

# NOAH

North Dublin Orthopaedic Animal Hospital

## Animal Ear Surgery

Your Pet's Ear

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# Your Pets Ear

## Anatomy of the Ear

The external flap of the ear is called the pinna. This leads into what is called the external ear canal, then the middle ear, and finally the inner ear. The external ear is a composition of auricular and annular cartilage. The auricular cartilage of the pinna is funnel like in shape. As the vertical ear canal descends it runs vertical in course for about 2.25 cm to then take a horizontal course known as the horizontal ear canal.

This is composed of auricular cartilage and annular cartilage. The horizontal canal leads to the ear drum, or the tympanic membrane, which is located in the middle ear. The middle ear also consists of an air-filled tympanic cavity, and three auditory ossicles or bones. These bones are responsible for transmission and amplification of air vibrations to the inner ear.

The tympanic membrane is a semi-transparent membrane divided into the pars tensa and the pars flaccida. The cavity formed holds a small epitympanic recess, a large ventral bulla and the tympanic bulla proper. Along the inside wall is where the cochlea are housed. The vestibular window is located on the underside outer wall surface and is covered by a thin diaphragm.

Further on is the auditory tube which is a short canal that extends from the nasopharynx to the tympanic cavity. The inner ear is located within a bony labyrinth within the temporal bone of the skull and contains the membranous labyrinth with its sensory organs that are responsible for hearing and balance.

## The Pinna

As we mentioned the visible part of the ear is called the pinna. This part of the ear can vary from breed to breed of animal. The pinna has muscles in it that allow movement and the ability to swivel in some directions to better pick up sounds around your pet. Most cats have erect pinna for example. In dogs some can also be erect or there are others that have floppy pinna.

Dogs like Spaniels have long dangly ears. This type of ear flap does not allow for proper airflow to the canal of the ear making them more prone to infection. The ear can become hot and moisture can be retained quite easily, setting up a perfect environment for bacteria, yeast, or parasites.

This is also the case for dogs that spend a considerable amount of time in water, as water can allow some things to grow much more readily. Finally, dogs with hairy ear canals should have the hair plucked if problems arise to provide better ventilation. It's important to know how and what solutions to use to properly clean your pet's ears and your Veterinary surgeon can advise you best on this.

## Diagnostics

### Diagnostics and Examinations: Looking at the Ear

#### Hearing

As sound is channelled from the pinna down the canal to the ear drum the canal drops in vertically to then turn horizontally. The ear drum is a very thin sheet of tissue where sound waves bounce into. It is located within the tympanic bulla which is a large amplifying chamber for the sound vibrations. The vibrations are transmitted utilising the auditory ossicles, the three very small bones, for hearing to take place. The hearing organ receives these vibrations and those are sent in the form of electrical signals to the brain for interpretation. This takes place within the skull itself and is known as the inner ear.

#### Hearing Loss

Should you consult your Veterinary surgeon because of hearing loss?

There are certain things that might be accomplished if your pet is free of disease to improve its hearing. First, testing the hearing of your pet might include what is called an Air-and-Bone conducted Brainstem Auditory

Evoked Response (BAER) test. It can be an important test to determine prognosis for normal and improved hearing pre-surgical procedure.

## **When Disease is Present**

It's important for Veterinarians to check your pet's ears, and if this can be accomplished early on, one might notice symptoms and minimise the chances of disease causing minimal injury. Your veterinary surgeon will use an otoscope to first look into the ear canal to assess the situation. In many instances of disease this will set the stage of what your Veterinarian will seek to do in the future. Sometimes even this simple exam can be problematic due to sensitivity and pain so your pet might have to be sedated or anaesthetised.

Otosopic examination during the consult might not be enough to come to a final assessment and make decisions as to what treatment might be necessary. This is especially the case with inflamed ear canals that can sometimes be so closed off it become impossible to look in. This is where more aggressive diagnostics might be necessary.

Redness, swelling, thickening all define the gross characteristics of inflammation. Microscopically the body is having a reaction where excessive numbers of inflammatory cells are reacting to an on-going problem such as infections or allergies. This can cause damage, irritation, pain, and increases the likelihood of further worsening the problem. It is important that samples of infectious material and tissue be examined usually under a microscope where a bacterial infection or yeast population can be identified. This sometimes might have to be interpreted for susceptibility testing for the right antibiotic to resolve the infection.

Narrowing of the canal should be evaluated through proper radiographs and possibly other diagnostic tests such as a Computed Tomography (CT) scan or Magnetic Resonance Imaging (MRI) to identify the extent of disease in question. Combinations of ultrasound and radiography have also proved successful in diagnostic tools used in accurate assessment of the bulla for abnormalities.

Vestibular Syndrome is a result of ear disease. Vestibular is related to balance, and when this occurs your pet might experience a head tilt or balance problems associated. It is the balance organ within the inner ear and although a problem that happens in less than 2% of patients it can be a bit more common in those pets that have had previous issues with balance or head tilting.

Swelling can also occur in and around the area of the ear along with the throat region which very well could present issues with breathing. If this becomes severe a breathing tube may need to be placed until swelling can be resolved. Swelling can even on rare occasions have such severity that a temporary tracheostomy may be needed. This is where a tube is surgically placed through the neck region into the trachea to bypass the swelling in the throat.

## **Tackling Ear Problems**

The most common problems with dog ears are chronic infections that thicken and block the ear canal. Other issues that can cause blockage are tumours that fill the middle ear or external ear canal. These conditions usually will require surgery.

Confirmation of the ear canal is what predisposes it to infection. Certain breeds of dogs can be susceptible to infection such as cocker spaniels, golden retrievers, and poodles. Dogs with large floppy ears, hair filled ear canals, and the creation of moist warm environments within can all be contributing factors to infection. These factors can also create a situation where it is difficult to control or eliminate the infection.

It's important to keep the ear dry otherwise infection will thicken the tissues of the ear canal and proliferative debris is trapped as a result. This can be a vicious cycle of worsening infection causing severe permanent changes to the ear.

A lot of ear infections can be isolated to cause and treated appropriately with an expected resolution in two to four weeks usually restoring the dog back to resume a normal life. Sometimes, however, an ear infection can be persistent and become chronic. These infections can reach the middle ear and result in painful symptoms such as dizziness, headaches, and a permeating foul odour.

Ear infections are sometimes very much a symptom of other disorders such as endocrine diseases or allergies. Investigation into these matters may be necessary to ensure that chronic infections get resolved as well as an overall improvement to the health and welfare of your pet.

A lot of times chronic infections in just one canal can be resolved through treatments and possibly combined with surgery, but it is also common with underlying other causes that these types of infections will occur in the opposite healthy ear canal. Obviously medical therapies are necessary in controlling allergies along with proper hygiene and cleanliness of the ears to prevent further ear disease.

Your pet can have allergies, hormonal issues, genetic issues, malformed development of tissue, or other problems beyond ear conformation causing predisposing factors for primary or secondary infection from yeast organisms or bacterial organisms. Vestibular Syndrome can be seen as a result of ear disease. Vestibular Syndrome is related to balance, and when this occurs your pet might experience a head tilt or balance problems associated. It is the balance organ within the inner ear and although a problem that happens in less than 2% of patients it can be a bit more common in those pets that have had previous issues with balance or head tilting. When vestibular disease is present, there is the likelihood of a middle ear infection.

There are a great many things that can fit in your pet's ear canal. Grass seed or such parasites as mites can take up residence in the ear canal. Ear infections can present with smelly discharge or odour and/or the ear canal may be filled with wax usually black in colour. Symptoms may arise with your pet that present with the appearance of itching, shaking of the head, rubbing the ears on the ground or on surfaces of static things, and of course persistent scratching. This in fact sets up the situations for infections.

Ear problems in cats can happen in any cat. Ear problems vary from dog to dog, just like any type of issue with humans. Some dog breeds are predisposed to ear problems, and yet some in those same breeds are lucky enough to have none at all. It's important as a pet owner to be educated on the breed of your pet, and most of all the uniqueness that is your pet to be aware when symptoms appear. Tackling problems before they grow is the best way to insure your pet's welfare and health.

The visible part of the ear is called the pinna. This part of the ear can vary from breed to breed of animal. The pinna has muscles in it that allow movement and the ability to swivel in some directions to better pick up sounds around them. Most cats have erect pinna for example. In dogs some can also be erect or there are others that have floppy pinna. Dogs like Spaniels have long dangly ears. This type of ear flap does not allow for proper airflow to the canal of the ear making them more prone to infection. The ear can become hot and moisture can be retained quite easily, setting up a perfect environment for bacteria, yeast, or parasite. This is also the case for dogs that spend considerable time in water, as water can allow some things to grow much more readily. Animals with hairy ear canals should have the hair plucked if problems arise to allow for better ventilation. It's important to know how and what solutions to use to properly clean your pet's ears and your Veterinary surgeon can advise you best on this.

As mentioned previously ear disease can present as bacterial, can be from yeast growth, and sometimes can present as a result of both. Also issues like allergies can play a large part, and it is important to focus on locating the possible issues that cause reaction in your pet. Often overlooked are some autoimmune disorders such as pemphigus or lupus which requires differentiation from what might be misunderstood as allergies. Also a cause in ear disease and sometimes a result of other secondary issues is infestation of parasites. Ear mites such as *Otodectes*, *Sarcoptes*, and *Demodex* are threats to your pet's ears. Neoplasia includes benign and malignant tumours, or cancer, can also occur in the ears.

Ear mites are more common in young pets like puppies and kittens than adult pets, and usually are treated with success. But should that same puppy or kitten live in a household where other pets reside ear mite infections might occur in those animals as well. Ear mite treatments are usually in the form of avermectin such as ivermectin or selamectin.

Issues with low thyroid hormone have been known to cause ear problems. Drug reactions for treatment to something entirely not related might subsequently result in creating ear infections that might not have occurred. Hygiene plays a huge role in your pet's ear and is always vastly important in the regular maintenance of your pet. Immune system diseases, Diabetes, Cushing's disease, and Feline Leukaemia and Feline Immunodeficiency Viruses all have played parts in secondary infections of the ear. Sometimes improper grooming techniques can cause inflammation leading to infection.

Usually within healthy ear canals a special oily to waxy material is produced in small amounts. This is known as cerumen. The production of cerumen is often increased as a result of inflamed ear canals, and this in turn can reduce the effectiveness of ear therapy medications. It's important that regular ear cleaning be maintained as part of ear therapy due to this overproduction.

Ear cleaners are designed to loosen and dissolve discharge, cerumen (ear wax), and if it exists, pus in the ear canal so that the material can be removed from the ear. These cleaners also possess antimicrobial ingredients in them that help kill bacteria and yeast, and some cleansers are just designed for the dissolution of cerumen. Cleansing and antiseptic mixtures are made from surgical spirits, boric acid and vinegar in various proportions.

Other cleaners can utilize betadine. This allows for the application of topical ear medications which usually come in a liquid or ointment form and contain antibiotic and/or antifungal drugs combined with anti-inflammatories.

Redness, swelling, thickening all define the gross characteristics of inflammation. Microscopically the body is having a reaction where excessive numbers of inflammatory cells are reacting to an on-going problem such as infections or allergies. This can cause damage, irritation, pain, and increases the likelihood of further worsening the problem.

Steroids or anti-inflammatories are used to reduce inflammation and are a very important part of the therapy of the ear. They exist as mentioned in most ear medications, and help assist in the control and resolution of infection. Most steroids have side effects and it is important to consider these when developing long term treatment plans.

In feline cases of otitis media the extension of infection through the auditory tube can occur resulting in chronic respiratory infection or chronic sinusitis. This is a type of haematogenous spread of infection, meaning the infection spreads via the blood supply. It is however, rare. One aspect to consider that is important though is that otitis media can lead to otitis interna damaging the inner ear structures which can lead to loss of hearing and loss of balance.

Malassezia pachydermatis is probably the most common fungal ear infections in dogs. Staphylococcus intermedius is the likely cause of bacterial infection, but Pseudomonas aeruginosa can present with far more serious effects through producing pus in the ear.

It is important that samples of infectious material and tissue be examined. Usually under a microscope a bacterial infection or yeast population can be identified. This sometimes might have to be interpreted for susceptibility testing for the right antibiotic to resolve the infection.

Canine ear infections are usually an occurrence within the ear canal, called otitis externa, and if left to grow and lead to secondary infection within the middle ear or tympanic bulla, called otitis media. If being vigilant with cleaning has not happened or has had little effect on warding off infection treatment will be required. Early on, treatment is important to stop any damage and further growth using a number of different tools.

Such as:

- Ear cleaner
- Systemic (oral) antibiotic and/or anti-inflammatory drugs
- Topical ear antibiotic
- Topical ear anti-inflammatory medication
- Ear flushing techniques

As mentioned dogs that have suffered for a considerable time from chronic ear infections can develop irreversible damages. In these instances the canal can become thickened and even in some cases ossification can occur. The middle ear can very well be affected by these infections. The middle ear is the Tympanic Bulla region of the ear and along with this area as it's common in these chronic issues that the ear drum is ruptured. Congenital Imperforate Ear Canal which is where there is a lacking normal opening to the canal can also result in middle ear infection.

## **Surgery**

### **Surgery as an Option**

Where surgery is part of a cure, as mentioned it's not the entire piece to the puzzle that solves the problem.

However it can be of great benefit to the debilitated dog helping to create immediate changes back to normality and activity. Usually most owners respond to ear surgery as part of resolution to chronic ear infections with great success commenting mostly that their dog is like a "new dog". Dogs are usually feeling remarkably better post-surgery and are more likely to respond to commands and requests. Usually a resolve comes to the chronic infections and reoccurrences that bring about cure and better health and welfare for the dog. Not to mention a huge savings in ear medications and treatments.

Most pets that have chronic ear disease can suffer some degree of hearing loss. Surgery might lessen the severity of the hearing loss caused by the infection. The cosmetic aspect of these surgeries varies greatly depending on the type of ear. Floppy ears have a very good cosmetic outcome where much of the appearance

can be retained for a number of surgical procedures. Cats and dogs that have erect ears can suffer injury to nerves that might produce an outcome of drooping. However variations of surgeries might be an option for your pet, and your Veterinary surgeon will determine if this is the case.

As with all procedures and disease there are complications associated within. For example, as we mentioned before there is hearing loss to be considered as a possible complication. Although very rare, anaesthetic death can occur. We do take measures such as offering you (the client) the option to complete blood chemistry profiles and tests to ensure your pet can undergo such a procedure.

We utilize modern anaesthetic protocols very much like those used in human medicine with a high standard of interest in maintaining optimal health and comfort for your pet. Usage of extensive monitoring devices such as electrocardiogram, blood pressure levels, pulse oxymetry, carbon dioxide level monitoring and respiration rate all to aid us in interpreting your animal's health from start to finish. These high standards insure the risk of problems associated with anaesthesia are vastly minimized, but rest assured that from beginning to end your pet is monitored by a qualified nursing staff along with doctors to insure everything goes smoothly and should there be any signs of complications the procedure will be curtailed till a later date when health has been improved.

## Pre-Surgery Diagnostics

Surgery is usually the last resort regarding attempts at trying to cure disease. If other methods of treatment can take place first with hopes of resolution those will be exhausted first. But should your Veterinarian arrive at the decision to move to a surgical procedure this will be done by understanding and evaluated a number of tests.

Preoperative radiographs of the skull are generally recommended and should be combined with the CT scan. These are diagnostic techniques used to assess changes that have taken place in the bony portion of the ear.

Animals undergoing surgical procedures for bacterial infections should have an accurate microbiologic assessment of the bacteria to determine the best selection of antimicrobials available for treatment this is usually done before surgery. Another sample is evaluated taken from deep inside the ear during surgery. During the elected surgical procedure there is a point in time where bacterial samples are taken for culture and antibiotic susceptibility testing. This allows for treatment with the correct antibiotic. On other occasions biopsies may be taken to identify abnormal tissue and growths in the ear to discern neoplastic issues.

Your pet will also be required to have blood testing along with any other special testing your Veterinary surgeon feels appropriate to insure the surgical procedure goes smoothly. It's important to interpret your animal's health at all times utilizing various tools we have at our disposal to insure that there is a resolution that comes with providing such a surgical procedure.

## Choosing Surgery

Managing ear infections with cleaning solutions, topical medications applied directly to the canal itself, and oral medications can present with little or no satisfaction in resolution. In these cases, surgery is the next logical step to be considered. There are three major types of surgical procedures that are performed when infections have become too great to eliminate through the use of treat other treatments. Those are the [Lateral Ear Resection \(LER\)](#), [Total Ear Canal Ablation and Bulla Osteotomy \(TECA & LBO\)](#), and the [Vertical Canal Resection \(VCR\)](#).

Ear infections can be the cause of a multitude of problems. Accomplishing surgery does not address these problems, but merely is a portion of the solution derived as a form of treatment and prognosis. Sometimes during the lifespan of a chronic infection proliferative ear growths can occur that will hinder the effects of surgery combined with proper cleaning and medication. Sometimes surgery is dependent on the breed/species and how the proper procedure might best suit to deliver desirable results.

The ear canals dogs and cats are first vertical and horizontal, making the shape of a "J". Human's process just a simple horizontal canal going straight into the head. Among other factors, this vertical portion of the canal in dogs and cats is why sometimes bacteria, yeast, and wax become harder to expel from the canal. The lateral ear resection accomplishes the removal of the vertical canal.

Sometimes it's not infection that produces the need for surgery to the ear. Cancer can be a disease type that might warrant the need for this type of surgery. In many cases dogs acquire adenocarcinoma of the ear canal. This malignant type of cancer can be curative with the [TECA surgery](#) as long as it's not yet invaded through the cartilage or into the middle ear cavity.

It's quite possible that in the process of itching and scratching damage to the skin occurs, a blood vessel could burst and the formation of swelling could occur in the flap of the ear, called pinna. This swelling can become inflamed and infected as well resulting in a blood filled mass within the cartilage of the pinna that is called a haematoma. This usually requires an operation to facilitate the draining of this fluid, flushing, and administration of antibiotics along with specialized stitching. But most of all if it's a result of scratching due to an infection of the ear canal then the task of clearing that up becomes greatly important at the avoidance of reoccurrence.

Usually a great many steps are taken to avoid surgery, and sometimes even referrals to specialists such as dermatologists can offer conservative management options. But at a point where severity has taken its toll with these types of infections ear surgery is the option turned to next for those cases that cannot be managed satisfactorily by medical means.

Surgical options such as the Lateral Wall Resection or the Vertical Canal Ablation are performed to improve air flow, remove debris, allow for better access for future treatments with medications, and resolve inflammation. These procedures have a great success in helping control bacterial growth and yeast populations. They are also in large part successful at preserving the normal anatomy of the ear.

Reasons for committing to performing a Total Ear Canal Ablation (TECA) with Lateral Bulla Osteotomy (LBO) include:

- Unresolvable otitis externa where it is severe and recurrent
- Narrowing of the ear canal due to disease and/or inhibits the delivery of medications
- When a Lateral Wall Resection or Vertical Canal Ablation is performed prior and still has not offered resolve to disease
- Tumours that occlude the ear canal entirely
- Otitis media, middle ear inflammation and infection, that has not responded to previous treatment

The TECA with LBO procedures can sometimes alter the pinna of the ear. Unfortunately there might be a difference in appearance or carriage of the pinna. For example, an erect pinna might no longer remain erect postoperatively. Your Veterinary Surgeon needs to be experienced and highly trained to follow through with TECA procedures, and the variations of. It might be the case that a variation might be an option to keep the cosmetic aesthetics of your pet's ear such as an erect pinna.

Surgical reconstruction of the pinna to offer cosmetic return to it being erect depends on the incident that caused the loss of carriage to being with such as, the size of the lesion, where it is located on the pinna, and the anatomic conformation that exists for the pinna in that animal.

Of course there are unfortunate incidences when such things as neoplasia might extend into the terminal pinna and amputation is the only option. The amputation of the terminal third of the pinna is best because of its relationship with the pinnal cartilage and overlying skin surfaces.

The lower part of the majority to the pinna is of a different anatomical make-up. The outer part of the skin from the dorsum of the head is mobile and free of the pinnal cartilage. This skin moves closer to the cartilage as it ascends to the terminal part of the pinna. Simple skin flap options for closure to defects in the lower have of the ear can be an option. This flap can also be made to extend to the tip of the pinna if necessary. Other types of flap closer that can be effective is the transposition, and it can be an effective local flap option in surgery after the removal of diseased skin and underlying cartilage. Transposition flaps can be used to cover large areas, and is an especially useful technique in situations relating to trauma. With lower pinnal defects simple skin advancement might offer solution where skin around the base of the ear and possibly if needed the vertical ear canal can make for donor sites offering pedicle graft development.

## **Haematoma Surgery**

Symptoms may arise with your pet that present with the appearance of itching, shaking of the head, rubbing the ears on the ground or on surfaces of static things, and of course persistent scratching. This in fact sets up the situations for infections. It's quite possible that in this process damage to the skin occurs, a blood vessel could burst and the formation of swelling could occur in the flap of the ear, called pinna. This swelling can become inflamed and infected as well resulting in a blood filled mass within the cartilage of the pinna that is called a haematoma. This usually requires an operation to facilitate the draining of this fluid, flushing, and administration of antibiotics along with specialized stitching. But most of all if it's a result of scratching due to an infection of the ear canal then the task of clearing that up becomes greatly important at the avoidance of reoccurrence.



A hematoma may also be a result of allergy, trauma, or after being bitten by another animal. Hematoma's that occur in pets with an erect pinna might result in damage to the carriage of that pinna. Or what is sometimes called a breaking of the ear, and subsequently the ear might not be able to remain erect ever again. It's important that in these cases postoperatively minimization be applied through proper taped or bonded supports, and that your pet not be allowed to scratch or remove them through the use and application of constantly wearing an Elizabethan collar till healed.

## **Cosmetic Surgery**

In situations where post-operative damage has occurred along with appropriate time elapsed to insure that unfortunately damage to the carriage of the pinna has occurred cosmetic options exist for your pet should you wish to see an erect pinna. The Neuticles Company produces a product called PermaStay which is an implant device for dogs that corrects broken, bent, or floppy ears. It is an implant device that is American FDA approved with a medical surgical mesh, fluroplastic materials that are ultra-thin and lightweight. It's practically undetectable once in place and is good for the life of your pet.

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## **Ear Cropping Surgery**

Outlawed in the EU, ear cropping is still practiced in some parts of the world. This procedure is painful and presents with great discomfort to the animal from healing to stretching, re-taping, and bandaging. This will have to be a repeated procedure for sometimes what takes months or longer and require most dogs to remain isolated from others. Ears can become infected as a possible complication and even eventually fail to stand or have a distorted shape or position and lead to further problems that might require surgical operations to resolve. There is no evidence that cropping of the ears aids in prevention of infections or that it improves hearing or later ear injury.

## **Surgery for Hearing Loss**

Age related hearing loss can possibly be improved through implanted hearing aids such as the Vibrant Sound Bridge. It's a safe surgical procedure with no real clinical adverse effects. A small percentage of dogs can suffer some bruising of the facial nerve resulting in transient facial paralysis.

## **Post-Operative Care**

The mandatory use of an Elizabethan collar is necessary to protect the delicate incisions from scratching. This is worn for 10 to 14 days at which time any external sutures can be removed at follow-up appointments. This looks like a big funnel on their head, and where one might feel sorry for them it is of great importance they wear this collar to avoid any damages to the surgical site and the healing process. Many times the removal of the collar might result in where the pet might scratch and damage the site.

Treatment of infection is still required so topical and oral medication will mostly likely continue to be used.

Surgery can be accompanied with oozing of blood or even clear fluid accumulation afterwards.

After surgery, when recovering at home your pet should have rest and limited activity. Don't be alarmed if it takes up to five days for your pet to have its first regular bowel movement as having fasted prior to surgery combined with what is probably a limited want to eat while in the hospital. They also frequently might require encouragement when they go home to eat further and complete their necessary dietary requirements. Also, pain medications, especially those that contain narcotics such as morphine, fentanyl patches, and tramadol can cause constipation. Metamucil can aid in stool softening, and advice on the use of this should be consulted with your Veterinary surgeon.

If there are issues with eating sometimes a diet blend in a ratio of a 1:1 of protein to carbohydrate sources can offer alternative to your pet's regular diet. For example, chicken and rice can offer alternative that might be more palatable to your pet and encourage eating. Later when back to better health reincorporating your pet's normal food can be done by mixing this ratio diet with their food for a day or two till they are fully back on their normal diet. Most Veterinary hospitals carry specialized foods for occasions where a pet has issues with eating. These diets, such as Hill's Science Diet A/D allows for ease to force feed or hand feed. It's important to note that smelly foods aid in the encouragement of your pet to eat, but such things as large quantities of protein only such as tins of tuna or peanut butter can put strain on organs like the kidneys and liver. In older animals decreasing the acidity of the stomach with Pepcid AC can help in some cases. In other cases, Metoclopramide and Cerenia are good anti-vomiting medications for dogs and cats. Appetite stimulants such as cyproheptadine may also offer aid, but should your pet refuse food after seven days it might become necessary to pass a stomach tube or nasogastric tube to provide nutrition and avoid organ issues. Cat's that don't eat for long periods can develop liver problems such as hepatic lipidosis, this should be avoided as it can have dire consequences.

Vomiting is a concern post-surgery, but it's very important to discern if your pet is vomiting or regurgitation.

Vomiting will always have heaving or retching associated before the stomach contents come up. However regurgitation is not associated with heaving and pet usually just opens the mouth and fluid or food is expelled. Usually this is clear or brown in colour.

Sometimes when your pet returns home they can drink large amounts of water. This excess drinking can result in vomit, and if this is the case then water should be limited and controlled in frequent smaller amounts. Medications as mentioned before can also be a result of nausea and cause behind vomiting. Be sure to administer drugs two hours apart from other drugs prescribed. Usually if they are sensitive to one particular medication they will develop symptoms that are apparent like drooling within an hour of administration. If this is a case sometimes alternative medications can be substituted to try and resolve this problem. Anaesthesia can cause upset, but it will pass within a day or two.

In extremely rare cases if an animal should go into internal organ failure, they might vomit. It's important to always consult with your Veterinary surgeon or clinic, and if they wish to see the animal immediately blood testing will confirm this problem and they will hopefully be better able to stabilize your pet and localise the problems that have arisen to cause such issues. Vomiting should not be ignored, and should not continue longer than a day without consulting your Veterinary Surgeon.

Regurgitation is usually a result of stomach acid that's entered the oesophagus of your pet while under anaesthesia. In many instances this acid can burn the lining of the oesophagus, very much like how you and I might experience "heart burn" and this is subsequently called esophagitis. This can result in poor function of the oesophagus and will not allow for the proper musculature movements to take place that slowly push the food down to the stomach. If this is the case, food, fluid or both can accumulate in the oesophagus and be expelled without warning. It's usually a condition that is easily resolved within two to three days.

In severe cases coating agents like sucralfate and acid blockers like omeprazole can be prescribed to help ease pain and limit further acid production. This condition (like all problems that arise post-surgery) should be brought to the attention of your Veterinary Surgeon. It's important that you always ring your Veterinary Clinic with information on any unusual complications that develop after surgery to be sure that your pet doesn't require further medical attention.

Pain is very much a symptom that accompanies surgery. We do our best to go into any procedure with the goals to limit pain and control pain with what is proper pain management. But should pain continue it can be recognized by such signs as crying, biting especially if attempts are made at inspection or palpation of the surgical site, grimacing, facial expressions, restlessness, sleeplessness, and pacing. With cats these symptoms can be less noticeable and they can tend to limit themselves from wanting to be near anyone and go off to hide. A lot of times there very well might be some pain associated for a day or two after as expected. But we will certainly try to limit this pain with medications we send home with you. Cold packs, cold gel packs, or even just a bag of frozen peas post-surgery can help limit inflammation. Post-surgery you will most like be required to continue medical treatments such as:

- Ear cleaner
- Systemic (oral) antibiotic and/or anti-inflammatory drugs
- Topical ear antibiotic
- Topical ear anti-inflammatory medication
- Ear flushing techniques

It's important to remember that once the situation has been resolved that future vigilance in cleaning and maintenance be maintained to avoid any future problems.

## **TECA and LBO**

### **Definition of TECA and LBO**

This surgery involves the removal of infected tissue and entire ear canal. The bulla, which is the bony portion of the ear, is opened and all the infected tissue from around the hearing apparatus is removed. This is also a point in time where bacterial samples are taken for culture and antibiotic susceptibility testing. This enables treatment with the correct antibiotic. On occasion biopsies may be taken to identify abnormal tissue. To ensure healthy tissue growth drains are placed which help avoid abscess pocket formation.

This is a highly successful procedure in alleviating the painful chronic ear infections. Hearing loss is a potential side effect with a chronic ear infection related to its severity in the middle ear but most of the time it does not last too long and the potential for the dog to retain some hearing capacity can occur.

Total Ear Canal Alabation and bulla osteotomy is simply stated, where the entire diseased ear canal is removed and the middle ear (bulla) is opened and the infected tissue within is also removed. Sometimes drains are put in place to facilitate drainage if the infection is of great severity. It is also to help aid the healing process rather than allowing the accumulation of disease debris.

### **Post TECA Surgery**

A large portion of TECA surgeries do not require drains, but should drains become necessary antiseptic and constant bandage changing might be required for a period of time till healing has improved. Post-surgery your dog will be required to stay in the hospital for twenty-four hours.

One of the most common complications associated with TECA surgery is facial nerve paralysis. This has a tendency to occur in up to ten per cent of the patients involved in the procedure. Seemingly the greater the severity of the ear disease, there is more a risk of injury to the nerve. This nerve is anatomically wrapped around the base of the ear and is an important nerve that innervates the muscles of the face. If this nerve is injured because of disease or surgery your pet will experience issues regarding the function of some of the musculature in the face.

For example, your pet might not be able to close the eyelids or its lips might appear droopy, and depends on the side of the face and obviously how easy it is for the surgeon to skilfully dissect out the nerve without damage. If there is a possibility that the muscles to the eye have been affected eye drops might be necessary to prevent the eye from drying. Most of the time the damage is usually bruising to the nerve, but there is a high incidence of recovery over a period of time where the nerve is given time to heal thus restoring gradual use the facial muscles.

This healing period usually averages around two months.

Pain might exist in the jaw region resulting in difficulty chewing or opening the mouth. Joint pain can exist because this is located in the skull just in front of the middle ear. A lot of times the inflammation from the chronic infection and even post operation can cause pain. Again this problem usually sees resolution within two weeks' time.

Sometimes the pupil of the eye can become constricted as in our pets there is a third eyelid that covers part of the eye, the result is Horner's Syndrome. Horner's is caused by damage or inflammation of the sympathetic nerve that runs through the middle ear. It typically is a very unusual complication as it is a fairly well protected nerve in our pets.

Total Ear Canal Ablation involves the removal of the infected tissue of the ear canal leaving inner ear intact. The middle ear chamber, or what is termed the Tympanic Bulla, is carefully inspected during the operation and any infected tissue or debris is cleaned out.

## **When is TECA Necessary?**

As mentioned dogs that have suffered for a considerable time from chronic ear infections can develop irreversible damages. In these instances the canal can become thickened and even in some cases ossification can occur. The middle ear can very well be affected by these infections. The middle ear is the tympanic bulla region of the ear and along with this area as its common in these chronic issues that the ear drum is ruptured. Congenital imperforate ear canal which is where there is a lacking normal opening to the canal can also result in middle ear infection.

Sometimes it's not infection that produces the need for surgery to the ear. Cancer can be a disease type that might warrant the need for this type of surgery. In many cases dogs acquire adenocarcinoma of the ear canal. This malignant type of cancer can be curative with the TECA surgery as long as it's not yet invaded through the cartilage or into the middle ear cavity.

Although rare, atresia of the external ear canal can occur through deformation in genetic growth. Atresia of the external acoustic meatus can occur if an embryological failure in the development of the ectoderm tube or a patent external canal after birth. Air-and Bone-conducted Brainstem Auditory Evoked Response (BAER) testing can be an important test to determine prognosis for normal and improved hearing pre-surgical procedure. This is surgically resolved through TECA & LBO procedure.

Other possible reasons for stenosis of the ear canal can be the presence of multiple follicular cysts. Many times these cysts can cause secondary infections. This presentation of disease can be remedied through TECA and LBO procedures. Usually surgical treatment proves curative for the resolve of the follicular cysts, but any secondary infections will have to be dealt with post-operatively.

Separation of the ear canal can occur in rare circumstances. This is where there is a disconnection of the ligaments that attach the auricular cartilage to the annular cartilage. Or this can happen where the annular cartilage attaches to the external auditory meatus causing a discontinuity of the external ear canal.

A great many instances for why TECA procedures are performed on cats is due to neoplasia occurrence. This can mean the unfortunate encounter with adenocarcinoma, which is a malignant form of cancer. If recognized very early on there is a chance of survival, but in most instances the median survival time is approximately four years post-operatively. This varies and the mitotic index of the tumour should be established when devising a treatment plan upon diagnosis. Horner's syndrome is the most common complication associated with the TECA procedure in the cat. This is probably due to the cat having a more fragile tympanic plexus and facial nerve than its canine counterpart.

In situations where disease affects only the middle ear, a bulla osteotomy might be recommended surgery. When an ear canal infection causes the eardrum to rupture is usually when a bulla osteotomy will be required. This can be especially common in cats with polyps. The bony wall of the bulla is opened surgically either from the side or under the neck allowing access to the middle ear. Two facilitate treatment and healing drains are placed to evacuate the infection.

## **Ablation**

### **Ablation Variations**

Success in TECA surgery in preservation of the carriage of the ear has been proven through application of single pedicle advancement flap as a way to maintain normal ear erect function (McNabb & Flanders, 2004). It is a simple modification of the skin incision that offers success cosmetically for the animal's normal ear carriage to be maintained.

It's important to try and achieve early recognition of a problem to avoid any abscessation and TECA surgery should alleviate the discomfort as the ear should improve with surgery and treatment. But pets with this separation of the annular and/or auricular cartilages with no history or current conditions with regards to infections or middle ear disease are candidates for primary repair via a caudal approach to the ear canal with excellent long-term prognosis (Tivers & Brockman, 2009).

There is a curvilinear incision made in the skin at the back base of the ear extending from the dorsal to ventral aspects. An identification of the proximal ear canal is done and is secured with stay sutures, it is then coupled with the distal ear canal. This is less likely to do harm and may preserve hearing.

Subtotal Ear Canal Ablation is a technique that requires less dissection and maintains a portion of the distal vertical ear canal. It's a technique best used to maintain normal ear carriage in situations where the pet has anatomical abnormalities or masses of the horizontal ear canal. It is also worth consideration in animals with erect ears suffering from otitis externa where the situation does not affect the vertical ear canal as erect carriage can be maintained in these animals, however more research needs to be completed before recommendation for those animals suffering otitis externa with pendulous ears (Mathews, Hardie, & Murphy, 2006). Also an option is the Total Ear Canal Ablation preserving the auricular cartilage, is a technique developed by Okamoto Miyatake (Miyatake & Inoue, 2001).

## **LER and VCA Definition**

Surgical options such as the Lateral Ear Resection (LER) or the Vertical Canal Ablation (VCA) are performed to improve air flow, remove debris, allow for better access for future treatments with medications, and resolve inflammation. These procedures have a great success in helping control bacterial growth and yeast populations. They are also in large part successful at preserving the normal anatomy of the ear.

Ear disease that is diagnosed early on may be remedied with a lateral ear resection surgery. The surgery can be used for diseases of the external ear. It involves removing and reconstructing small lateral portion of the ear canal. This helps drainage of the ear canal and permits application of medications directly into the ear canal. Lateral ear resection is ideal for ears that have not reached their end-stage development and resolution can be achieved through access to better cleaning and canal ventilation.

The surgery creates an incision that cuts the vertical canal in half spanning the length of the vertical portion till the junction where it turns horizontal. There are a number of versions of how this surgery can be accomplished. Take for example, the Zepp procedure where skin is removed from the area outside or later to the ear so this newly dissected half of the vertical canal can fold downwards to form a drain. Another variation is the LaCroix procedure where the outer or lateral part of the vertical ear canal is simply removed thus creating a new opening. Both create an opening that allows for more ventilation, less area to withhold infectious material and wax, and creates a simply horizontal canal. With the lateral ear resection surgery there is now a much better accessibility to cleaning.

Sometimes surgery is dependent on the breed of dog and how the proper procedure might best suit to deliver desirable results. When vestibular disease is present, usually in the sign of a head tilt, there is the likelihood of a middle ear infection. A lateral ear resection is not a proper procedure to remedy this problem.

## **Post LER or VCA Surgery**

The LER and VCA can present with complications. The structure at the entrance of the newly re-shaped ear canal could very well scar into a hole that is too narrow for proper ear treatment and will most likely require revision surgery to widen the opening. Dehiscence is where the stitches might not hold in the healing process, and this can also be a complication of the lateral ear resection surgery. It's usually a result of too much tension or the infection is remarkably debilitating of the healing tissues. If this happens the patient will have to wear an Elizabethan collar for an extended period of time to allow natural healing to take place.

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