Inflammatory polyp in the middle ear of a dog: a case report

A. Blutke[1], B. Parzefall[2], A. Steger[2], T. Goedde[2], W. Hermanns[1]

[1]Institute of Veterinary Pathology, Ludwig-Maximilians-University Munich, Munich, Germany
[2]Small Animal Referral Practice Staufeneck, Piding, Germany

ABSTRACT: Nasopharyngeal polyps are non-neoplastic masses, originating from the mucosa of the nasopharynx, the tympanic bulla or the Eustachian tube. Inflammatory polyps extending into the tympanic bulla cavity are a common cause of otitis media in cats. In dogs, however, occurrence of middle ear polyps has rarely been reported. The present report describes the findings of the clinical examination, diagnostic imaging and histopathological appraisal of a ten year old male dog with an inflammatory middle ear polyp arising from the mucosa of the Eustachian tube. Clinically, the dog displayed a peripheral vestibular syndrome. Magnetic resonance imaging revealed a hyperintense soft tissue mass filling the right middle ear cavity. Following ventral bulla osteotomy, a polypoid growth with a stalk arising from the auditory tube was surgically excised from the tympanic bulla. Histologically, the polyp was composed of a fibrous connective tissue stroma with discreet infiltration of inflammatory cells and an overlying surface layer of partially ulcerated respiratory epithelium. Similarities and differences between the histological appearance of the present case and the few previously reported records of canine middle ear polyps are discussed, along with a comparative review of etiological, pathogenetic and therapeutic aspects of middle ear polyps in cats and dogs

Keywords: nasopharynx; otitis; polyp; tympanic bulla

Nasopharyngeal polyps are non-neoplastic masses, presumed to originate from the mucosa of the nasopharynx, the tympanic bulla or the Eustachian tube. Their occurrence has been described in humans (Hellquist, 1990), cats (Harvey and Goldschmidt, 1978; Lane et al., 1981; Baker, 1982; Bradley, 1984; Kirpensteijn, 1993; Pope, 1995; Muilenburg and Fry, 2002; Lanz and Wood, 2004), horses (Head and Dixon, 1999), and in dogs (Pollock, 1971; Fingland et al., 1993; Pratschke, 2003). In cats, nasopharyngeal polyps represent frequent findings, commonly referred to as Feline nasopharyngeal polyps (FNPs) (Pope, 1995; Allen et al., 1999; Muilenburg and Fry, 2002; Lanz and Wood, 2004). FNPs extending into the tympanic cavity often cause otitis media, and, depending on their size, expansion and associated inflammation, they may also lead to otitis interna and externa (Kirpensteijn, 1993; Muilenburg and Fry, 2002). The respective clinical symptomatolo-gies are variable and range from acute to chronic signs, including otorrhea, head shaking, peripheral vestibular syndrome, Horner's syndrome, nystagmus and ataxia (Kirpensteijn, 1993; Pope, 1995; Muilenburg and Fry, 2002; Lanz and Wood, 2004). Diagnosis of middle ear FNPs involves clinical, oropharyngeal, otoscopic and endoscopic examination, as well as diagnostic imaging, including radiography or computed tomography (CT) and magnetic resonance imaging (MRI) (Kirpensteijn, 1993; Pope, 1995; Allen et al., 1999; Muilenburg and Fry, 2002; Lanz and Wood, 2004).

In radiographs, CT or MR scans, middle ear FNPs appear as soft tissue densities in the tympanic bullae, often associated with changes such as bulla enlargement or a proliferative periosteal response (Muilenburg and Fry, 2002; Lanz and Wood, 2004). For effective treatment of inflammatory middle ear FNPs, surgical excision of the polyp following a

ventral or lateral bulla osteotomy is recommended (Boothe, 1991; Trevor and Martin, 1993; Pope, 1995; Muilenburg and Fry, 2002; Lanz and Wood, 2004). If these surgical techniques are properly executed, postoperative complications and recurrence rates of FNPs are comparably low (Muilenburg and Fry, 2002; Lanz and Wood, 2004). Grossly, middle ear FNPs present as elliptic, white to pink, pedunculated masses with variable ulceration, and stalks originating from the mucosa of the nasopharynx, the auditory tube or the tympanic bulla (Kirpensteijn, 1993; Pope, 1995; Muilenburg and Fry, 2002; Lanz and Wood, 2004). To differentiate these FNPs from neoplastic lesions or infectious otitis, histopathologic evaluation of the excised polyp should generally be carried out. The typical histological appearance of middle ear FNPs is characterized by a stratified squamous or pseudostratified ciliated columnar epithelium, covering a core of fibrovascular connective tissue with scattered lymphocytes, plasma cells, and macrophages (Harvey and Goldschmidt, 1978; Kirpensteijn, 1993; Pope, 1995; Muilenburg and Fry, 2002; Lanz and Wood, 2004).

Compared to cats, reports of nasopharyngeal polyps in dogs are uncommon (Pollock, 1971; Fingland et al., 1993; Pratschke, 2003). The occurrence of canine nasopharyngeal polyps in the middle ear has rarely been documented (van der Gaag, 1986), and only a single study by Pratschke (2003) provided an exhaustive description of inflammatory middle ear polyps in dogs in a series of five cases (Pratschke, 2003). Thus, inflammatory middle ear polyps could be considered as a rare condition in dogs, although the true incidence of this disease might actually be considerably higher.

Case description

In the present case, a ten year old male, middle-sized, cross-breed dog was presented to the veterinary practice because of disequilibrium. Anamnestically, the dog had routinely been vaccinated at regular intervals and displayed a good general condition. All standard clinical and chemical parameters of blood and urine were within the reference ranges. In the neurological examination, the dog displayed a peripheral vestibular syndrome with a moderate head tilt to the right side. Other cranial nerve functions and proprioception were not impaired. Otoscopic examination showed large amounts of detachable dirty-brown masses

present in both ears. After irrigation of the external ear canals, the integrity of both tympanic membranes could be confirmed. Visual inspection of the pharynx revealed no conspicuous abnormalities. Magnetic Resonance Imaging (Vet-MR, Esaote, Genoa, Italy) revealed the presence of a hyper-intense mass of approximately 1.5 cm in diameter in the right tympanic bulla (Figure 1A). Following two weeks of antibiotic pre-treatment with amoxicillin-clavulanate, the mass was surgically excised after a ventral bulla osteotomy under general isoflurane-anaesthesia. In the surgical situs, the excrescence presented as a pedunculated globular polypoid growth of bluish to reddish-brown colour filling the tympanic bulla cavity. The mass displayed a firm consistency, a smooth mucosal surface with few detachable adhesions to the medial wall of the tympanic bulla, and a stalk arising from the Eustachian tube (Figure 1B). Cytology (Diff-Quick staining kit, Fisher Scientific GmbH, Schwerte, Germany) of an impression smear showed a moderate number of mostly degenerated neutrophils, plasma cells and clusters of polygonal epithelial cells. For histopathological examination, specimens of the excised mass were fixed in 10 per cent buffered formaldehyde and routinely embedded in paraffin and glycolmethacrylate/methylmethacrylate (Hermanns et al., 1981). Histologically, the mass was composed of a fibrous connective tissue stroma with decent, accentuated subepithelial infiltration of neutrophils, macrophages, lymphocytes and plasma cells, and few foci of calcification and cholesterol clefts. The overlying surface layer of respiratory epithelium was partially ulcerated and consisted of columnar cells, in some areas covered by a dense margin of long cilia (Figure 1C and D). Based on these histological characteristics and the anatomical site, a middle ear polyp was diagnosed.

DISCUSSION AND CONCLUSIONS

The clinical and diagnostic imaging findings in the present case accorded with those of middle ear FNPs and the previously reported cases of middle ear polyps in five dogs described by Pratschke (2003). Four of these dogs displayed chronic otitis media, and corresponding radiographic findings showed soft tissue masses in the tympanic bulla cavity. The histopathological findings in these dogs and in the present case also generally resembled those reported for middle ear FNPs. In contrast
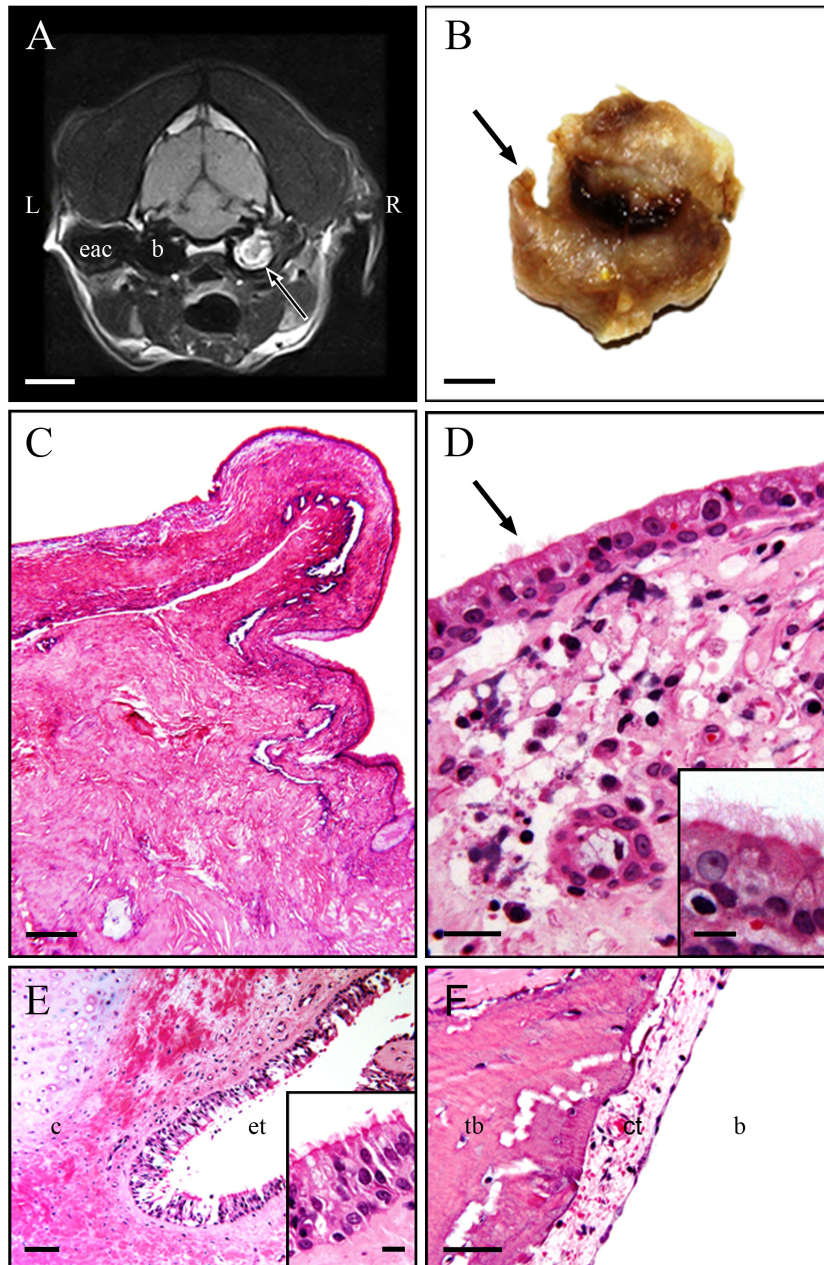
Figure 1. **A** = magnetic resonance image showing a transversal scan section of the skull (fluid attenuated inversion recovery-mode). A hyper-intense mass is visible in the right tympanic bulla (arrow). Left (L), right (R), external auditory canal (eac), tympanic bulla (b). Bar = 2 cm. **B** = polyp removed from the tympanic bulla. Note the tapered stalk (arrow) connecting the polyp to its origin in the Eustachian tube. Fragmented and formaldehyde-fixed tissue. For presentation, the photography was processed, using image editing software. Bar = 5 mm. **C**, **D** = histological section of the polyp, displaying a moderate purulent and granulating inflammation with foci of calcification and cholesterol clefts. The polyp is covered by a partially ciliated epithelium (arrow) with focal ulceration. **C** = paraffine section, H&E staining. Bar = 400 µm. **D** = Glycolmethacrylate/methylmethacrylate section, H&E staining. Bar = 20 µm. Inset: Detail enlargement of the ciliated epithelium. Bar = 10 µm. **E**, **F** = normal epithelia of the canine middle ear. **E** = transversal section of the normal canine Eustachian tube with a ciliated epithelium. Cartilage (c), Eustachian tube (et). Glycolmethacrylate/methylmethacrylate section, H&E staining. Bar = 100 µm. Inset: Detail enlargement of the ciliated epithelium. Bar = 20 µm. **F** = section of the normal ventral portion of the canine tympanic bulla lined by a simple squamous epithelium. Tympanic bone (tb), loose connective tissue (ct), tympanic bulla (b). Glycolmethacrylate/methylmethacrylate section, H&E staining. Bar = 40 µm

to the previously reported cases of canine middle ear polyps, which displayed a stratified squamous keratinising epithelium with marked hyperkeratosis, serofibrinous exudation and ulceration (Pratschke, 2003), the polyp in the present case was covered by a pseudostratified, ciliated columnar epithelium with minor inflammatory alterations. The different epithelial coverage might reflect differences in the degree and chronicity of concomitant inflammation, as well as different anatomical sites of origin of these middle ear polyps.

Identification of the exact anatomic origin of nasopharyngeal polyps is difficult by means of histology in both cats and dogs, since the mucosal lining between the nasopharynx, the auditory tube and the tympanic bulla is continuous and histologically similar (Pope, 1995; Davidson, 1998; Lanz and Wood, 2004). Moreover, the epithelia of middle ear polyps might secondarily be altered as a consequence of concomitant inflammatory processes. In dogs, the wall of a great proportion of the tympanic bulla is lined by a columnar ciliated epithelium, which is continuous with the nasopharynx through the Eustachian tube (Figure 1E), whereas the ventral part of the tympanic cavity is covered by a thin layer of simple squamous epithelium (Figure 1F) (Lanz and Wood, 2004). Canine middle ear polyps covered by a squamous keratinising epithelium might therefore be supposed to arise from the epithelium of the ventral part of the tympanic bulla, whereas polyps displaying a ciliated epithelial coverage might likely originate from the epithelium of other parts of the tympanic bulla, the auditory tube or the pharynx. The polyp in the present case is thought to have originated from the Eustachian tube, since its stalk arose from the auditory tube, it was covered by the characteristic respiratory epithelium and oropharyngeal examination revealed no evidence of a pharyngeal derivation of the polyp.

So far, the etiology of nasopharyngeal polyps in cats and dogs is unknown. It has been suggested that FNPs may arise as a result of prolonged inflammatory processes due to viral or bacterial infections ascending from the nasopharynx (Kirpensteijn, 1993; Pope, 1995; Davidson, 1998; Anderson et al., 2000; Muilenburg and Fry, 2002; Lanz and Wood, 2004). Indeed, feline calicivirus has been recovered from the polyps of some affected cats, and diverse bacteria were isolated from both feline and canine inflammatory middle ear polyps (Pope, 1995; Davidson, 1998; Muilenburg and Fry, 2002;

Pratschke, 2003; Lanz and Wood, 2004). However, caliciviruses are ubiquitous, and the spectrum of detected bacteria species, as well as the number of animals with positive cultures from inflammatory middle ear polyps is highly variable (Muilenburg and Fry, 2002; Pratschke, 2003; Lanz and Wood, 2004). A clear cause and effect inference, in which a chronic local inflammation due to a viral or bacterial infection of the middle ear triggers subsequent polyp development, has not been demonstrated so far. The typical inflammatory changes seen histopathologically in middle ear polyps could also be interpreted as successive alterations of primarily non-inflammatory polyps. In this case, the expansion of a polyp into the auditory tube or the tympanic bulla could impair the adequate exchange of air and fluid between the pharynx and the middle ear, and thereby establish a local environment promoting inflammation and/or infection. Thus, it is not known whether infectious or inflammatory processes are primary or secondary events in the etiopathogenesis of middle ear polyps (Pope, 1995; Davidson, 1998; Muilenburg and Fry, 2002; Pratschke, 2003; Lanz and Wood, 2004). Since FNPs most commonly occur in young cats with a median age of 2.5 years (Pope, 1995), also a congenital etiology, involving remnants of the brachial arches was proposed (Baker, 1982). Dogs with reported inflammatory middle ear polyps had an age of four to 13 years (Pratschke, 2003), suggesting an older age of onset of this disease than in cats. Whereas there is no apparent sex predilection of FNPs in cats (Pope, 1995; Muilenburg and Fry, 2002), the reported cases of middle ear polyps in dogs, including the present record, interestingly exclusively affected male animals (Pratschke, 2003).

In summary, clinical presentation, diagnostic imaging findings and histological appearance in the present case largely resembled those in the few previously reported cases of inflammatory middle ear polyps in dogs, as well as in cats with middle ear FNPs. Due to the limited number of published cases of canine middle ear polyps, such cases should be thoroughly investigated and documented in order to estimate their true incidence, and obtain further evidence concerning their potential etiology.

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Corresponding Author:

Andreas Blutke, Ludwig-Maximilians-University Munich, Institute of Veterinary Pathology, Veterinaerstr. 13, 805 39 Munich, Germany
E-mail: blutke@patho.vetmed.uni-muenchen.de