



What Is Your Diagnosis?



Figure 1—Left lateral (A), ventrodorsal (B), and open mouth (C) radiographic views of the tympanic bullae of a 6-year-old spayed female Golden Retriever with a 6-week progressive history of a left-sided head tilt, loss of balance, and difficulty rising from a lying position.

History

A 6-year-old spayed female Golden Retriever with bilateral chronic otitis externa and suspected left-sided otitis media and interna was evaluated. The owner described a 6-week history of a left-sided head tilt that had progressed to loss of balance and difficulty rising from a lying position. The patient had a 4-year history of intermittent antimicrobial-responsive otitis externa. There was no indication of disease recurring more frequently in one ear or the other, and neurologic signs had never previously been reported.

The patient had a left-sided head tilt. Findings on neurologic examination were otherwise normal. Otoscopic examination of the left ear revealed a marked quantity of brown, waxy debris obstructing the ear canal lateral to the tympanic membrane. Examination of the right ear was unremarkable, with only mild waxy debris found. Microscopic examination of specimen swabs of both external ear canals confirmed bilateral otitis externa with yeast. Results of CBC and serum biochemical analysis were unremarkable. The patient was anesthetized, and radiographs of the tympanic bullae were obtained (Figure 1).

Determine whether additional imaging studies are required, or make your diagnosis from Figure 1—then turn the page →

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Figure 2—Same ventrodorsal and open mouth radiographic images as in Figure 1. Notice the thickening and sclerosis of the left tympanic bulla medially and caudally (black arrows), thinning and loss of definition of the left tympanic bulla ventrally (white arrows), and soft tissue opacity that fills the left tympanic cavity. There is also stenosis of the left external ear canal (arrowheads).

Diagnostic Imaging Findings and Interpretation

There is increased soft tissue opacity of the left tympanic cavity, with thickening, sclerosis, and loss of definition of the medial and caudal margins of the tympanic bulla (Figure 2). There is thinning of the left bulla ventrally with poorly defined margins. The air-filled portion of the left external ear canal is stenotic. Radiographic findings are consistent with severe otitis media, neoplasia (ceruminous gland adenoma, adenocarcinoma, or papilloma), cholesteatoma, granulomatous disease, or a polyp. To determine the extent of the disease for surgical planning, CT was performed (Figure 3).

On CT images, there is expansion of the left tympanic cavity and bulla with homogenous non-contrast-enhancing soft tissue-attenuating material. Material extends into the proximal portion of the horizontal ear canal. Lysis of the petrous temporal bone and distortion of the petrous temporal and basisphenoid bones are present. There is osteolysis and osteoproduction of the left osseous bulla. The CT finding of an expansile lesion affecting the left inner, middle, and external ear is highly suggestive of an aural cholesteatoma.

Treatment and Outcome

Total ear canal ablation and lateral bulla osteotomy were performed without complication. *Malassezia pachydermatis* was cultured from bulla contents, and histopathologic findings were consistent with a cholesteatoma: laminar keratin debris with hyperplastic stratified squamous epithelium and minimal inflammation. Aggressive curettage of the bulla was not possible because of abnormally soft bone and concern regarding adjacent vital structures. The owner reported resolu-

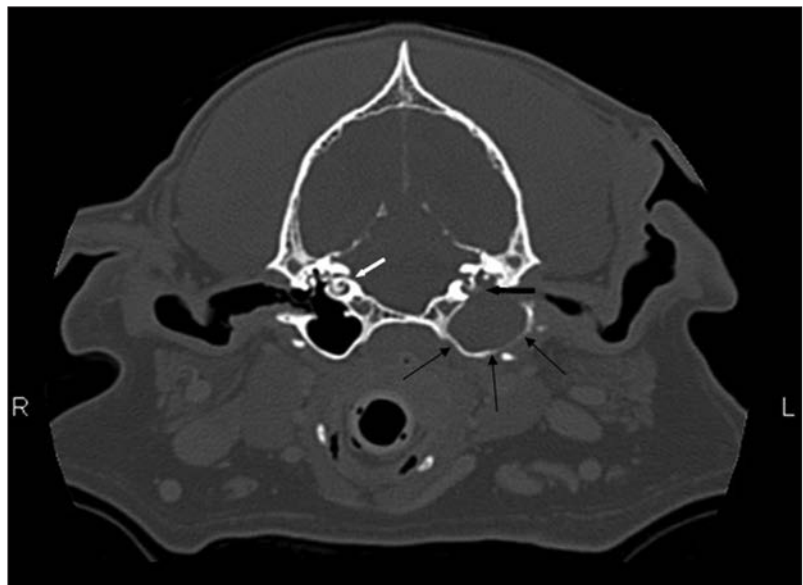


Figure 3—Transverse CT image of the skull at the level of the tympanic cavity displayed in a bone window (slice thickness, 2 mm; window center, 300 Hounsfield units; window width, 1,500 Hounsfield units). There is thickening of the left horizontal ear canal. Notice the left tympanic cavity (thin black arrows). The expanded left tympanic bulla contains material of soft tissue attenuation. Also note the destruction and distortion of the left petrous temporal bone (thick black arrow) and the normal cochlea of the right inner ear (white arrow) compared with the left.

tion of the head tilt within 1 week after surgery, and 6 weeks following surgery, the owner reported no clinical abnormalities.

Comments

In the dog of the present report, radiographic findings were consistent with aural disease as the cause of peripheral vestibular signs. Neurologic signs may be observed with middle ear disease as abnormal fluid or tissue in the middle or inner ear may compress or inflame the facial nerve and sympathetic nerves of the eye that pass through this region.¹ Additionally, when inflammation or infection extends through the vestibular

(oval) window or through the petrous temporal bone into the internal ear canal, the sensory organs of hearing and balance and the vestibulocochlear nerve may be affected.¹

On the basis of radiographic findings alone, the cause or extent of aural disease in the case described here could not be determined. Conventional radiography may be rewarding in the diagnosis of middle ear disease; however, radiographic imaging of the middle ear is technically difficult and interpretation can be challenging.² Not only are multiple radiographic projections necessary to compensate for superimposition of the petrous temporal bone over the bullae, but artifactual increases in radiographic opacity due to overlying soft tissue structures also complicate interpretation.² Furthermore, bony changes to the bulla and soft tissue opacities within the bulla are nonspecific findings.²⁻⁵ In the dog of the present report, CT was important in demonstrating both the osteolysis of the petrous temporal bones and bulla as well as the marked expansion of the left bulla and tympanic cavity, characteristics that together are highly indicative of an aural cholesteatoma.^{3,5}

Less likely differential diagnoses that could not be excluded on the basis of imaging results in the case described here included severe otitis interna, media, and externa; granulomatous disease; and neoplasia. Otitis media may induce sclerotic and proliferative changes to the bulla wall, but expansion of the bulla is uncharacteristic.^{4,5} Similarly, neoplasia may result in a permeative lysis of the tympanic bulla, but this differs from the pattern of bone destruction seen in cholesteatomas as a result of compression by the continuous shedding

of keratinaceous debris.⁵ Computed tomography was helpful in the dog of the present report in its ability to reveal bone destruction; however, MRI is often a more sensitive imaging modality in its ability to highlight change to soft tissue structures as seen with structural asymmetry as well as contrast enhancement in neuritis or brain involvement.

A cholesteatoma is a nonneoplastic, aggressive lesion occurring in the middle ear.⁶ These lesions may be either congenital or acquired in people, but most cases in dogs have been associated with chronic otitis media.^{3,6} Clinical signs include head tilt, facial palsy, ataxia, nystagmus, circling, pain on opening of the mouth, and upper respiratory noise.³ Treatment for aural cholesteatoma is aimed at surgical removal of the lesion and control of infection.³

1. Cole LK. Anatomy and physiology of the canine ear [Erratum published in *Vet Dermatol* 2010;21:221]. *Vet Dermatol* 2010;21:221-231.
2. Garosi LS, Dennis R, Schwarz T. Review of diagnostic imaging of ear diseases in the dog and cat. *Vet Radiol Ultrasound* 2003;44:137-146.
3. Hardie EM, Linder KE, Pease AP. Aural cholesteatoma in twenty dogs. *Vet Surg* 2008;37:763-770.
4. Rohleder JJ, Jones JC, Duncan RB, et al. Comparative performance of radiography and computed tomography in the diagnosis of middle ear disease in 31 dogs. *Vet Radiol Ultrasound* 2006;47:45-52.
5. Travetti O, Giudice C, Greci V, et al. Computed tomography features of middle ear cholesteatoma in dogs. *Vet Radiol Ultrasound* 2010;51:374-379.
6. Persaud R, Hajiioff D, Trinidad A, et al. Evidence-based review of aetiopathogenic theories of congenital and acquired cholesteatoma. *J Laryngol Otol* 2007;121:1013-1019.