Unusual presentation of canine Mycobacterium avium infection

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Abstract
This short communication describes the clinical and morphological findings, diagnosis and treatment of a case of Mycobacterium avium infection in a golden retriever that presented with a progressive nasal swelling and lymphadenopathy. Although well documented in cats, where cutaneous lesions are frequently recognised, canine M avium infection is less commonly reported, and cutaneous lesions are rare. To the authors’ knowledge this is the first documented case of canine M avium infection that presented with a cutaneous lesion but no systemic clinical signs. It occurred in a dog with no previously reported breed predisposition and highlights that in cases of cutaneous histiocytic infiltrate in dogs mycobacterial infection should remain a differential diagnosis, even in the absence of suggestive organisms on histopathological examination.

Mycobacterial infections are a significant cause of morbidity and mortality in human beings and farm animals, and are of increasing clinical significance in companion animal medicine. Disease-causing species are grouped into those that cause tuberculous disease (ie, members of the Mycobacterium tuberculosis complex) and those that cause a non-tuberculous mycobacteriosis (NTM). In human beings, the prevalence of NTM is increasing, with Mycobacterium avium-intracellulare complex (MAC) organisms being isolated in a significant proportion of cases. Similarly, MAC was identified as the most common cause of feline NTM in the UK. In contrast, incidence data for canine NTM do not exist. Reports of canine MAC infection are rare, and miniature schnauzers and basset hounds are over-represented. It is suggested that these breeds have a genetic predisposition to infection.

In cats, skin lesions are a frequent feature of the disease. In dogs, cutaneous lesions are reported in only two cases. Most cases demonstrate involvement of the gastrointestinal tract, liver and spleen. Systemic clinical signs include lethargy, weight loss and diarrhoea.

This short communication describes an atypical case of canine M avium infection that occurred in a breed with no reported predisposition and presented with a cutaneous lesion but no systemic clinical signs.

A three-year-old, male neutered, golden retriever presented for investigation of progressive nasal swelling of six weeks’ duration. The dog was on schedule with core vaccines recommended by the World Small Animal Veterinary Association for UK-resident dogs, was fed a complete cooked diet, received regular preventive treatments for endoparasites and ectoparasites, and there was no history of travel outside the UK.

Physical examination detected a firm, non-painful swelling affecting the nasal dorsum (figure 1A) and enlargement of the left prescapular and right popliteal lymph nodes. Routine haematology and serum biochemistry were unremarkable, partial thromboplastin time and activated partial thromboplastin time were within reference interval, and Aspergillus species serology was negative.

Head CT demonstrated a soft-tissue attenuating mass affecting the dorsal aspect of the nose, and moderate enlargement of the mandibular and medial retropharyngeal lymph nodes (figure 2A,C). Abdominal CT demonstrated subcutaneous nodules of the abdominal wall. Medial iliac lymph nodes were not reported to be enlarged on CT but were enlarged on abdominal ultrasonography. Thoracic CT and rhinoscopy were unremarkable.
Fine needle aspirates (FNAs) of the nasal mass were non-diagnostic. Ultrasound-guided FNAs of the affected lymph nodes were consistent with lymphoid hyperplasia. Histopathology of punch biopsies from the nasal mass revealed a histiocytic infiltrate. No fungal organisms or bacterial colonies were observed, and special staining for infectious agents, including bacteria (Gram), acid-fast bacteria (AFB) (Ziehl-Neelsen) and fungal elements (periodic acid-Schiff) was negative. Aerobic, anaerobic and fungal cultures were negative. To investigate further, the right mandibular lymph node was excised and a wedge biopsy taken from the nasal mass. Histopathology revealed histiocytic and neutrophilic lymphadenitis, and histiocytic, lymphocytic, and neutrophilic dermatitis and cellulitis (figure 1B). As above, no microorganisms were observed and special staining for infectious agents was negative.

A sample of the nasal mass was submitted for culture for Bartonella henselae and Bartonella B subspecies, which was negative, and for PCR analysis for Mycobacterium species (TDDS, Exeter, UK). The resultant PCR product was purified and sequenced, and a Basic Local Alignment Search Tool was used to compare the DNA with sequences reported in the genetic sequences database GenBank. This identified the PCR product as a Mycobacterium species, most closely related to *M. avium*, with 98 per cent similarity.

Treatment was initiated with enrofloxacin (Baytril, Bayer; 10 mg/kg orally every 24 hours) and doxycycline (Ronaxan, Merial Animal Health; 10 mg/kg orally every 24 hours), with limited response. Following further research, the protocol was adjusted to enrofloxacin (as above), clarithromycin (generic; 15 mg/kg orally every 12 hours) and rifampicin (generic; 10 mg/kg orally every 24 hours). After four months the nasal lesion had significantly reduced in size. On palpation the left prescapular and right popliteal lymph nodes were normal. CT performed after nine months confirmed the improvement in the nasal lesion and demonstrated resolution of the mandibular and retropharyngeal lymphadenopathy and subcutaneous nodules (figure 2B,D). Treatment was discontinued.

*M. avium* is an opportunistic human and animal pathogen, and is ubiquitous in the environment. Reservoirs include water bodies, soil, hot water systems, livestock and wildlife. Infection occurs following ingestion or inhalation of organisms, or through breaches of the skin. A hunting or fighting lifestyle is hypothesised to increase the risk of NTM in cats, and it has been suggested that working dogs are at increased risk, although this was not a factor in this case.

Despite its zoonotic potential there are currently no reports of transmission of *M. avium* from companion animals to human beings. Risk of transmission is mainly thought to be significant to immunocompromised individuals.

This case of canine *M. avium* infection has several interesting features. The presence of high numbers of AFB is considered an almost pathognomonic feature of most previously reported NTM cases. Here *M. avium* was detected by PCR in the absence of AFB on histopathological examination. It is possible that the PCR product was a contaminant, but the clinical
improvement following combination antibiotic therapy provides support for a true MAC infection.

The case is also remarkable in its presentation. Although unconfirmed, the presence of the abdominal nodules and generalised lymphadenopathy, and their improvement following treatment, suggests disseminated infection. Most disseminated canine MAC cases present with a history of systemic clinical signs, but in this case the nasal mass was the only presenting complaint.12 13

To the authors’ knowledge this is the first documented case of canine M avium infection that has presented with a skin lesion but no systemic clinical signs. The disease occurred in an atypical breed, and there was no evidence of AFB on histopathology. Given the zoonotic potential of the disease, misdiagnosis could have consequences for public health, as well as for the individual patient. As such NTM should be considered as a differential for public health, as well as for the individual patient.

References

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Gunn-Moore DA, McFarland SE, Brewer J, et al. Mycobacterial disease in cats in Great Britain: I. Culture results, geographical distribution and clinical presentation of 339 cases. J Feline Med Surg 2011;13:934–44.

Campora L, Conzaia M, Zullino C, et al. Mycobacterium avium subspecies hominisuis disseminated infection in a Basset Hound dog. J Vet Diagn Invest 2011;23:1083–7.

Carpenter JL, Myers AM, Conner NW, et al. Tuberculosis in free basset hounds. J Am Vet Med Assoc 1988;192:1563–8.

Eggers JS, Parker GA, Braf FA, et al. Disseminated Mycobacterium avium infection in three miniature schnauzer litter mates. J Vet Diagn Invest 1997;9:424–7.

Horn B, Forshaw D, Cousins D, et al. Disseminated Mycobacterium avium infection in a dog with chronic diarrhea. Aust Vet J 2000;78:320–5.

Barandiaran S, Martinez Vxto M, Falzone L, et al. Mycobacterioses in dogs and cats from Buenos Aires, Argentina. J Vet Diagn Invest 2017;29:729–32.

Hobi S, Bettenay S, Majzoub M, et al. Mycobacterium avium subspecies hominisuis infection in a dog from Germany with multifocal alopecia, exfoliative dermatitis, hypercalcaemia and subsequent sebaceous atrophy. Vet Rec Case Rep 2015;3:e000168.

Armas F, Furlanello T, Camperio C, et al. Molecular characterization and drug susceptibility profile of a Mycobacterium avium subspecies avium isolate from a dog with disseminated infection. J Med Microbiol 2016;65:278–85.

Friend SC, Russell EG, Hartley WJ, et al. Infection of a dog with Mycobacterium avium serotype II. Vet Pathol 1979;16:381–4.

Gow AG, Gow DJ. Disseminated Mycobacterium avium complex infection in a dog. Vet Rec 2008;162:594–5.

Kim DY, Cho DY, Newton JC, et al. Granulomatous myelitis due to Mycobacterium avium in a dog. Vet Pathol 1994;31:491–3.

O’Toole D, Tharp S, Thomsen BV, et al. Fatal mycobacteriosis with hepatosplenomegaly in a young dog due to Mycobacterium avium. J Vet. Diagn. Invest 2005.

Kontos V, Papadogiannakis EI, Mantzias G, et al. A case of disseminated Mycobacterium avium Infection in a dog in Greece. Case Rep Vet Med 2014;2014:1–3.

Kim MC, Kim J, Kang W, et al. Systemic infection of Mycobacterium avium subspecies hominisuis and fungus in a pet dog. J Vet Med Sci 2016;78:157–60.

Haist V, Sreerensen F, Moser I, et al. Mycobacterium avium subspp. hominisuis infection in 2 pet dogs, Germany. Emerg Infect Dis 2008;14:988–90.

Shackelford CC, Reed WM. Disseminated Mycobacterium avium infection in a dog. J Vet Diagn Invest 1989;1:273–5.

Walsh K, Losco P. Canine mycobacteriosis: a case report. J. Anim. Hosp. Assoc 1984;20:295–300.

Miller MA, Greene CE, Brix AE. Disseminated Mycobacterium avium—intracellulare complex infection in a miniature schnauzer. J Am Anim Hosp Assoc 1995;31:213–6.

Eleneve CL, Granat F, Trumel C, et al. A mycobacterial co-infection in a dog suspected on blood smear. Vet Clin Pathol 2013;42:516–21.

Naughton JF, Mealey KL, Wardrop KJ, et al. Systemic Mycobacterium avium infection in a dog diagnosed by polymerase chain reaction analysis of buffy coat. J Am Anim Hosp Assoc 2005;41:126–32.

Bauer N, Burkhard S, Kirsch A, et al. Lymphadenopathy and diarrhea in a Miniature Schnauzer. Vet Clin Pathol 2002;31:61–4.

Reed C, van Reyn CF, Chambrele S, et al. Environmental risk factors for infection with Mycobacterium avium complex. Am J Epidemiol 2006,164:32–40.

Thorel MF, Huchzermeyer H, Weiss R, et al. Mycobacterium avium infections in animals. Literature review. Vet Res 1997;28:439–47.

Whitley H, Giglio S, Benham R. Opportunistic pathogens Mycobacterium Avium Complex (MAC) and Legionella spp. Colonise Model Shower. Pathogens 2015;4:590–8.

Baral RM, Metcalfe SS, Krockenberger MB, et al. Disseminated Mycobacterium avium infection in young cats: overrepresentation of Abyssinian cats. J Feline Med Surg 2000;78:320–5.

Gunn-Moore D, Dean R, Shaw S. Mycobacterial infections in cats and dogs. In Pract 2010,32:444–52.

Dedola C, Zobba R, Pinna Parpaglia ML, et al. First report of canine leprosy in Europe: molecular and clinical traits. Vet Rec 2014;174:120.1–120.

Biet F, Boschini ML, Thori MF, et al. Zoonotic aspects of Mycobacterium bovis and Mycobacterium avium-intracellulare complex (MAC). Vet Res 2005;36:411–36.

Greene CE, Gunn-Moore DA. Infections caused by slow growing mycobacteria. Greene CE, ed. Infectious diseases of the dog and cat. 3rd edn. St Louis: Saunders Elsevier, 2006.463–77.

Kiper A, Schiller I, Baumgärtner W. Immunopathological studies on feline cutaneous and (muco)cutaneous mycobacteriosis. Vet Immunol Immunopathol 2003;91:169–82.