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When and how to do a myringotomy – a practical guide

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A myringotomy is a surgical incision made in the tympanic membrane (TM). This gives access to the middle ear for sampling, flushing and instilling topical therapy. It should be considered whenever the TM is intact and there is clinical evidence of otitis media, abnormal TMs and/or abnormal diagnostic imaging. Samples should be collected for cytological investigation and culture, and then the external ear should be cleaned and dried (if required). Myringotomies should be performed under general anaesthesia and, wherever possible, using a video otoscope; the enhanced view and instrument ports facilitate the technique and reduce the risk of complications. The myringotomy incision should be made in the caudoventral quadrant of the TM using an appropriately sized urinary catheter to collect samples and flush the middle ear cavity. A thorough understanding of the anatomy, technique and potential ototoxicity of topical therapy is needed to minimize the risk of neurological and other complications. The TM usually heals within 35 days if kept free of infection.

Introduction

Otitis media is common and potentially underdiagnosed.¹ Infectious otitis media occurs in 50–82% of dogs with chronic recurrent otitis externa, particularly where there is horizontal ear canal stenosis and/or infection with Gram-negative bacteria.^{2,3} While the majority of these cases were a progression of an otitis externa through a perforated tympanic membrane (TM), several dogs had an intact tympanum that was thought to have healed over an active otitis media.³ A sterile form, primary secretory otitis media (PSOM) or otitis media with effusion (OME), was recognized in cavalier King Charles spaniels (CKCS) initially, although it can affect any brachycephalic breed. It may be present in $\leq 70\%$ of CKCS with or without associated clinical signs.⁴ Otitis media in cats most commonly presents as a result of a nasopharyngeal polyp (NPP), from pharyngeal or upper respiratory infection which has extended up through the auditory (Eustachian) tube, following auditory tube dysfunction or obstruction, or associated with a sterile mucositis/sinusitis. Less commonly, otitis media occurs as an extension of otitis externa and it also has been suggested that a potential cause could be haematogenous spread.⁵

The clinical signs of otitis media overlap with otitis externa. This can make the diagnosis challenging. Clinical signs include head shaking, scratching and rubbing the ear, dullness, avoiding head contact (e.g. petting), ear canal exudates, reluctance to eat hard foods, pain on opening the mouth, and odour. In addition, otitis media

can lead to otitis interna with signs such as head tilt and deafness. Horner's syndrome is more common in cats due to the more superficial anatomy of their sympathetic trunk. Peripheral vestibular syndrome (i.e. head tilt, ataxia and/or horizontal nystagmus) and facial nerve deficits can occur in advanced or severe cases and should be treated as an emergency.

Otoscopic examination may reveal an abnormal TM (Figure 1). Changes include a thickened, opaque, inflamed or grey TM, material behind the TM and a convex pars tensa. It may be possible to see ruptures or tears in the TM, which typically (in the absence of traumatic or iatrogenic damage to the TM) confirms otitis media. However, small tears are almost impossible to see without the magnified image from a high-quality video otoscope. Moreover, some tears may only become visible when they open during ear flushing or other procedures. Even with video otoscopy, stenosis and/or debris in the horizontal ear canal can limit examination of the TM. In the CKCS a bulging pars flaccida obscuring some or all of the pars tensa is diagnostic for PSOM (Figure 1b), although a flat pars flaccida does not rule it out (Figure 2).⁴

Diagnostic imaging [e.g. computed tomography (CT), magnetic resonance imaging (MRI) or radiographs] of the middle ear is indicated when otitis media is suspected. CT is preferred by the authors, as it is most sensitive and specific for changes to the bony structures of the middle ear.⁶ Abnormal findings (including soft-tissue material in the tympanic bullae and changes to the bulla wall) confirm otitis media (Figure 3). However, normal findings (especially with plain radiography, which is less sensitive) do not rule it out.

Myringotomy

A myringotomy is a surgical incision made in the TM to allow entry into the middle ear. It is used to confirm the presence of fluid and/or debris in the middle ear, remove

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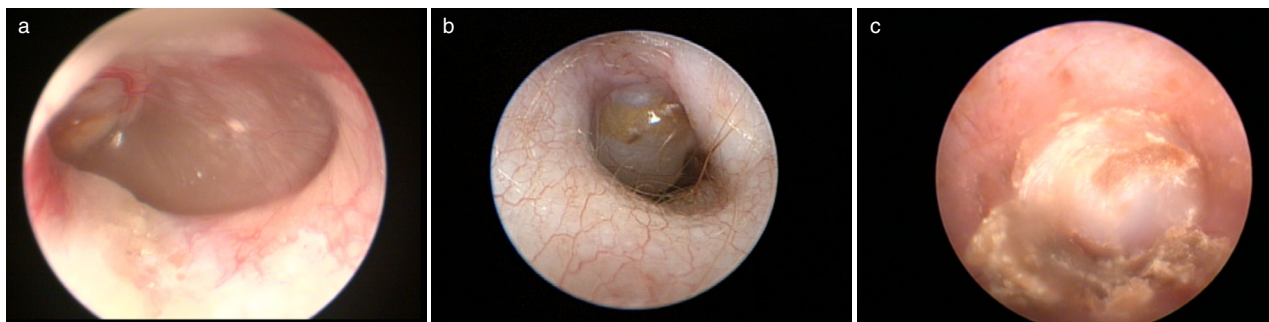


Figure 1. Examples of abnormal tympanic membranes (TM) that justify a myringotomy (top = dorsal; bottom = ventral; left = rostral; right = caudal).

(a) Material visible in the middle ear behind the TM in a cat with an inflammatory polyp. (b) A severe bulging pars flaccida obscuring the pars tensa in a cavalier King Charles spaniel with primary secretory otitis media. (c) A convex and opaque TM bulging into the horizontal ear canal in a dog with infective otitis media. Compare with the normal appearance of the TM in Figure 5.

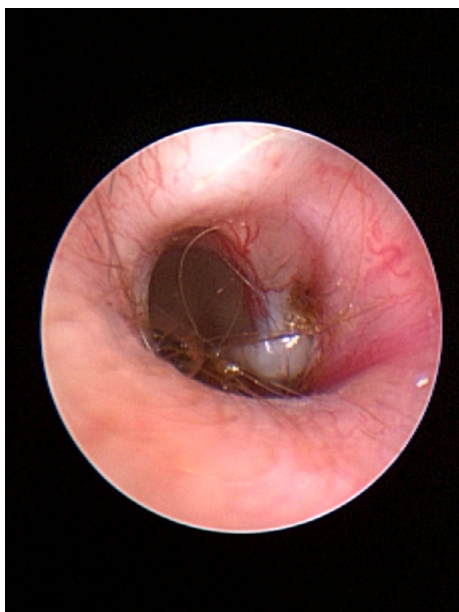


Figure 2. Flat pars flaccida in a cavalier King Charles spaniel with primary secretory otitis media which was diagnosed on a CT scan (top = dorsal; bottom = ventral; left = caudal; right = rostral).

exudates from the middle ear cavity, obtain samples for cytological evaluation and microbial culture, drain the middle ear and to instill topical otic therapy into the middle ear cavity.

Indications for a myringotomy

A myringotomy should be considered when one or more of the following are present:

- Clinical signs consistent with otitis media or otitis interna (including acute onset peripheral vestibular disease, hearing loss, facial paralysis and/or Horner’s syndrome) with either an abnormal otoscopic appearance of the TM or abnormal middle ear findings on diagnostic imaging; OR
- Abnormal otoscopic appearance of the TM (see above and Figure 1); AND/OR
- Abnormal middle ear findings on diagnostic imaging (see above and Figure 3).

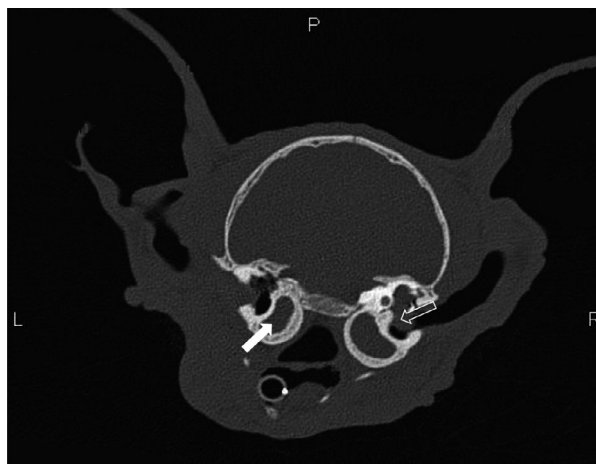


Figure 3. Computed tomography scan of a cat with soft-tissue opacities in both middle ears.

Hounsfield unit scale density analysis indicated that there was fluid in the ventromedial compartments (solid arrow) and soft tissue in the dorsolateral compartments (open arrow). Note the complete bony shelf and compare this to the incomplete bony shelf in dogs illustrated in Figures 6 and 7.

Patient preparation, room set-up and complications

Oral and/or topical glucocorticoids should be used for two to three weeks initially to open up hyperplastic and/or stenotic ear canals, except in circumstances where the systemic use of glucocorticoids is contraindicated. A myringotomy requires general anaesthesia and involves associated risks. Patients should be stabilized before the procedures, taking into account any concomitant conditions. The patient must be intubated with a secure endotracheal tube to prevent fluid aspiration from auditory (Eustachian) tube drainage.

In a room set up with the video otoscope and anaesthetic ear flush (Figure 4), patients should be placed in lateral recumbency on a medically approved heating pad with the affected ear uppermost, to completely clean and evaluate the ear. Where possible, the neck should be slightly elevated such that the head is positioned at a

downward angle to facilitate drainage of fluid through the nose or mouth. This reduces the risk of fluid aspiration in the case of an inadequate seal around the endotracheal tube. Other equipment and materials are listed in Table 1.

Possible complications from the myringotomy and middle ear flush include Horner's syndrome, facial nerve paralysis, vestibular disturbances, permanent TM defects and deafness. Owners should be made aware of these when giving informed consent. Owners should be instructed to watch for these complications after the procedures and topical treatment. They should discontinue treatment and contact the clinic immediately if they occur. These complications normally resolve over two to four weeks yet may be permanent.

Review of pertinent anatomy

It is important to be familiar with the normal structures of the external and middle ear.^{7,8} The TM is a semitransparent membrane separating the external ear canal from the middle ear. It has two sections: the smaller upper pars flaccida and the larger lower pars tensa. The manubrium of the malleus attaches to the medial surface of the pars tensa and is visible externally as the stria mallearis (Figure 5).

The middle ear consists of a mucosal-lined air-filled tympanic cavity and the three auditory ossicles (malleus,

incus and stapes) (Figure 6). Rostrally, it is connected to the nasopharynx by the auditory (Eustachian) tube. The tympanic cavity consists of a small dorsal epitympanic recess, the tympanic cavity proper and the ventral cavity. The largest of the three cavities is the ventral cavity, the part within the tympanic bulla. There is a bony ridge (septum bulla) that separates the tympanic cavity proper from the ventral cavity. In cats, this almost completely separates the cavity into two compartments (dorsolateral and ventromedial) making it impossible to pass a catheter into the ventromedial compartment (Figure 3). In dogs the septum bulla is incomplete allowing access to flush the whole tympanic cavity. On the medial wall of the tympanic cavity proper opposite the TM there is a bony eminence, the promontory, which houses the cochlea. There are two small foramina on the promontory; the caudolateral round or vestibular window and the dorsolateral oval or auditory window. The latter is adjacent to the pars flaccida and is covered by a thin diaphragm attached to the footplate of the stapes (Figure 7).

There are several nerves associated with the middle ear. The facial nerve enters the internal acoustic meatus and travels through a bony tunnel, the facial canal, of the petrous temporal bone. In dogs, this canal is incomplete and exposed to the middle ear cavity caudal and dorsal to the stapes. An infection in the middle ear could therefore infiltrate through the connective tissue and result in facial paralysis. In cats, the facial canal is complete and does not expose the facial nerves as they pass through the middle ear. Otitis media-associated facial nerve deficits, as described for dogs, are therefore rare unless there is bony destruction involving the facial canal. An ascending infection could affect the vestibulocochlear nerve resulting in otitis interna. A facial nerve branch, the chorda tympani, exits the facial canal, passes beneath the base of the malleus medially, close to the pars flaccida, and exits the middle ear to merge with the lingual branch of cranial nerve V and innervate the rostral third of the tongue. Otitis media or traumatic/surgical rupture of the pars flaccida could therefore impair taste. Another facial nerve branch, the greater petrosal nerve, provides innervation to the lacrimal and lateral nasal glands. Damage to this nerve can result in neurogenic keratoconjunctivitis sicca (KCS) and dry nose (xeromyxetria) (Figure 6). Post-ganglionic fibres of the cervical sympathetic trunk are located in the dorsomedial wall of the tympanic cavity. In dogs, these run through the petrous temporal bone associated with the internal carotid artery in the carotid canal. However, cats do not have a carotid canal and the sympathetic nerve fibres enter the tympanic cavity and form a plexus overlying the cochlear promontory. Damage to the sympathetic nerve fibres can lead to Horner's syndrome which is more common in cats as a consequence of the superficial course of the fibres in this species (Figures 6 and 7).

When performing a myringotomy, it is important to avoid damaging the promontory, the round and oval windows, nerves and auditory ossicles to avoid iatrogenic neurological complications. These all are necessary for the amplification and transmission of sound waves to the inner ear, vestibular function and ocular innervation. Because the promontory is located opposite the mid-dorsal

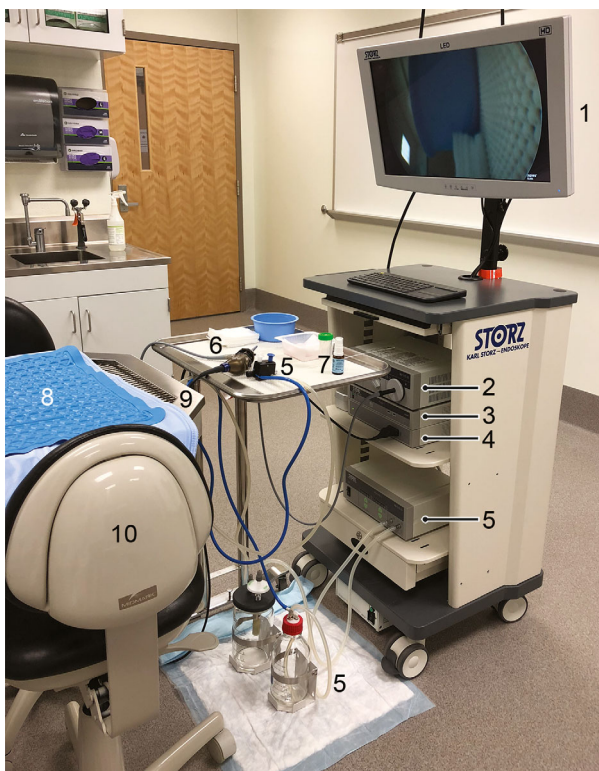


Figure 4. Room set-up with video otoscope for an anaesthetic ear flush.

1, Monitor; 2, light source; 3, digital capture system; 4, camera box; 5, external flushing device [VETPUMP 2 (box, glass canisters and hand-piece)]; 6, camera attached to otoendoscope and light source on Mayo stand; 7, defogging agent (UltraStop); 8, medically-approved heating pad; 9, tub table (Midmark Canis Major Wet Dental/Treatment Lift Table); 10, stools (Midmark Dental Stools for the clinician and technician).

Table 1. Equipment required for ear flushing and myringotomy using handheld and video otoscopes

Cleaning the external ear canals (if required)	
1	Cotton-tipped applicators and glass microscope slides for cytological evaluation
2	Sterile culture swabs and sterile containers
3	Cleaning agent, which should be non-ototoxic (i.e. squalene or saline)
4	Gauze sponges, towels and/or incontinence pads to soak up fluid and protect the face
5	0.9% irrigation saline, warmed
6	Bulb syringes
7	Flushing/lift table (e.g. Midmark Canis Major Wet/Dental Treatment Lift table)
Handheld otoscope	
1	Otoscopic cones of the appropriate diameter and length
2	10 or 12 cc/mL syringes
3	8-French polypropylene urinary catheters or red rubber catheters
Myringotomy and middle ear flush with video otoscope (Figure 4)	
1	Anti-fogging agent (e.g. UltraStop)
2	10 or 12 cc/mL syringes
3	5-French polypropylene urinary catheters or red rubber catheters
4	External suction and irrigation device (i.e. Vet Pump 2) OR 10 or 12 cc/mL syringes

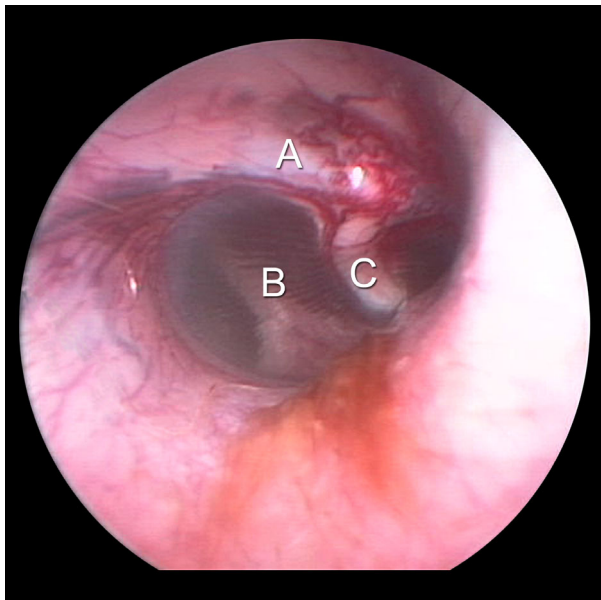


Figure 5. Normal canine tympanic membrane (right ear). A, Pars flaccida; B, pars tensa; C, stria mallearis (top = dorsal; bottom = ventral; left = caudal; right = rostral).

aspect of the TM, the oval window on the dorsolateral aspect of the promontory, the round window on the caudolateral aspect of the promontory, and the ossicles dorso-rostrally in the middle ear, the myringotomy should be performed in the caudoventral quadrant of the TM (Figure 7). The required accuracy is greatly facilitated by a good-quality video otoscope.

Myringotomy procedure

Diagnostic imaging should be performed before the ear flush to evaluate the soft tissue and osseous structures of the external and middle ear. For cases of infectious otitis externa, samples should be obtained from the external

ear canal for cytological evaluation and, if clinically indicated, microbial culture and antibiotic susceptibility testing (AST) before the ear flush.

For the external ear flush,⁹ the ear canal is soaked for 10 min with a non-ototoxic ceruminolytic ear cleaner (e.g. squalene) if the patency of the TM is unknown. The ear then is flushed with warm sterile 0.9% saline and a bulb syringe to remove large debris and exudate. This is followed by flushing with saline using a handheld or video otoscope (Table 1). Once the ear is clean, the ear cleaner and saline are suctioned out to dry the ear; drying the ear reduces the risk of iatrogenic contamination of the middle during the myringotomy. Once the ear canals are clean and dry, the TM can be visualized, ideally with a video otoscope. It is very difficult to assess the integrity of the TM and perform an accurate myringotomy with a handheld otoscope.

If the TM is not intact, samples for cytological evaluation and bacterial AST can be collected directly from the middle ear. This is performed by passing a 5 French polypropylene urinary catheter or 5 French red rubber feeding tube attached to a 10 or 12 cc/mL syringe through the instrument port and channel on the video otoscope into the middle ear cavity. It is important to keep the position of the catheter or feeding tube on the ventral floor of the ear canal to avoid damage to the middle ear structures (Figure 8). Samples can be obtained by gentle direct aspiration of fluid from the middle ear cavity. If this is not possible saline can be flushed into the middle ear cavity and aspirated back. The fluid is placed into a sterile container for bacterial culture and AST. A second sample then can be collected for cytological evaluation. The middle ear then is gently flushed repeatedly with approximately 1 mL of saline using the catheter or feeding tube (cut to the appropriate length of 30 cm; the angle of the cut should be 90° and sharp edges should be smoothed to avoid trauma to the ear canal epidermis and middle ear mucosa) attached to a 10 or 12 cc/mL syringe or an external suction and irrigation device. It is essential that all of

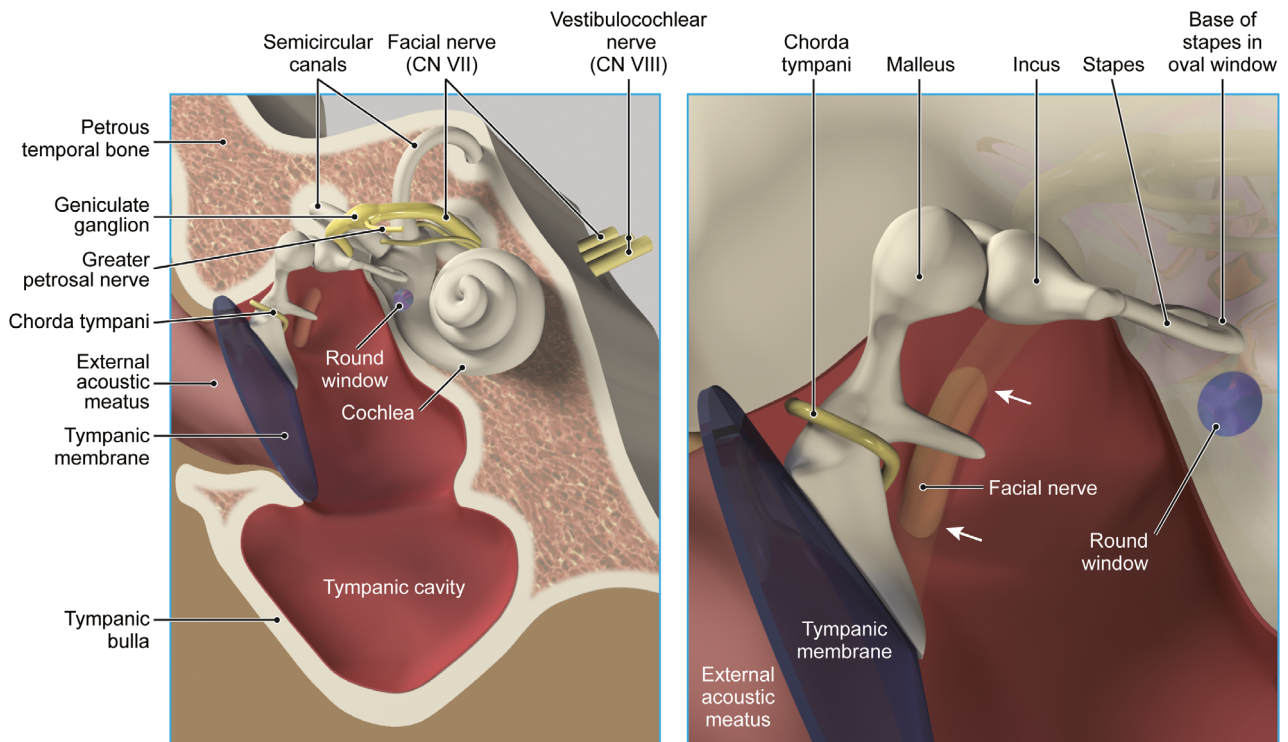


Figure 6. Anatomy of the middle and inner ear and associated structures. Arrows indicate the region where the bony (facial) canal is incomplete and the facial nerve is exposed to the middle ear cavity caudal and dorsal to the stapes. In dogs, the sympathetic nerve fibres run in the carotid canal within the petrous temporal bone; in cats they form a tympanic plexus over the cochlear promontory between the round and oval windows (see also Figure 7). (© Tim Vojt).

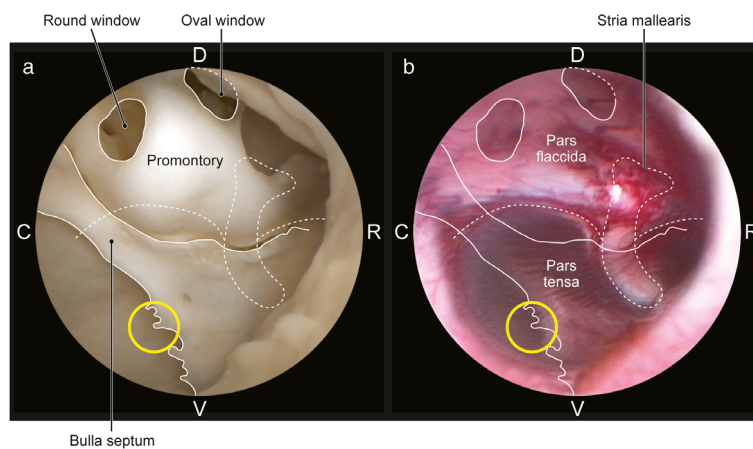


Figure 7. Normal anatomy and appearance of the canine tympanic membrane (TM) and middle ear (right ear). (a) Bony structures of the middle ear with the outline of the TM and stria mallearis superimposed (broken white lines). (b) Normal canine TM and stria mallearis (broken lines) with the middle ear structures outlined (solid white lines). The anatomy of the feline middle ear is similar except that the bulla septum divides the middle ear into dorsolateral and ventromedial compartments. In addition, the tympanic plexus of the sympathetic nerve runs over the cochlear promontory between the round and oval windows. The yellow circle highlights the myringotomy site – this avoids the important structures in the dorsal and rostral middle ear and (in dogs) affords access into the ventral tympanic bulla. (D, dorsal; V, ventral; C, caudal; R, rostral). (© Tim Vojt).

the mucus, pus, debris and cleaning fluids (including that from initially cleaning the external ear canals) are removed. Finally, any residual saline should be aspirated.

If the TM is intact, a myringotomy is needed to obtain samples and to flush the middle ear cavity. This can be done with a 5 French polypropylene urinary catheter. In the authors' opinion, other instruments, such as a myringotomy needle or laser, make too small an incision,

and spinal needles and buck curettes do not pass down the port of the otoscope. The catheter is placed through the instrument port and channel on the video otoscope and used to make the incision. This should be made in the caudoventral quadrant of the pars tensa of the TM, keeping the position of the catheter or feeding tube on the ventral floor of the ear canal to avoid damage to the middle ear structures (Figure 8). However, chronic

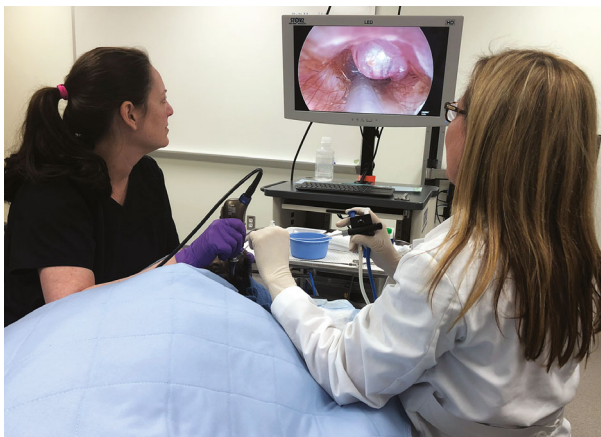


Figure 8. Clinician (right) and technician (left) performing a myringotomy and flushing a dog's right ear using the setup shown in Figure 4. Note the bulging pars flaccida and the caudoventral placement of the catheter in the screen image.

changes due to severe otitis externa and/or conformation in brachycephalic dogs (especially rostral deviation of the proximal ear canal and tympanic bulla in pugs and French bulldogs) can make it difficult to visualize the TM and/or correctly align the catheter. It is possible to perform a "blind" or "off-target" myringotomy, by "aiming" the catheter towards the caudoventral quadrant of the pars tensa, yet this increases the risk of complications. Alternatively, the procedure can be abandoned and a surgical approach considered.

Once the myringotomy incision has been made, the catheter or feeding tube is advanced until encountering bone (bullae septum) or solid soft tissue and then backed off slightly to begin flushing and suctioning. Samples then can be obtained for cytological evaluation and AST as described above. Where necessary, the initial myringotomy incision can be slightly enlarged to facilitate retrograde flow of material. Over-vigorous flushing through a small incision without adequate space around the catheter is less efficient and can lead to a build-up of pressure that may damage the TM (e.g. causing an uncontrolled tear) or middle ear structures. The middle ear then is gently flushed and aspirated through the incision with saline using a catheter or feeding tube, as described above (Figures 8 and 9).

In some CKCS with PSOM the pars flaccida is so large that it completely obscures the pars tensa. To make the myringotomy incision, the catheter can be slipped under the bulging pars flaccida, directed towards the caudoventral quadrant of the pars tensa and with gentle pressure the myringotomy incision is made. However, visualizing the TM can be made easier by initially puncturing and deflating the pars flaccida, even though this results in flush fluid being expelled through the incision in the pars flaccida simultaneously when fluid is flushed through the myringotomy incision.

Contamination of the middle ear post-myringotomy can be a concern. In a study of normal canine cadavers, contamination with fluorescein-stained saline from the horizontal canal was noted in 19 of 28 (68%) of the middle ears. There was positive bacterial growth in only one of

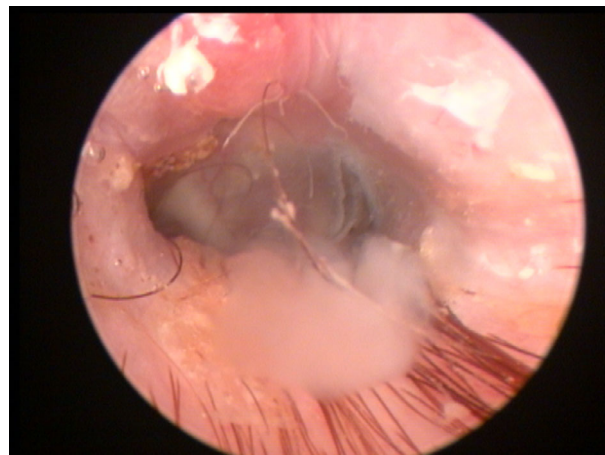


Figure 9. Mucus emerging from a myringotomy incision in the caudoventral quadrant in the left tympanic membrane of a dog with primary secretory otitis media.

11 (9%) of the middle ears with corresponding external ears with positive cultures.¹⁰ However, microbial contamination may have been rare in this study as these were normal ear canals that were first cultured, and then flushed and suctioned before myringotomy. If these ears had been infected, the microbial contamination rate may have been higher. The risk of contamination from a healthy ear canal (e.g. in cases of PSOM without concurrent otitis externa) would appear to be low, and clinicians should be aware that the risk of contamination of the middle ear from the external ear canal may be much greater where there is a significant concurrent infectious otitis externa. The ear canals therefore should be cleaned thoroughly to remove any debris and micro-organisms before drying the area. This will reduce the risk of introducing residual saline, debris and/or micro-organisms into the middle ear during the myringotomy.

Topical therapy can be instilled directly into the middle ear cavity after cleaning if there is cytological evidence of infection. The choice of medication will depend on the cause of the otitis media and the type of infection; however, ointment- and suspension-based otics should be avoided. Topical therapy may be continued at home, although it is unclear how much medication will penetrate to the middle ear; therefore, a sufficient volume of the topical treatment should be used. As it is likely that medication will penetrate, ototoxicity must be considered when selecting treatment.

The normal TM heals in 21 to 35 days,¹¹ although in cases with complete rupture and/or chronic perforation of the TM healing can take up to 15 weeks.¹² Therefore, if the ear is kept free of infection after the myringotomy procedure, the TM should heal. Nonhealing resulting in a permanent TM defect is a rare complication.

Conclusions

A myringotomy is indicated whenever there is clinical evidence of otitis media, abnormalities of the TM and/or abnormal findings on diagnostic imaging of the middle

ears. Myringotomy and flushing/aspiration of the middle ear are required for cytological evaluation, ASTs, and to remove debris and/or mucus. Good technique is required to avoid neurological deficits and other complications. This relies on a thorough understanding of the TM and middle ear anatomy, accurate positioning and careful procedures. Video otoscopes should be used wherever possible as the enhanced view and instrument ports facilitate the technique and reduce the risk of complications.

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Author contributions

Lynette Cole: Conceptualization, Methodology, Project administration, Resources, Visualization, Writing-original draft, Writing-review & editing. **Tim Nuttall:** Conceptualization, Methodology, Project administration, Resources, Visualization, Writing-original draft, Writing-review & editing

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Supporting Information

Additional Supporting Information may be found in the online version of this article.

Video S1. The correct procedure for performing a myringotomy shown in the right ear of a cadaver using a video otoscope. A 5 French urinary catheter is used to make the myringotomy incision into the caudoventral quadrant of the pars tensa.

Video S2. Performing a myringotomy using a video otoscope in the right ear of a cavalier King Charles spaniel with primary secretory otitis media (PSOM – note that this dog has a flat pars flaccida despite having PSOM). The myringotomy incision is made with a 5 French urinary catheter in the caudoventral quadrant of the pars tensa. 0.9% irrigation saline is manually flushed into the middle ear cavity to expel the mucus into the horizontal ear canal, which is then suctioned out of the ear canal either manually or with an external suction device.

Video S3. Performing a myringotomy using a video otoscope in the left ear of a dog with an infectious otitis media. The myringotomy incision is made with a 5 French urinary catheter in the caudoventral quadrant of the pars tensa. Note the abnormal blue-grey colour of the pars tensa. The brown purulent debris is flushed and aspirated from the middle ear using 0.9% irrigation saline either manually or with an external suction device from the middle ear cavity.

Résumé – Une myringotomie est une incision chirurgicale de la membrane tympanique (TM). Elle donne accès à l'oreille moyenne pour prélèvement, flushing et traitement topique. Elle doit être envisagée même si la TM est intacte et si il y a des signes cliniques évocateurs d'otite moyenne, de TM anormale et/ou un diagnostic anormal d'imagerie. Les échantillons devraient être collectés pour cytologie et culture, et ainsi l'oreille externe devrait être nettoyée et séchée (si besoin). Les myringotomies devraient être réalisées sous anesthésie générale et si possible à l'aide d'un vidéo-otoscope; l'amélioration de la visualisation et du port des instruments facilitent la technique et réduit le risque de complications. L'incision de myringotomie devrait être réalisée dans le quadrant caudo-ventral de la TM à l'aide d'une sonde urinaire de diamètre approprié pour la collecte des échantillons et le nettoyage de la bulle tympanique. Une meilleure connaissance de l'anatomie, la technique et la potentielle ototoxicité du traitement topique est nécessaire pour minimiser le risque de complications, notamment, neurologiques. La Tm cicatrise habituellement en 35 jours si aucune infection n'est présente.

Resumen – Una miringotomía es una incisión quirúrgica realizada en la membrana timpánica (TM). Esto da acceso al oído medio para tomar muestras, lavar e introducir la terapia tópica. Se debe considerar siempre que la TM esté intacta y haya evidencia clínica de otitis media, TM anormales y/o imágenes de diagnóstico

anormales. Se deben obtener muestras para investigación citológica y cultivo, y luego se debe limpiar y secar el oído externo (si es necesario). Las miringotomías deben realizarse bajo anestesia general y, siempre que sea posible, utilizando un video otoscopio; la mejor visualización y los enlaces para instrumentos facilitan la técnica y reducen el riesgo de complicaciones. La incisión de miringotomía debe realizarse en el cuadrante caudoventral de la TM utilizando un catéter urinario de tamaño apropiado para recolectar muestras y lavar la cavidad del oído medio. Se necesita un conocimiento profundo de la anatomía, la técnica y la posible ototoxicidad de la terapia tópica para minimizar el riesgo de complicaciones neurológicas y de otro tipo. La TM generalmente cicatriza en 35 días si se mantiene libre de infección.

Zusammenfassung – Eine Myringotomie ist eine chirurgische Inzision am Trommelfell (TM). Diese ermöglicht einen Zugang zum Mittelohr, um Proben zu nehmen, es zu spülen oder topische Medikamente zu applizieren. Sie sollte immer in Betracht gezogen werden, wenn das TM intakt ist und eine klinische Evidenz für eine Mittelohrentzündung, abnormale TMs und/oder eine abnormale bildgebende Diagnostik vorliegen. Die Proben sollten für eine zytologische Untersuchung und Kultur genommen werden, danach sollte das äußere Ohr gereinigt und (wenn nötig) getrocknet werden. Myringotomien sollten unter Vollnarkose und wenn möglich mittels Video Otoskop durchgeführt werden; die erweiterte Sicht und die Instrumentenzugänge erleichtern die Technik und reduzieren das Risiko von Komplikationen. Die Inzision für die Myringotomie sollte im caudoventralen Quadranten des TM erfolgen, wobei ein entsprechend großer Katzenharnkatheter zur Probenahme und zur Spülung des Mittelohrs Verwendung finden sollte. Ein genaues Wissen der Anatomie, der Technik und der möglichen Ototoxizität der topischen Therapie ist Voraussetzung, um das Risiko einer neurologischen oder einer anderen Komplikation zu minimieren. Das TM heilt normalerweise, wenn eine Infektion verhindert wird, innerhalb von 35 Tagen zu.

要約 – 鼓膜切開術は、鼓膜(TM)を切開する手術である。鼓膜を切開することにより、中耳へのアクセスが可能となり、サンプリング、フラッシング、外用療法の実施が可能となる。鼓膜が無傷で、中耳炎の臨床的証拠、鼓膜の異常、および画像診断の異常がある場合には、鼓膜切開を考慮すべきである。細胞学的検査および培養のためにサンプルを採取し、外耳洗浄して乾燥させる(必要な場合)必要がある。鼓膜切開術は全身麻酔下で行い、可能な限りビデオ耳鏡を使用すべきである。鼓膜切開術は、サンプル採取および中耳腔洗浄のために適切なサイズの尿道カテーテルを用いて鼓膜の尾腹側四分円に行うべきである。神経系やその他の合併症のリスクを最小限に抑えるためには、解剖、技術、および外用療法の潜在的な耳毒性を十分に理解する必要がある。感染がなければ、TMは通常35日以内に治癒する。

摘要 – 鼓膜切開術是在鼓膜(TM)上做的手术切口。这允许进入中耳进行采样、冲洗和外部治疗灌注。当TM完整且有中耳炎、TM异常和/或诊断成像异常的临床证据时,应考虑TM。应采集样本进行细胞学检查和培养,然后(如需要)清洁外耳并使之干燥。鼓膜切開術应在全身麻酔下进行,并在可能的情况下使用视频耳鏡进行操作;增强的视野和器械端口有助于该技术,并降低并发症的风险。应使用合适尺寸的导管在TM尾腹側象限做鼓膜切開術切口,采集样本并冲洗中耳腔。需要全面了解外部治疗的解剖结构、技术和潜在耳毒性,以将神经和其他并发症的风险降至最低。如果保持无感染,TM通常在35天内愈合。

Resumo – A miringotomia é uma incisão cirúrgica realizada na membrana timpânica (MT) que dá acesso ao ouvido médio para coleta de amostras, limpeza e instilação de terapia tópica. A miringotomia deve ser considerada sempre que a MT está intacta e há evidência clínica de otite média, MTs anormais e/ou exame de imagem anormal. As amostras devem ser coletadas para investigação citológica e cultura, e depois o ouvido médio deve ser limpo e seco (se necessário). Miringotomias devem ser realizadas sob anestesia geral e, sempre que possível, utilizando um vídeo otoscópio; a visão ampliada e as portas para instrumentos facilitam a técnica e reduzem o risco de complicações. A incisão da miringotomia deve ser realizada no quadrante caudoventral da MT utilizando um cateter urinário de tamanho apropriado para coletar amostras e lavar a cavidade do ouvido médio. Um conhecimento aprofundado da anatomia, técnica e potencial ototoxicidade de produtos tópicos é necessário para minimizar o risco de complicações neurológicas e de outra natureza. A MT geralmente cicatriza em 35 dias se for mantida sem infecção.