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*Suggested Personal & Professional Development (PPD)



RABBITS

Ear-based swellings in rabbits

Ear-based swellings are common in lop-eared, brachycephalic rabbits and result from a build-up of cerumen in the soft-walled part of the canal, owing to the failure of cerumen to drain either via the external auditory meatus or the Eustachian tubes. Some cases may become secondarily infected.

These cases have frequently been referred to as ‘ear-based abscesses’, which does not adequately describe their aetiology and may encourage a less appropriate surgical approach.

This article will describe the aetiology of what may be more adequately described as ‘aural diverticulosis’ and will outline a diagnostic and therapeutic approach based on cerumen removal and facilitating drainage/removal thereafter.

Aetiology

The ‘normal’ or ‘prick-eared’ rabbit ear anatomy is well described (Popesco, 1978; Chow, 2011) and is best described as three interlocking auricular cartilages that provide a rigid support for the erect ear. The anatomy of the lop-eared rabbit, however, has less commonly been described as to how the lop ‘forms’ – in these animals there is a gap between the second and third cartilages, which being soft tissue only, therefore allows the ear to fall (Darwin, 1868; Chitty and Raftery, 2013) (**Figure 1**).

This loss of rigidity also closes the canal – effectively forming ‘separate’ horizontal and vertical canals, thus preventing drainage of cerumen to the exterior. In brachycephalic breeds, there is additionally likely to be reduced drainage via the Eustachian tubes, such as occurs in Cavalier King Charles spaniels.

As a result, cerumen will build up continuously inside the ‘horizontal canal’ (**Figures 2a & 2b**). This applies pressure to

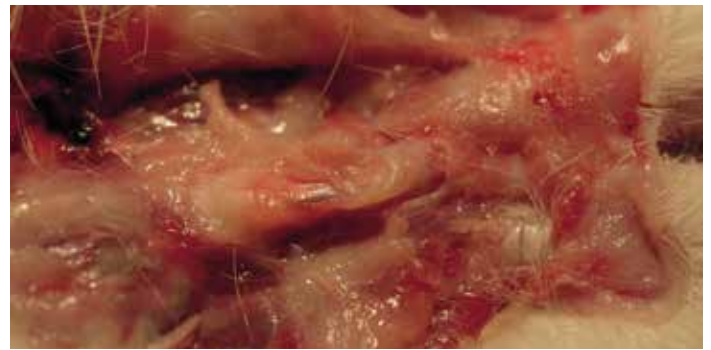


Figure 1. Dissection of a lop-eared rabbit ear showing the soft-walled portion of the ear canal (Source: BSAVA Manual of Surgery, Dentistry and Imaging).



Figure 2a. Swelling at the base of the ear, typical of an aural diverticulum.

the soft-walled portion of the canal, causing stretching and a bulging mass of cerumen in what is, effectively, a diverticulum of the ear canal (Chitty and Raftery, 2013).

This cerumen may become secondarily infected with a resultant inflammatory reaction, although this reaction is not present in all cases. Even when infected, this lesion does not represent a true ‘abscess’

as it does not represent infection within a tissue.

Diagnostic investigation

Clinical signs of a palpable bulge in the lateral wall of the ear canal are diagnostic. In some cases, there will also be discomfort or irritation of the ear. There may also be signs of deeper ear disease – ‘head tilt’, for instance.

The main aims of a diagnostic investigation are to determine the:

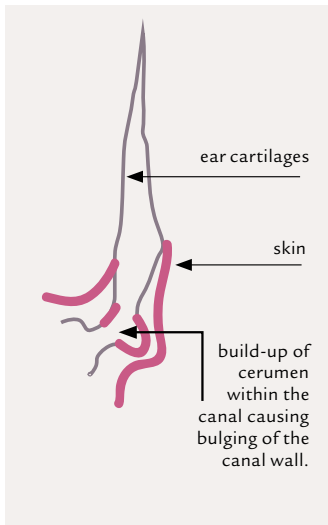


Figure 2b. Diagram showing how cerumen builds up within the soft-walled canal.

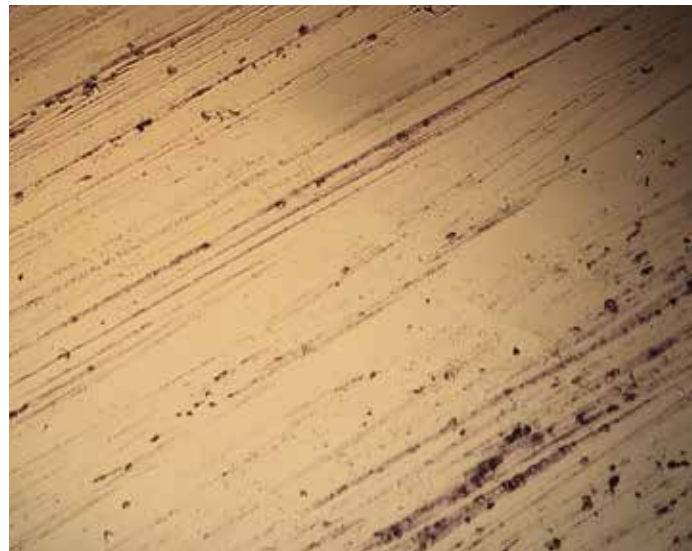


Figure 3a. Cytology of normal cerumen – acellular, with masses of ‘debris’.

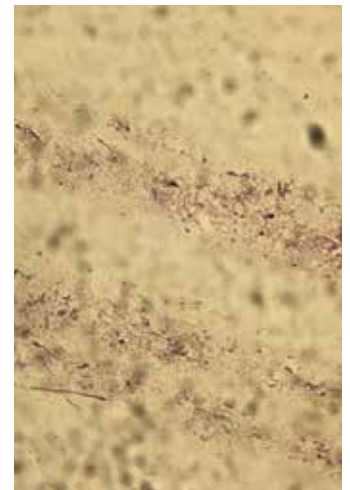


Figure 3b. Cytology of cerumen with an inflammatory response – cellular exudate with many micro-organisms present.

- degree of ear disease
- therapeutic approach
- significance of any bacterial infection.

A full clinical examination – and any further testing suggested by examination findings – should always be performed to gain an idea of the overall health of the rabbit.

Auroscopic examination is of little value in the conscious animal. It is impossible to see the tympanum in a lop-eared rabbit, even with a clear canal. In these cases, cerumen totally precludes extensive examination. In terms of determining the presence of inflammation/infection, rabbit pus and cerumen are visually identical.

Imaging

Radiography can be performed and congestion of the middle ears may be seen. However, this technique is insensitive and cerumen may not be visualised.

Computed tomography (CT) is vastly superior and, with increasing access and reduced costs, should be performed in all cases pre-surgery. CT will enable visualisation of soft tissue and fluid parts of the ear and canal, as well as the bony portion of the middle ear.

Cytology/bacteriology

Bacteriology should always be performed as antimicrobial resistance is encountered in some isolates. However, it should be borne in mind that there is a background bacterial microflora in the normal rabbit ear (Chitty et al, 2016) and a variety of isolates may be commensal, including *Pasteurella* spp., *Staphylococcus* spp., *Pseudomonas* spp. and yeast. Cytology should, therefore, always be performed in order to distinguish whether there is an inflammatory reaction or not (**Figures 3a & 3b**).

Therapy

Unless there is lysis in the bulla – in which case a bulla osteotomy technique may be required (Eatwell et al, 2013) – the initial technique of choice is syringing of material from the external and, if required, middle ear.

This has the effect of relieving pressure and reducing/diluting any infected material.

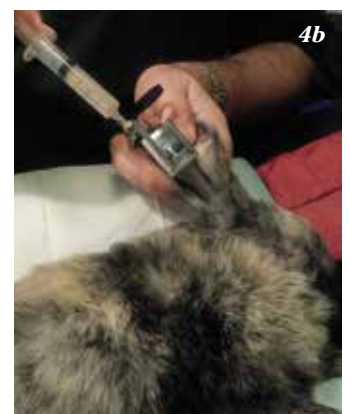
This procedure should always be performed under general anaesthesia and the technique used is similar to that used in other species – with alligator forceps to remove large pieces of cerumen and a Spreull needle to insert/remove saline (**Figures 4a & 4b**).

Saline is the fluid of choice because ototoxicity is seen in rabbits and care must be taken with potentially ototoxic agents. In this author’s experience, chlorhexidine must never be used in the ear canal.

Systemic antibiotics is not required unless there are deep inflammatory bone lesions. Non-steroidal anti-inflammatory drugs (NSAIDs) will be required where there is discomfort and in the immediate postoperative or post-syringing period.



4a



4b

Figures 4a & 4b. Use of alligator forceps (4a) and flushing (4b) to remove cerumen.

“Ear-based swellings are common in lop-eared, brachycephalic rabbits ... owing to the failure of cerumen to drain either via the external auditory meatus or the Eustachian tubes”

In cases of inflammatory ear disease with bacterial infection, an antibiotic-impregnated 'ear wick' may be placed following syringing. The choice of antibiotic should be based on culture and sensitivity. However, if not resistant, this author tends to use water-soluble trimethoprim-sulphonamide solution in the wick.

Where there is multiple drug-resistance, pure TRIS-EDTA solutions (no chlorhexidine!) may also be added with, to date, no noted side effects. Wicks should be removed after seven to 10 days. If left longer, an extensive granulomatous reaction may develop that makes the wicks harder to locate and remove.

In all cases, owners should be taught how to massage the ear bases and push cerumen into the distal ear canal – once the main accumulation has been broken down this is generally a simple, well-tolerated procedure and is greatly eased by concurrent use of a squalene-based ear cleaner. This author has tried various preparations and Otoact (Vetruus, UK) has appeared the most efficacious.

In cases where the swellings keep recurring, or where cleaning is not tolerated, lateral wall resection is indicated. A standard Zepp-modification (as used in dogs) is used and achieves excellent results because the:

- stretched, soft part of the ear canal provides an excellent and large 'draining board'
- lateral soft part of the canal wall is removed, thus preventing accumulation of cerumen
- 'horizontal canal' is easily accessed for regular cleaning.

The technique (**Figure 5**) is described by Chitty and Raftery (2013) and Capello et al (2015).

Prevention

The main way of preventing these ear-based problems is through owner education or,



Figure 5. Lateral wall resection in a rabbit.

- (a) The site has been prepared and parallel incisions are made from the external opening of the ear canal to approximately 2cm ventral to the ear-based swelling.
- (b) The incisions are deepened to include the entire lateral wall, which is reflected ventrally. This exposes the cerumen build-up which can be removed at this stage.
- (c) The majority of the reflected tissue is removed leaving a 1-2cm remnant as a 'draining board'. This is sutured to the skin margin ventral to the ear canal.
- (d) Once the draining board has been secured, the canal and skin edges can be sutured
- (e) Completed surgery showing the open 'vertical portion' and the new opening of the 'horizontal portion'.
- (f) Healed ear canal – during healing the wounds should be cleaned daily with saline. Particular care must be paid to the draining board. This author does not use Elizabethan collars because they cause considerable stress to the patient.

more importantly, prospective owner education.

Fundamentally, the disease results from anatomical changes produced by selective breeding. New owners should be advised to purchase 'prick-eared' rabbits rather than 'lop-eared'; and to purchase rabbits with long noses – a photograph in the clinic of a wild rabbit is a very good aid to educate people as to what a rabbit *should* look like.

However, it is unlikely that purchasing of lop-eared brachycephalics will stop or that veterinary professionals will be presented with these animals before they have ear problems.

Some authors have suggested the prophylactic application of lateral wall resection for these rabbits. However,

not all will develop aural diverticula and such extensive surgery does seem excessive, especially as the procedure is much more difficult with an unstretched lateral wall making it more difficult to create an effective draining board and maintain the reformed canal opening.

Nonetheless, there is the likelihood that these rabbits will be suffering some accumulation of cerumen within the closed-off ear canals. As such it may be appropriate to advise ear massage and the use of squalene-based cleaners from an early age; although it should be noted that there are no studies performed to establish the efficacy of such a prophylactic regimen.

In summary, the only definite method of preventing these

problems is by avoiding breeding susceptible conformations.

Conclusions

Aural diverticulosis is common in lop-eared, brachycephalic rabbits owing to the anatomical conformation of the ear canal and Eustachian tubes. Computed tomography and cytology/culture of the cerumen are important parts of the diagnostic investigation. Therapy involves syringing of the ear canals, followed by use of squalene-based cleaners and ear massage. In recurrent cases, lateral wall resection is effective in preventing cerumen build-up and facilitating cleaning. ■

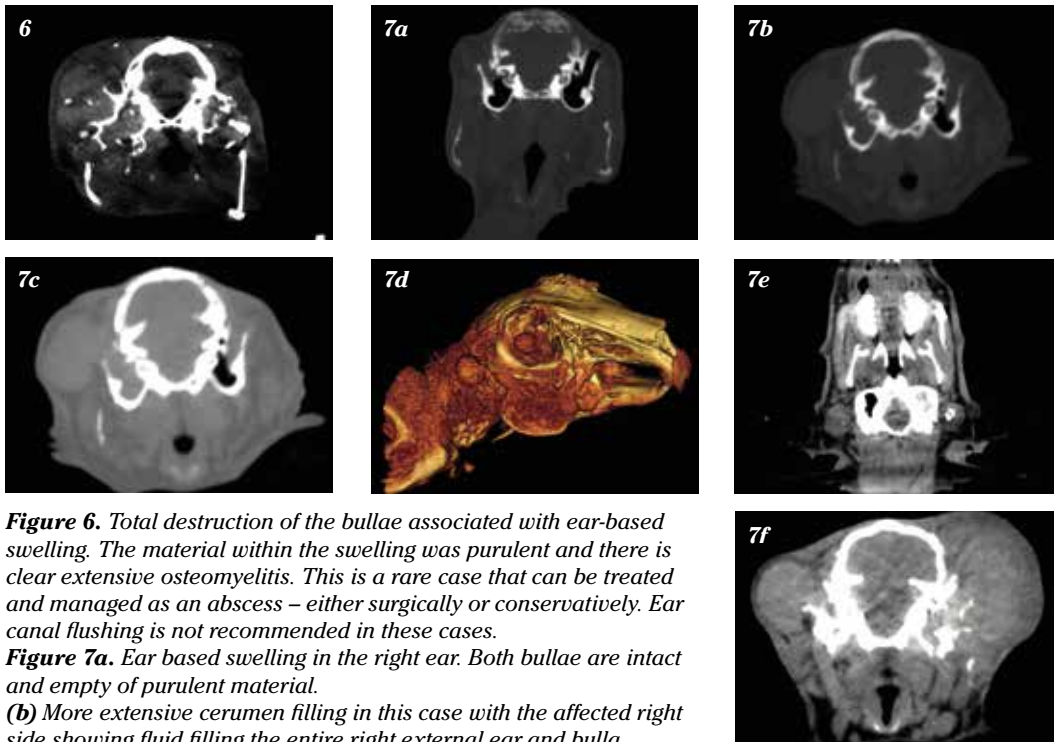


Figure 6. Total destruction of the bullae associated with ear-based swelling. The material within the swelling was purulent and there is clear extensive osteomyelitis. This is a rare case that can be treated and managed as an abscess – either surgically or conservatively. Ear canal flushing is not recommended in these cases.

Figure 7a. Ear based swelling in the right ear. Both bullae are intact and empty of purulent material.

(b) More extensive cerumen filling in this case with the affected right side showing fluid filling the entire right external ear and bulla. There is cerumen filling of the left ear canal. The right bulla also shows bone thickening which may represent reactive change.

(c) Same case as 7b but different weighting the extent of the cerumen filling can be seen.

(d) Same case – 3D reconstruction demonstrates the containment of the cerumen.

(e) A more chronic case showing calcification of the cerumen, in this case of bilateral swelling.

(f) Bilateral ear-based swellings. On the right there is bone reaction but the bulla is intact. This side responded well to flushing and regular cleaning. On the left there is bulla destruction and extensive distension of the ear canal. Lateral wall resection was required on this side.

References and further reading

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PPD Questions

1. *Pseudomonas* spp may be isolated from an ear swab. It may be regarded as:
 - A. a serious primary pathogen
 - B. a potential zoonosis
 - C. a commensal organism in the rabbit ear
 - D. an opportunistic pathogen.

2. Aerobic/anaerobic culture of ear swabs should always be interpreted together with:
 - A. nothing – culture findings are adequate in their own right
 - B. ear cytology
 - C. skull radiography
 - D. skull CT.

3. Ear-based swelling in lop-eared rabbits is primarily linked to:
 - A. anatomical defects in ear cartilage formation, together with brachycephalism
 - B. inflammatory skin disease
 - C. bacterial infection
 - D. iatrogenic damage with the otoscope.

4. Which of the following is most suitable for use in syringing the ear?
 - A. saline
 - B. glucose-saline
 - C. dilute chlorhexidine
 - D. salicylic acid-based low-pH cleaners.

1.C 2.B 3.A 4.A
Answers