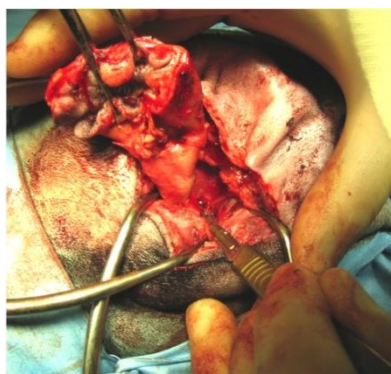




Advanced Surgical Procedures for Advanced Practitioners Mini Series

Session 1: Surgical Treatment of Chronic Ear Disease

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Surgical Treatment of Ear Disease

Anatomy

The canine and feline ear can be divided into their component parts, the pinnae, external ear canal, the middle ear and the inner ear. Knowledge of the structure and function of the ear is very important to be able to diagnose and treat ear disease. It's also important to be aware of the various structures associated with the ear that could be damaged when performing surgery of the ear.

The pinna plays an important part in sound localization and collecting sound waves and transmitting them to the tympanic membrane. The pinna is composed of auricular cartilage covered by hair in both sides complete with apocrine sweat glands, sebaceous glands and hair follicles.

The opening of the external ear canal faces dorsolaterally. The quadrangular plate of cartilage, the tragus forms the lateral boundary of the ear canal. The antitragus is a thin elongated piece of cartilage caudal to the tragus. On the medial aspect of the opening we have the anthelix, and on the cranial aspect we have the helix. The proximal portion of the auricular cartilage becomes funnel shaped forming the vertical ear canal. The vertical ear canal deviates medially just dorsal to the level of the tympanum to form the horizontal ear canal. A separate cartilaginous band, the annular cartilage, fits within the base of this horizontal canal. This third cartilage has fibrous attachments to the osseous external acoustic meatus. The osseous auditory meatus is an extension of the temporal bone. The ear canal is lined by stratified squamous epithelium and contains hair follicles and adnexal structures (sebaceous and ceruminous glands). The external ear terminates medially at the tympanic membrane.

The tympanic membrane is a semitransparent three layer membrane its divided into two sections the dorsal pars flaccida and the larger ventral pars tensa. The pars flaccida is normally flat but in some cases it may be bulging and normal, but a bulging pars flaccida is normally indicative of ear disease. To the pars tensa the malleolus is attached.

The middle ear

The middle ear is derived from the pharynx and separates the external acoustic meatus from the cochlear and vestibular structures of the inner ear. Its major components are the tympanic cavity, tympanic membrane, ossicles (malleolus incus and stapes).

The tympanic cavity is formed by the tympanic component of the temporal bone. The cavity has dorsal middle and ventral compartments and is lined with respiratory mucosa contiguous through the Eustachian tube with the nasopharynx. The dorsal component (epitympanum) is the smallest. The middle compartment or mesotympanum or true tympani chamber and the ventral component termed the hypotympanum, which is the largest chamber.

A number of nerves supply or pass through the tympanic chamber. The facial nerve reaches the internal auditory meatus in close association with the vestibulococlear nerve, enters the facial canal within the petrous bone coming out through the stylomastoid foramen. The tympanic plexus is formed of branches of the cranial nerve IX and the caroticotympanic nerve. It spreads across the bony promontory before entering the lesser petrosal nerve.

Cats:

The feline middle ear is very similar to the dog but its chamber show much more distinct separation into a larger ventral cavity, the hypotympanum and a smallest rostralateral which corresponds to the epitympanum and mesotympanum. These two are almost completely separated by a bony septum. The distribution of the neural structures is similar but the tympanic plexus distributes widely across the bony promontory but is reported to be more exposed or more sensitive to iatrogenic trauma.



Ear Surgery

Ear surgery plays an important role in the management of ear disease. However good case selection is essential for successful outcomes. Indications for surgery include otitis unresponsive to medical management, resistant infections such as *Pseudomonas*, irreversible changes to the ear canal, otitis media, polyp, formation and neoplasia.

Assessment for surgery

The following are required in decision making process with regards to ear surgery

- Palpation of ear canal
- Otoscopy
- Otic cytology
- Culture and sensitivity
- Imaging of the ear canal and bulla
- Assessment for generalised skin disease

Diagnostic Imaging of the ear canal and bulla

Diagnostic imaging is useful to determine the extent of changes in the ear canal and also demonstrate the presence of otitis media. These are important factors in deciding the need for surgery in managing ear disease and the most appropriate procedure. Certain changes may also alert the clinician to the presence of neoplasia or cholesteatoma formation which will alter prognosis.

Radiography is useful when most useful when multiple views are taken consisting of a lateral, ventrodorsal and open mouthed rostrocaudal. The limitations are the superimposition of structures and the tendency to underestimate the presence of otitis media.

CT provides much more detailed images without superimposition of structures and has a higher sensitivity for otitis media and is the modality of choice for imaging the ear.

MRI can be used to assess the bulla but gives poor bony detail. However it is particularly useful if investigation otitis interna or there is a suspicion of extension from the bulla into the brain.

Indications for surgical management of otitis on imaging include narrowing and calcification of the external ear canal and otitis media. Expansile changes and lysis of the wall of the bulla are suggestive of more aggressive disease processes such as neoplasia or cholesteatoma formation.

Preparation of the patient for ear surgery

The following is appropriate for ear surgery

- Wide clip and sterile prep including flushing ear canal with sterile saline
- Perioperative intravenous antibiotics as contaminated surgery
- Multimodal analgesia consisting of opiate NSAID and local nerve blocks

Lateral wall resection (LWR)

LWR aids the management of recurrent otitis externa by improving the micro environment and drainage of the ear canal. Expectations are the procedure is unlikely to completely resolve problems. It is more likely there will be less episodes which are easier to manage.

Good case selection is essential for this procedure as reported 'success rates are 33-50% with a 86% failure rate in Cocker Spaniels. This probably reflects poor case selection.

Indications for LWR

- Recurrent otitis externa. However must be used early in the course of the problem
- No changes to the external ear canal. Eg narrowing, thickening or calcification.
- No otitis media

Technique LWR

- Position in lateral recumbency with small sandbag under neck.
- Make two parallel incisions from either side of tragus to junction of horizontal and vertical canals.
- Reflect skin flap.
- Reflect subcutaneous tissues to expose lateral wall of vertical canal. Take care with parotid gland cranially and facial nerve ventral and deep.
- Make two parallel incisions in vertical canal with scissors. Continue cut to junction with horizontal canal.
- Cut in stages to ensure incisions stay parallel as there is a tendency for them to converge.
- Amputate proximal 2/3rd of cartilage flap.
- Suture remaining 3rd ventrally to create drainage board.
- Appose cartilage to skin with simple interrupted monofilament nylon sutures.

Aftercare for LWR

- Buster collar
- NSAID analgesia 7-10days
- Antibiotics 7-10 days
- Suture removal under sedation at 14 days.

Complications

- Wound dehiscence. This can usually be managed by second intention healing
- Stenosis of the horizontal canal. Either due to poor case selection or technical errors in creating the cartilage flap.
- Ongoing otitis. Poor case selection or limitation of the procedure.



Vertical Canal Ablation (VCA)

VCA is indicated when changes to the ear canal or very early neoplasia is restricted to the vertical canal only. Indications for this procedure are uncommon.

VCA technique

- Incision around opening of ear canal.
- Dissection close to cartilage of vertical canal to level of horizontal canal.
- Amputate vertical canal retaining and short segment of vertical canal proximal to junction with horizontal canal.
- Create proximal and distal drainage boards
- Appose cartilage to skin with simple interrupted monofilament nylon sutures.
- Close remaining skin incision.

Aftercare and complications of VCA

As for lateral wall resection.

Total Ear Canal Ablation (TECA) and Lateral Bulla Osteotomy (LBO)

TECA is a radical procedure which removes the whole vertical and horizontal ear canals. It is always performed in combination with a lateral bulla osteotomy (LBO). TECA is very successful in resolving ear problems and client satisfaction with the procedure is high. However it is essential to carefully counsel owners before surgery. They should be aware of the potential complications and that some can be significant. They should also be aware that animals are nearly completely deaf in the ear following surgery and there is a loss of erect pinna carriage.

Indications for TECA

- Recurrent otitis externa with irreversible changes to the ear canal.
- Otitis media combined with otitis externa
- Pseudomonas infections resistant to medical management
- Neoplasia of the ear canal
- Otitis in patients which will not tolerate medical management

TECA and LBO technique

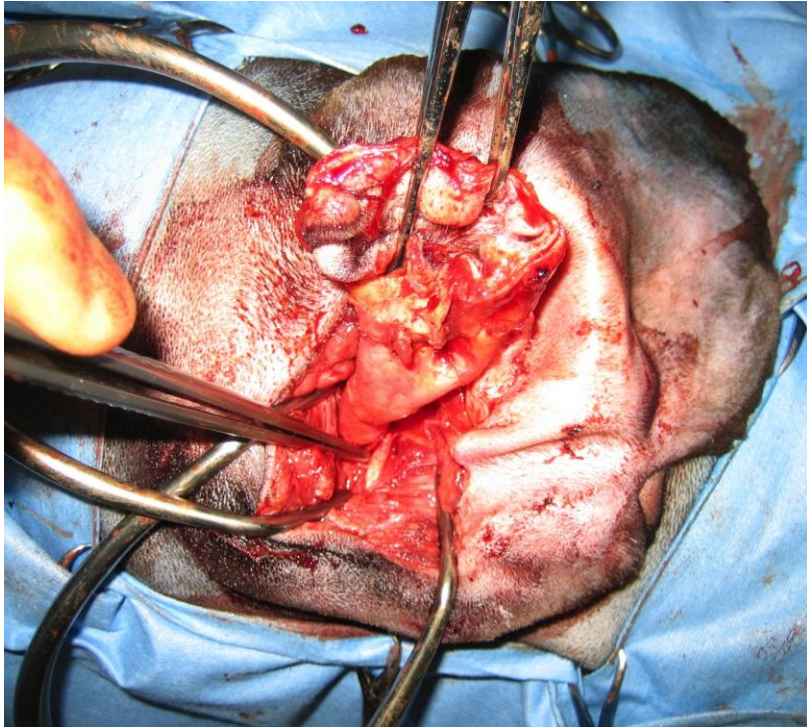
- Circular incision around ear canal.
- Need to cut through cartilage of pinna.
- Dissect adjacent to cartilage of ear canal. Cut muscle attachment. Bleeding can be profuse when chronic ear disease present. This is best controlled with diathermy
- Dissect to level where ear canal attaches to osseous external meatus.
- Amputate canal with 11 blade. This can be difficult if highly calcified. Cut away from facial nerve to reduce risk of damage.
- Remove hyperplastic soft tissue from opening to make opening to bulla visible
- Elevate soft tissue ventrally with periosteal elevator to expose lateral wall of bulla.
- Avoid excessive rostral and ventral dissection due to retroglenoid vein cranially and branches of carotid ventrally and medially.
- Create lateral bulla osteotomy using rongeurs. Kerrison can be particularly useful. Use high speed burr for very thick bulla. Avoid osteotome and mallet as less controlled and risk fracturing bulla.
- Remember cat has two compartments to bulla. Need to penetrate septum to curette both compartments. Relatively thin penetrate with needle and enlarge with curettes.
- Curette and flush bulla copiously with sterile saline. Ensure all debris and hyperplastic epithelium is removed.
- Take culture swab after lavage.
- Closure in 3 layers. Deep purse string suture in soft tissues, subcutaneous and skin to cartilage.
- Drain placement is not necessary except in cases of extensive paraural abscesses.

Complications of TECA and LBO

- Significant haemorrhage
This is often due to damage to the retroglenoid vein cranially or a branch of the carotid ventral to the bulla. Can often be resolved by pressure, cold saline lavage and the use of collagen sponge. Rarely requires closure over packing and further surgery in 24-48 hours.
- Wound problems
These are common and can usually be managed topically and by second intention wound healing.
- Pinnal necrosis
This occurs due to damage to the pinnal vessels during dissection.
- Facial paralysis
Due to damage by retraction during surgery. Usually resolves over days to weeks but can be permanent.
- Vestibular signs
Due to over vigorous curettage dorsomedially damaging the vestibular apparatus.
- Abscess/ fistula formation
- Ongoing pinnal dermatitis
This is due to failure to identify underlying dermatological disease such as atopy or leaving hyperplastic tissue after surgery.

Post operative management following ear surgery

- Use of a Buster collar to prevent scratching
- Continued analgesia. NSAID for 7-10 days
- Post operative course of antibiotics 7 days



Tumours affecting the ear canal

Tumours of the ear canal are relatively common. The general occur in dogs over 9 years old, with spaniels over represented. The most common tumour is the ceruminous gland carcinoma in both dogs and cats. They are diagnosed by biopsy or FNA and imaging can be useful to determine extent particularly bulla involvement.

These tumours are characterised by local invasion and low metastatic rate. Appropriate surgery results in long survivals in dogs. In general TECA is the preferred surgery. Significantly higher reoccurrence rates are reported with LWR or VCA (75% vs 0%). Median survivals of 58 months are reported in dogs. In cats the tumour is more aggressive with median survivals of 11 months. Poor prognostic indicators include bulla involvement, neurological signs or SCC vs adenocarcinoma.

Cholesteatoma

These are non neoplastic epidermoid cyst in the bulla. Cornifying squameous epithelium produces keratin which accumulates and produces slowly expansile bulla lesion. Results from chronic otitis allowing epithelium to seed into bulla. Clinical signs chronic otitis, TMJ/bulla pain, neurological signs. Diagnosis based on otoscopy and imaging.

Treatment is removal of all keratin and epithelium via TECA. There are high reoccurrence rates of 50% reported. This is more likely in severe cases with neurological signs pre surgery.

Ventral bulla osteotomy (VBO)

VBO is indicated when ear disease is limited to the middle ear. The main indication is middle ear disease in cats mainly due to nasopharyngeal polyps. The procedure is much more difficult in dogs as the bulla is less prominent and located deeper. Dogs also generally have otitis media secondary to external ear disease often making TECA a more appropriate procedure.

Nasopharyngeal polyps in cats

These are seen in cats generally less than 2 years but reported up to 15yrs. They arise from the bulla and extend to nasopharynx, ear canal or both. The cause is unknown but thought to be secondary to respiratory virus infections. Cats with aural polyps present with otitis, head shaking whilst nasopharyngeal polyps show respiratory signs and dysphagia.

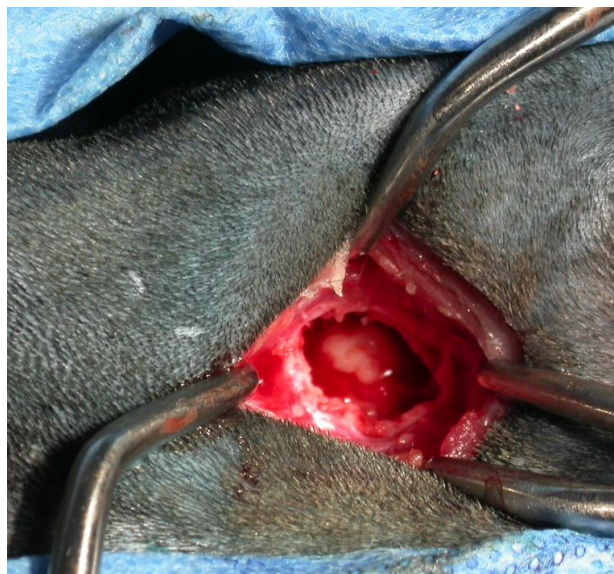
Treatment options include removal by traction or removal via VBO. Following traction there is a 40-50% reoccurrence rate. This may be reduced with post removal corticosteroids. Ventral bulla osteotomy to remove the origin of the polyp has only a 5% reoccurrence rate.

VBO technique

- Place in dorsal recumbancy with small sandbag under neck. Upper jaw taped to the table.
- Palpate bulla and create skin incision centred on bulla.
- Cut thin platysma muscle.
- Retract submandibular salivary gland and bifurcation of lingofacial and maxillary veins.
- Separate digastricus and mylohyoid muscles. Care to avoid hypoglossal nerve medially
- Continue to palpate bulla during dissection.
- Elevate periosteum and thin muscular layer from bulla surface.
- Enter bulla using gradually enlarging Steinman pins. Enlarge opening further with rongeurs.
- Remove secretions with suction.
- Penetrate septum with pin and enlarge with currettes.
- Curettage and remove polypoid material and debris. Care with ventral curettage over the promenatry where sympathetic fibres run and caudally where the vestibular apparatus is located.
- Routine closure with no need for drain

Complications of VBO

- Horner's syndrome 80%
- Vestibular signs
- Hypoglossal nerve damage
- Polyp reoccurrence 5%
- Deafness



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