

#### Indwelling IV Catheter

- Allows administration of crystalloids during examination, diagnostic procedures, or surgery.
- Rate of fluid administration depends on the purpose (e.g., during surgery, for maintenance of hydration).

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### Antimicrobial Use

- Dependent on type of surgery and surgeon’s judgment.
- Perioperative use during surgery: Some surgeons may not use perioperative antimicrobials until specimens for culture are obtained from the bulla intraoperatively.
  - Cefazolin: 22 mg/kg IV q2h during surgery.
  - Cefoxitin: 30 mg/kg IV q2h during surgery (has a better anaerobic spectrum if needed).
- Perioperative use should not exceed 24 hours.
- Debridement of the middle ear, such as with TECA-LBO, is suggested to result in a clean-contaminated wound, but bacteria remain after thorough lavage.
- Therapeutic use after surgery:
  - Based on results of culture and susceptibility testing and the type of aural disease (e.g., therapy for otitis externa may be affected by choices made for concomitant generalized skin disease).
  - *Malassezia* spp may be present and complicate treatment. Cleaning and drying the ear canal is important in controlling bacterial infection and with antifungal therapy. Agents such as miconazole, clotrimazole, and other antifungals may be used topically, and ketoconazole may be administered orally (5–10 mg/kg bid).
  - In general, therapeutic use of antimicrobials should continue for at least 14 days.

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### Analgesics

#### Opioids

Protocols vary depending on the invasiveness of surgery. Duration of opioid administration is commonly 3 to 5 days but should be based on patient response. The following agents are commonly used, although individual preferences differ.

- **Morphine**: Duration of use varies but may be for 24 to 72 hours after surgery (use for longer than 48 hours is not common as other analgesics may be substituted before the patient is discharged from the hospital).
  - 0.1–0.5 mg/kg SC q4h.
  - Constant-rate infusion: 1.2 mg/kg/24 hr in 250 ml 0.9% saline, given at a rate of 10 ml/hr. (Rate of administration may be adjusted up or down depending on clinical signs.)

- **Transdermal fentanyl patch**: Efficacious for 48 to 72 hours in dogs and can be applied 12 to 24 hours before surgery if care is taken to place the patch away from a surface likely to be close to thermal support devices, such as a warm-water blanket.
Bupivacaine:
— Splash block (single dose); total dose should not exceed 3 mg/kg in dogs and 1.5 mg/kg in cats.
— Continuous nerve blockade using a fenestrated butterfly catheter placed in the surgical wound, exiting through a stab incision away from the apposed skin incision (the needle is removed before the catheter is placed and an injection port is attached, allowing constant-rate infusion of bupivacaine at 0.13–0.21 mg/kg/hr).
— These blocks did not decrease metabolic markers of pain in the postoperative period, but empirically some clinicians feel these techniques are useful.

Tramadol: 5 mg/kg PO q12h.

Antiinflammatory Drugs
- NSAIDs: May be used in combination with opioids if no contraindicating conditions are present. Duration of use is a clinical judgment but is usually no longer than 10 to 14 days.
- Prednisone: 0.25 mg/kg bid tapering to sid and then every other day over a 3-week period. Used after lateral ear resection surgery to decrease head shaking, for analgesia, and to lessen ear canal swelling that often accompanies otitis externa treated adjunctively by surgery (used in combination with appropriate antimicrobial therapy).

Topical Therapy
- Ear washes, lavages, and topical antimicrobial therapy are prescribed based on the type of surgery done (lateral or vertical ear resection; unnec—
neccary postablation) and the cytologic data from the ear canal.

- Topical antimicrobial therapy based on culture and susceptibility results is important in the treatment of otitis externa.
- Topical antiinflammatory therapy can be used to decrease swelling from surgery or ongoing otitis externa, to decrease head shaking and self-trauma, and simply for the comfort of the patient.
- Topical lavage and gentle cleansing to remove exudate from the remaining canal are important. It is also important to assess the owner’s ability to accomplish this at home, and periodic reexamination (biweekly or weekly) is necessary to assure treatment is being done.

Alternative/Optional Treatments/Therapy

Treatment of ear disease beyond appropriate medical therapy usually involves some type of surgical intervention, either to achieve better drainage from the ear or to resect a portion or all of the ear canal to remove an end-stage ear canal or neoplastic process.

Otitis Externa—Surgical Options

- Lateral ear canal resection (LECR): An adjunctive treatment used to aid medical therapy for otitis externa. Rarely, a tumor involving the lateral vertical ear canal may be removed. The procedure may be done when relapsing otitis persists despite appropriate medical care and should be performed early in animals with recurrent ear disease. Chronic proliferative canal disease and breed predisposition are factors that suggest LECR may not be effective. LECR should not be performed if there are chronic proliferative changes involving the ear canal or evidence of cartilage calcification/mineralization with horizontal canal obstruction.

- Vertical ear canal resection (VECR): A more aggressive resection of the entire circumference of the vertical ear canal to remove proliferative disease often associated with allergy or for removing neoplasia localized to the vertical canal. This procedure is adjunctive for proliferative disease affecting primarily the vertical canal, but it should not be performed if the horizontal canal is compromised.

- Total ear canal ablation and lateral bulla osteotomy: TECA–LBO is used to remove the external ear canal in its entirety and all proliferative tissue near the canal opening, even extending to the pinna if necessary. The external meatus of the tympanic bulla is opened using an air drill (my preference) or rongeurs. Rongeurs are used to remove mineralized tissue near the meatus and may be used to debride debris and tissue from the middle ear. Small angled curettes or a Freer elevator are also useful. The most common indications are end-stage otitis externa, neoplasia, and traumatic canal injury that has resulted in obstruction from stricture or stenosis.

- Ventral bulla osteotomy: Exposure and osteotomy of the ventral aspect of the tympanic bulla to allow exploration and drainage from the middle ear. Note that in cats the tympanic bulla is partitioned by an incomplete septum dividing the dorsolateral compartment (where inflammatory polyps originate) and the ventromedial compartment. This procedure is usually reserved for primary otitis media without external ear canal disease that fails to respond to medical therapy (myringotomy and drainage) or for polypectomy in cats. In cats, both compartments must be opened to adequately explore for or remove polyps.

Aural Hematomas—Drainage Procedures

- Needle aspiration and a compression bandage.
- Larson’s teat cannula inserted in the dependent region.
- Silastic or polyvinyl drain, fenestrated and sutured proximal and distal.
- Active closed suction drainage (butterfly catheter and vacuum tube).
- Surgical incision, debridement of organized hematoma, and suturing are indicated for aural hematomas that are refractory to drainage proce-
dures. (Some veterinarians prefer this technique as the primary surgical therapy.)

**Supportive Treatment**
- IV fluids.
- Analgesics.
- Antimicrobials based on culture and susceptibility testing.
- Tranquilization.
- Bandaging.
- Restraint.
- Ocular lubrication for patients with facial paralysis.

**Patient Monitoring**

**Postoperative Care**
- Routine postoperative assessment (blood pressure, capillary refill time, eliminations, heart rate, respiratory rate, pain) is indicated.
- Patients should be observed for vestibular signs (head tilt, nystagmus); aggressive curettage should be avoided in the anteromedial aspects of the tympanic bulla. If vestibular signs occur, antiinflammatory doses of prednisone (0.25 mg/kg PO bid) may be used and tapered as signs regress.
- Respiratory function should be monitored, especially if a bandage has been applied (upper airway); tight bandages that constrict the airway should be avoided.
- Hemorrhage (acute and external; can swell toward the airway) can be avoided through good hemostasis. Care should be taken in particular to avoid aggressive dissection ventral and medial to the bulla. Hemorrhage in this area can be difficult to control, and hematoma expansion can encroach on and compromise the airway.
- An Elizabethan collar is recommended to prevent self-trauma.
- Facial nerve function should be assessed. If paralysis is noted, the eye should be lubricated frequently using an artificial tear or ocular lubricant. The ability to retract the globe of the eye is still intact (oculomotor nerve).

**Medical Follow-Up Care**
Specific guidelines depend on the procedure performed.
- Short term:
  - Management of swelling with cold compresses and antiinflammatory medications.
  - Topical agents, based on cytology and culture and susceptibility testing if lateral or vertical ear resection was performed.
  - Antimicrobials: First line initially, altered based on cytology and culture and susceptibility testing.
  - Suture removal.
- Long term:
  - Antimicrobial use based on culture and susceptibility testing.
  - Draining fistula (occurs in <5% of patients after TECA–LBO): This complication usually requires additional surgery and is prevented by careful removal of all canal epithelium and debris from within the tympanic cavity.
  - Monitoring for recurrence of neoplasia: Periodic examination of the surgical site and regional lymph nodes is indicated, as is thoracic radiography. Suspicious areas can be evaluated by fine-needle aspiration and cytologic examination.

**Home Management**
- Continuation of routine and appropriate medical care as necessary, particularly for other generalized skin disorders if present.
- Administration of medications as directed.
- Incision should be checked for swelling, dehiscence, drainage (especially if it has a foul odor), and swelling with increasing pain response.
- Owners can apply a moist, warm compress to the incision if the animal will tolerate it.
- Owners should be educated about proper drain management if applicable.
- Owners should monitor their pet’s respiratory rate and effort.

**Milestones/Recovery Time Frames**
- Gradual lessening of swelling and sensitivity to examination.
- No drainage or cessation of minor drainage.
- In patients with inflammatory polyp (nasopharyngeal): Improved respiration or resolution of otitis externa and ear canal drainage.
- In patients with neoplastic disease: Good surgical margin and regional lymph nodes free of neoplastic invasion. Normal thoracic radiographs at follow-up examinations every 3 or 6 months.

**Treatment Contraindications**
- **Lateral ear resection:**
  - If ear canal is obstructed or if there are chronic proliferative changes, especially if cartilage calcification is present.
  - The decision to perform LECR in cocker spaniels should be made with careful consideration of predisposing factors. There is a reported 63% failure rate in cocker spaniels versus 37% in other breeds.
- **Vertical canal resection:**
  - Obstructed horizontal ear canal, or if there is

(continues on page 12)
evidence of progressive inflammatory disease in or within the horizontal canal (e.g., cartilage calcification).
— Inability to obtain surgical margin (neoplasia).

• **TECA–LBO:**
  — Metastatic spread of neoplastic disease.
  — Evidence of local invasion into calvarium noted on CT or if obvious on plain radiographs.

### PROGNOSIS

**Favorable Criteria**
- Gradual improvement: Decreasing drainage and resolution of infection.
- Uncomplicated wound healing.
- Benign histology in patients with neoplasia.
- Confinement of neoplasia to ear canal: Aggressive surgery is associated with longer survival times in dogs and cats.

**Unfavorable Criteria**
- Hemorrhage.
- Swelling, dehiscence.
- Fistulae formation.
- Regrowth of polyps.
- Malignant histopathology.
- LECR: Progression of canal response (stenosis).
- TECA-LBO: Vestibular signs, nystagmus and head tilt, draining fistulae.
- Neoplastic extension through ear canal into surrounding soft tissue or bone.
- Recurrence.
- “Cauliflower” ear in patients with aural hematomas.

### RECOMMENDED READING