A variety of surgical procedures have been described for treatment of otitis externa and media, but the decision to proceed with ear surgery can be difficult. Most owners do not want their pets to undergo an aggressive ear procedure, especially when it can result in complete hearing loss.

However, there are situations in which surgery is the only option, including when:

- Neoplastic or severe obstructive or proliferative calcifying conditions affecting the vertical and horizontal portions of the ear canal or tympanic bullae are present
- Medical therapy is unsuccessful, which may result from failure to explore all viable medical options.

It is important to note that surgery may not address chronic otitis if underlying primary diseases are not controlled.

**TYPES OF SURGERY**

The most common surgical procedures for treatment of chronic otitis are (Table 1):

- Lateral ear canal resection (LECR; modified Zepps procedure)
- Total ear canal ablation with lateral bulla osteotomy (TECA/LBO).

Vertical ear canal ablation (VECA) is another surgical procedure for treatment of chronic otitis, but it is not as commonly performed as LECR and TECA/LBO.

Other less common procedures include removal of smaller masses, cysts, polyps, or ceruminous gland hyperplasia. Videotoscopy and lasers are often used for these procedures.

Most of these techniques, but especially the TECA/LBO, require an experienced and skillful surgeon. These techniques are described in surgery texts and will not be discussed in this article.

**SURGICAL CONSIDERATIONS**

**Advantages of Surgery**

Ears naturally clean and remove debris, excessive wax, and exfoliated cells via normal epithelialization, in which epidermal turnover moves from the horizontal to the vertical canal and then to the outer ear. During this process, material is moved out of the horizontal and vertical canals to the outer ear orifice. When chronic proliferative, obstructive, or
neoplastic disease affects the ear canal, the normal, “self-cleaning” function of the ear is altered.

Surgical management of chronic otitis typically restores the ear’s self-cleaning function by:
- Removing proliferative, obstructive, neoplastic, and/or infected tissue
- Promoting ventilation and drainage of the ear canal by removing stenotic tissue and decreasing the ear canal’s length.

Disadvantages of Surgery
With the exception of tumor excision and polyp removal, surgery rarely eliminates all causes of chronic otitis externa. None of the surgical procedures eliminate diseases that target the pinna or the medial aspect of the external ear orifice; therefore, clinical signs of primary ear disease that target these sites often persist following surgery. Prior to surgery, all primary diseases, such as adverse food reactions and atopic dermatitis, should be addressed.

Surgical Techniques
When selecting a surgical procedure, it is important to identify whether the vertical ear canal, horizontal ear canal, or middle ear is affected, and how those areas may be impacted by a procedure that does not eliminate all the affected tissue. Considering this aspect of surgery, it is apparent why a TECA/LBO has the highest success rate and best prognosis of all the surgical procedures described for treating chronic otitis.

PRESURGICAL CONSULTATION
Prior to surgery, the owner and clinician should determine the goals of surgery: what component of the chronic otitis will be treated by surgery and whether that component will be completely or only partially eliminated.

This consultation should also address whether:
- Further treatment is needed to control or work up the primary underlying disease
- All options for medical therapy have been sufficiently exhausted to warrant surgery
- Surgery will eliminate the pain, discomfort, and clinical signs associated with the disease
- Continued medical therapy will be needed for long-term management after surgery
- The pet’s hearing will be lost or further compromised due to the procedure.

Many pets have significant hearing loss due to ongoing ear disease; therefore, this consideration is made on a case-by-case basis.

Finally, the variation in surgical techniques, outcomes, risks, and complications should be described to the owner.

PRESURGICAL DIAGNOSTICS
One of the most important steps prior to surgery is identifying and controlling the underlying etiologies that initiated the ear disease. Proper ear evaluation and diagnostics should be performed and, when possible, alternative medical options should be pursued prior to surgery.

The etiology of otitis externa and media includes many primary and secondary causes as well as perpetuating and predisposing factors (see Causes & Factors of Otitis, page 26) (Figures 1 and 2). Even if one ear needs an aggressive surgical procedure, understanding and treating the primary cause of the ear disease can help prevent the other ear from becoming severely diseased and needing future surgery.

The diagnostic approach described in this article applies to both general diagnosis of otitis as well as the presurgical diagnostic evaluation.

FIGURE 1. A young Pekingese cross with early atopic dermatitis otitis, exhibiting marked erythema to the pinnae; atopic dermatitis is one of the most common primary causes of otitis externa.

FIGURE 2. Mature Labrador retriever with chronic otitis externa that began as atopic dermatitis. After many years of relapsing bacterial and yeast infections, the ear has developed severe perpetuation changes, including proliferation and scarring.
Ear Examination

Otoscopes must have a strong light and power source combined with at least 10× magnification that allows focusing within the normal length of the ear canal. If any of these components are missing, otoscopic examinations may not be totally effective. Various sizes of otoscope cones are needed to examine the different sizes and breeds of dogs and cats seen in practice.

The advent of fiber optics, improved lighting, and miniaturization of video cameras combined with a rigid endoscope designed for use in the external ear canal has led to the development of fiber-optic video-enhanced otoscopy (FVEO). The fiber-optic tip with camera magnifies and, with a focal length of several centimeters, improves visualization of the ear canal. It also allows permanent recording of ear canal appearance and allows clients or other veterinarians to visualize pathology of the ear canal.

Videotoscopy should be utilized in all patients in which surgical intervention is being considered. The increased visualization and acuity of videotoscopy aids in determining which procedure may be indicated. In fact, some surgical biopsies and procedures can be performed via videotoscopy, avoiding the need for more aggressive procedures (Figures 3 and 4).

Cytology

While cytologic evaluation does not always establish a definitive diagnosis, it is the preferred method to ascertain the role of Malassezia and, in most cases, bacteria (Figures 5 and 6).

Material for cytologic examination is best collected by ear loop or tube passed deep into the canal and should be representative of the discharge in the deeper levels of the canal. The cytology sample...
should be smeared onto a glass slide, heat fixed, and stained with Diff-Quik, a Romanowsky-type stain yielding good cytoplasmic and organism detail.

I generally consider the following as abnormal:

- Yeast counts greater than 3 yeasts/oil immersion field (OIF)
- Bacteria counts greater than 5 cocci/oif or 1 rod/oif.

Even more important is the presence of inflammatory cells, which is highly suggestive of secondary infection.

While cytologic results do not help determine whether surgery should be performed, or which surgery technique to use, they are important in addressing underlying disease, which leads to successful surgical results.

Culture & Sensitivity

Bacterial culture and sensitivity (C/S) is indicated when:

- Resistant strains of bacteria are suspected (eg, history of chronic topical therapy or bacteria persistent on cytologic examination despite appropriate therapy)
- Severe proliferative changes or otitis media are present.

C/S data appear to be more valuable in antibiotic selection when systemic therapy has been chosen to treat otitis media or deeper, soft tissue infections of the ear canal.

Ideally, cultures should be taken before initiation of therapy or after discontinuing topical or systemic antibiotic therapy. The exact time for antibiotic therapy withdrawal is not known, but many specialists typically recommend 1 to 3 days; however, when I see bacteria on cytology, I am comfortable performing C/S without drug withdrawal.

C/S testing should never be performed without cytology. If cytology reveals suppurative inflammation with rods or cocci or no visible organisms in a patient that has not responded to appropriate antibiotic therapy, C/S may be indicated.

C/S testing is important prior to surgery in order to identify and control infection, which minimizes postsurgical infection and complications.

Diagnostic Imaging

Imaging techniques, such as radiographs, computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound can be helpful diagnostic tools to evaluate whether middle ear disease is present in patients with chronic disease (Figure 7).

The least expensive imaging options are radiographs and ultrasound. While the value of these procedures prior to surgery is somewhat controversial, they may help identify canal stenosis, mineralization, fluid or soft tissue densities, masses in the middle ear cavity, or lytic changes to the bulla cavity. However, radiography is not as reliable and accurate as CT and MRI.

While the cost and availability of CT and MRI may make them prohibitive for some clients, they should be recommended prior to considering more aggressive surgical options, such as TECA/LBO.

Figure 5. Mixed bacterial otitis externa in a springer spaniel.

Figure 6. Cytology from same patient in Figure 5 showing mixed population of coccoid and rod-shaped bacteria; the severity of the case warranted culture and sensitivity.

Figure 7. Magnetic resonance imaging of a 6-year-old cavalier King Charles spaniel with primary secretory otitis externa of the right ear; increased tissue density in the middle ear is present (arrow).
Laboratory Analysis
Routine laboratory analysis should be performed prior to any anesthesia, but does not typically detect underlying disease that would influence surgical considerations.

PRESURGICAL MEDICAL THERAPY
Define & Control Primary Disease
It is critical to work up and control any underlying hypersensitivity disorders, such as atopic dermatitis or adverse food reaction. This helps control infection relapse and minimizes canal edema and self-trauma.

Control Infection
Infection must be controlled—based on the results of cytology and C/S testing—prior to consideration of any surgery, with topical and oral antimicrobials utilized. If a client would like to avoid surgery in chronic proliferative ears, infection can be managed, allowing the pet to be more comfortable for extended periods of time.

Reduce Proliferative Canal Changes
Glucocorticoid therapy is indicated in markedly inflamed edematous otitis and when chronic pathologic changes cause marked stenosis of the canal lumen. Some patients with allergic otitis may be treated with systemic glucocorticoids, which allow the initial topical therapy to be a low potency glucocorticoid product.

Injectable dexamethasone is useful when only 2 to 3 days of action are required. For more severely inflamed ears, especially when other systemic signs are present, anti-inflammatory dosages of prednisone or prednisolone (1 mg/kg PO Q 24 H) or triamcinolone (0.125–0.25 mg/kg PO Q 24 H) can be used initially; then tapered to the minimum alternate day dosage that controls clinical signs. In some cases, low-dose, alternate day therapy can be used to avoid the need for surgery.

For the patient with severe stenosis, primarily of the vertical canal, intra-otic/intralesional triamcinolone acetonide (2 mg/mL) may be helpful.

COMMON SURGICAL PROCEDURES
Lateral Ear Canal Resection
LECR eliminates the lateral wall of the vertical canal. It is only successful—success being defined as patients in which recurrent otitis does not occur—in approximately 50% of patients. Clients should be warned of the relatively high failure rate. In one study, the failure rate was as high as 62.5%. This study utilized strict criteria for post surgical evaluation to determine success.3

When this procedure is performed early in the disease process—before development of otitis media or chronic proliferative changes to the horizontal canal—it is much more successful. In one study, lateral resection failed in 86.5% of the cocker spaniels but other breeds, especially Chinese shar-peis, had a better outcome, especially when LECR was performed early in the disease process.4 Cocker spaniels often have more proliferative and mineralizing changes that affect the entire ear canal and bullae, likely accounting for the higher failure rate seen in this breed (Figure 8).

LECR is indicated in patients with stenotic vertical ear canals or those in which this procedure can improve medical management by allowing better drainage and ease of topical application. It is not indicated in dogs with stenotic horizontal ear canals, otitis media, and severe proliferative disease or mineralization of the auricular cartilage. In these patients, the success of LECR is very poor.

LECR can also be considered when primary disease is limited to the vertical canal. It may reduce sensitivity associated with the medial wall of the vertical canal. A study reported improvement in 95% of cases treated.5 Elimination of signs occurred in only 23% of patients; the other patients required continued medical therapy, which was easier to administer or needed less frequently.

I do not typically recommend LECR, and commonly see patients in which this procedure was performed and failed, with TECA/LBOs subsequently needed to correct end-stage ear disease (Figure 9).

Total Ear Canal Ablation with Lateral Bulla Osteotomy
TECA/LBO is indicated in patients with visible masses that cannot be removed by alternative methods, neoplasia of the ear canal/bullae, and severe end-stage otitis externa/media that has not responded to medical therapy (Figures 10 and 11).
TECA should always be performed with LBO, which allows for removal of infected tissue, exudate, or bone that may be trapped in the middle ear. If LBO is not performed, this trapped material can result in persistent infection and granulation tissue in the bulla and create postoperative abscesses and drainage.6,8

This procedure still requires that underlying skin disease be managed or controlled or higher failure rates are seen.9 A large percentage of dogs, ranging from 46% to 80%, that have undergone TECA/LBO also have generalized skin disease.1,10,11 In one study, ongoing disease persisted in the medial aspect of the pinnae, creating ongoing problems in 6 of 8 patients.1

TECA/LBO has a high complication rate and requires a skilled surgeon, usually one who is board certified. Even in the hands of experts, damage to the facial nerve, inner ear, superficial temporal and auricular vessels, retroarticular vein, and branches of the external carotid artery can occur. Facial nerve paralysis is most common, which results in palpebral reflex defects and drooping of the facial muscles or lip area. The incidence of this side effect varies but can occur in approximately 24% of patients, with 10% experiencing long-term deficits.11,12

When performed properly, the overall success of this procedure is high. In one series, 27 of 29 dogs (93%) undergoing TECA/LBO—in which follow-up results were obtained—had an excellent or improved outcome following surgery,1 with other reports in the literature showing ranges of 76% to 95%.30,13

**Laser Surgery Options**

I have successfully used the CO2 laser for removal or ablation of some ear canal cysts, polyps, and tumors. The CO2 laser utilizes a very long wavelength of 10,600 nm. It is highly absorbed by water, creating a photothermal interaction, which results in vaporization of tissue with minimal scatter, shallow penetration, and minimal peripheral tissue injury. These features make the CO2 laser highly useful for most cutaneous procedures.

Vaporization of proliferative tissue, cysts, polyps, and masses can be performed on the outer and inner ear (Figures 12 and 13, page 30). The fiber can be passed through most video otoscopes and used to vaporize and remove small cysts and polyps in the ear canal (see *Feline Ceruminous Cystomatosis*, page 30).

**IN SUMMARY**

While there are a variety of surgical procedures that can be performed for chronic proliferative, obstructive,
or neoplastic ear disease, a thorough evaluation of the patient needs to be performed before surgery is pursued.

In particular, primary underlying diseases and infections need to be controlled. Appropriate diagnostics should also be performed to determine if medical therapy is a good alternative option or, when medical therapy has failed, whether failure resulted from not exploring all viable medical options.

Once a surgical procedure is chosen, a complete understanding of the expectations and limitations of the surgery should be discussed with the client.

C/S = culture and sensitivity; CT = computed tomography; FVEO = fiber-optic video-enhanced otoscopy; LBO = lateral bulla osteotomy; LECR = lateral ear canal resection; MRI = magnetic resonance imaging; OIF = oil immersion field; TECA = total ear canal ablation; VECA = vertical ear canal ablation

References

Suggested Reading
Mathews KG, Hardie EM, Murphy KM. Subtotal ear canal ablation in 18 dogs and one cat with minimal distal ear canal pathology. JAAHA 2006; 42(5):371-380.
CE TEST: CHRONIC OTITIS: A DERMATOLOGIST’S PERSPECTIVE ON SURGERY

This article is RACE-approved for 1 hour of continuing education credit. To receive credit, take the approved test online at VetMedTeam.com/tvp.aspx (CE fee of $5/article).

Learning Objective
After reading this article, practitioners should be able to determine which surgical procedure to select based on a thorough evaluation of the patient’s history, otic examination, and diagnostics. The readers will recognize the importance of defining and controlling underlying primary diseases and pursuing aggressive medical therapy prior to surgical procedures. Once a surgical procedure is chosen, practitioners will be able to discuss with the client the expectations and limitations of the surgery.

1. Which of the following is the most common cause for failed ear surgery?
   a. Primary underlying disease not defined and controlled
   b. Determining whether pet could hear before surgery
   c. Not performing radiographs prior to surgery
   d. Failure to check for pain at the temporal mandibular joint
   e. Not performing culture and sensitivity testing

2. Which of the following is the most common cause for chronic relapsing otitis externa?
   a. Pemphigus foliaceus
   b. Primary idiopathic seborrhea
   c. Atopic dermatitis and adverse food reactions
   d. Pinnal vasculitis
   e. Contact drug eruptions

3. Which of the following is an example of a perpetuating factor that accentuates chronic otitis?
   a. Staphylococcus pseudintermedius bacterial infection
   b. Malassezia pachydermatis yeast infection
   c. Contact dermatitis from topical ear medication
   d. Ear canal proliferation and stenosis
   e. Hypothyroidism

4. Which of the following tests should always be performed with culture and sensitivity?
   a. Cytology
   b. Radiographs
   c. Ultrasound
   d. Computed tomography/magnetic resonance imaging
   e. Thyroid panel with TSH and free T4 by equilibrium dialysis

5. Which of the following is the preferred test to identify Malassezia pachydermatis?
   a. Culture and sensitivity
   b. Videotoscopy
   c. Handheld otoscope
   d. Ear loop from the middle ear
   e. Cytology

6. Which of the following surgical procedures would likely provide the best outcome for the cocker spaniel shown in Figure 8 with severe vertical, horizontal, and middle ear disease and complete canal calcification?
   a. Lateral ear canal resection
   b. Vertical ear canal ablation
   c. Total ear canal ablation and lateral bulla osteotomy
   d. Tympanostomy tubes in both eardrums
   e. Pressure equalization tubes in middle ears

7. Which of the following breeds has a high incidence of stenosis of the vertical ear canals with normal appearing horizontal canals, making it a better candidate for lateral ear resections?
   a. Chinese shar-pei
   b. Labrador retriever
   c. Golden retriever
   d. Cocker spaniel
   e. French bulldog

8. A medical option to consider prior to surgery for a dog with severe proliferative otitis externa would include which of the following medications?
   a. Antihistamines and antimicrobials
   b. Essential fatty acids and antimicrobials
   c. Oclacitinib maleate and antimicrobials
   d. Systemic glucocorticoids and antimicrobials
   e. Daily ceruminolytics and TrizEDTA rinses

9. Which of the following best characterizes normal ear cytology as viewed under oil immersion field (oif) 100×?
   a. Yeast counts > 5/oif and cocci bacteria > 5/oif
   b. Yeast counts < 3/oif and cocci bacteria < 5/oif with no neutrophils
   c. Yeast counts > 3/oif and cocci bacteria < 5/oif with 3 neutrophils/oif
   d. Yeast counts > 5/oif and cocci bacteria > 5/oif, and rod-shaped bacteria > 5/oif
   e. Yeast counts < 3/oif and cocci bacteria < 5/oif with 3 neutrophils/oif and > 5 macrophages/oif

10. Facial nerve paralysis is a complication that can occur with which of the following procedures?
    a. CO2 laser for a polyp in the horizontal ear canal
    b. Videotoscopy
    c. Lateral ear resection
    d. Computed tomography/magnetic resonance imaging
    e. Total ear canal ablation and lateral bulla osteotomy