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Source: Journal of Feline Medicine and Surgery Open Reports, 9(2)

Published By: SAGE Publishing

URL: https://doi.org/10.1177/20551169231208890

Case Report

jfms OPEN REPORTS

Journal of Feline Medicine and Surgery Open Reports
1–5

DOI: 10.1177/20551169231208890
journals.sagepub.com/home/jfmsopenreports

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Toxoplasma gondii spinal granuloma in a cat

Florian Tyroller[1], Barbara Haas[1], Barbara Posch[2], Bianca Hettlich[3], Christian Schwandt[1] and Stephan Pfleghaar[4]

Abstract

Case summary A 7-year-old female spayed domestic shorthair cat was presented with a history of progressive pelvic limb ataxia. A CT scan of the thoracic spine identified an extradural, left lateralised and compressive soft tissue mass at the level of T9. A decompressive hemilaminectomy at the level of T8–T10 and tissue sampling of the mass were performed. Histopathological examination revealed a parasite granuloma caused by *Toxoplasma gondii* infection. Postoperatively, the cat improved consistently, but mild left pelvic limb lameness remained. At 5 weeks, a recheck CT scan showed a small, enhancing soft tissue lesion in the left epidural space at T9, causing a mild left lateral compression of the spinal cord. After 9 months, the cat acutely deteriorated neurologically and was euthanased without postmortem examination.

Relevance and novel information To our knowledge, this is the first report of a *T gondii* spinal granuloma in a cat. Such a granuloma should be considered as a differential in cats with evidence of an extradural soft tissue mass.

Keywords: Parasite diseases; toxoplasmosis; spinal diseases; hemilaminectomy

Accepted: 4 October 2023

Introduction

In cats, the most common causes for pelvic limb ataxia are inflammatory/infectious or neoplastic spinal diseases. Less common causes are trauma, congenital, vascular and degenerative or metabolic/alimentary diseases.[1–3]

Toxoplasmosis is a common feline parasite disease causing central nervous deficits and is considered to be one of the most important parasite diseases of the central nervous system in cats.[4–8] This report describes a case of a histopathologically and PCR-confirmed spinal *Toxoplasma gondii* granuloma in a cat.

Case description

A 7-year-old, female spayed domestic shorthair cat was referred to our veterinary hospital with a history of progressive pelvic limb ataxia. The cat had been regularly vaccinated and dewormed. At the time of presentation, the cat was in a good body condition and had no reported pre-existing illnesses. Trauma could not be excluded, as the cat had access to the outdoors, but no obvious injuries had been observed.

Before presenting to our hospital, the cat had been examined by a local veterinarian. Radiographs of the spine, haematology and biochemistry were unremarkable at the time. Treatment with meloxicam (Metacam suspension 0.5 mg/ml; Boehringer Ingelheim) 0.1 mg/kg q24h PO for several weeks did not lead to an improvement of the clinical signs.

A general physical examination at our hospital revealed no abnormalities. The neurological examination showed moderate pelvic limb ataxia. Proprioception and spinal reflexes were normal. Palpation of the spine at the thoracolumbar junction was painful. No cranial

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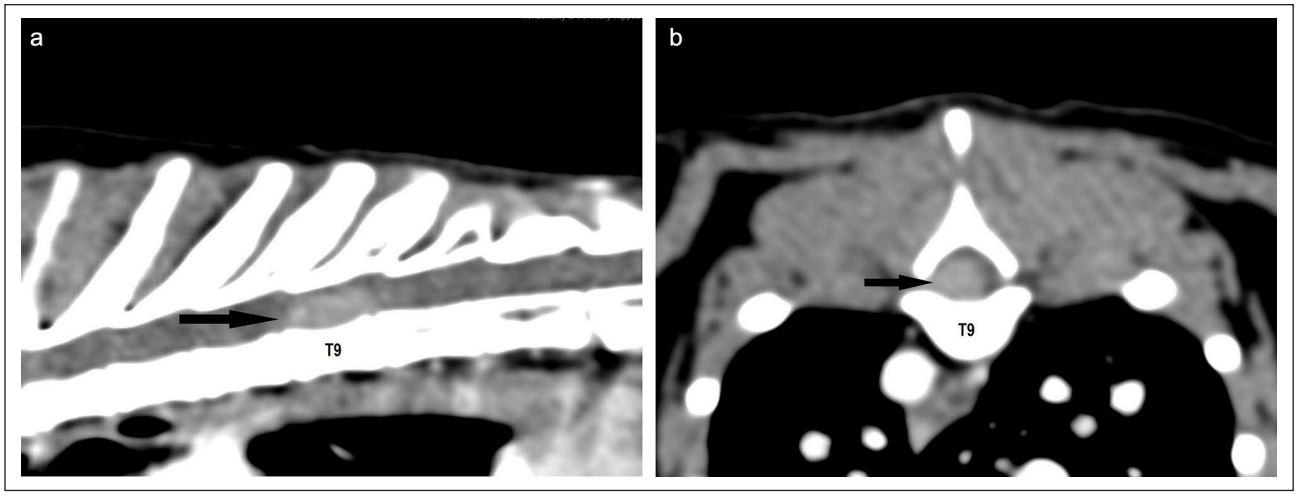

Figure 1 (a) CT image in soft-tissue window: sagittal reconstruction of the spine from the sixth to 12th thoracic vertebra. There is a moderately enhancing soft-tissue attenuating mass in the spinal canal over the body of T9 (arrow). (b) CT image in soft-tissue window: transverse image at the midbody level of the ninth thoracic vertebra. The moderately enhancing soft-tissue attenuating mass is causing severe compression of the spinal cord (arrow)

nerve deficits or behavioural abnormalities were present. For further investigations, a CT scan (GE Healthcare) of the spine was performed under general anaesthesia. The cat received butorphanol (Butorgesic 10 mg/ml; CP-Pharma) 0.2 mg/kg, dexmedetomidine (Dexdomitor 5 mg/10 ml, Zoetis) 2 g/kg, midazolam (Midazolam-ratiopharm 5 mg/ml; Ratiopharm) 0.1 mg/kg and Alfaxalon (Alfaxan 10 mg/ml; Jura) 2 mg/kg. During the CT scan, the cat received oxygen and isoflurane to maintain the anaesthesia.

During CT, an extradural, left lateralised, well-demarcated, oval-shaped and moderately enhancing soft-tissue attenuating mass was identified at the level of T9 (Figure 1). The mass occupied approximately two-thirds of the vertebral canal, resulting in severe compression of the spinal cord. The maximum width, height and length of the extradural mass was 4.5 × 3.5 × 9.3 mm. No osseous response of the vertebral body of T9 could be demonstrated.

A neoplastic or inflammatory mass was considered as the main differential diagnosis. Surgical exploration was initially declined and the cat was continued on medical treatment with meloxicam (Metacam suspension 0.5 mg/ml; Boehringer Ingelheim) 0.1 mg/kg q24h PO. However, due to the progression of neurological signs, the owner consented to surgery 5 days later. Preoperatively, the general examination was still unremarkable; however, the progression of ataxia without lateralisation was evident on the neurological examination.

A repeat CT scan before surgery showed an increase in size of the extradural mass at T9, measuring 4.9 (W) × 3.7 (H) × 11 (L) mm, resulting in more severe spinal cord compression. The general anaesthesia was induced with midazolam (Midazolam-ratiopharm 5 mg/ml, Ratiopharm) 0.1 mg/kg and alfaxalon (Alfaxan 10 mg/ml; Jurox) 4 mg/kg. Maintenance of the anaesthesia was achieved with oxygen and isoflurane. Perioperatively, the cat received a continuous infusion with isotonic crystalloid solution (Ringer's lactate Hartman B Braun; Braun Melsungen) 5 ml/kg/h and fentanyl (Fentadon 50 µg/ml; Dechra) 5 µg/kg/h.

A left-sided decompressive hemilaminectomy was performed at the level of T8–T10. Intraoperatively, the mass was located at the level of T9 and appeared as a left-sided homogeneous non-bone-invasive extradural mass, resulting in severe spinal cord compression. The mass had no obvious capsule, and due to a very friable consistency, it could only be removed piecemeal. The mass was debulked as much as possible but could not be removed in its entirety. Tissue samples were preserved in formaldehyde and sent for histopathological examination (Fachpraxis für Tierpathologie München).

The cat recovered uneventfully from the general anaesthesia and remained hospitalised postoperatively. Therapy was started with amoxicillin–clavulanic acid (Synulox RTU 140/35 mg/ml; Zoetis) 20 mg/kg q24h SC, maropitant (Prevomax 10 mg/ml; Dechra) 1 mg/kg q24h IV, buprenorphine (Buprenovet Multidose 0.3 mg/ml; Bayer) 20 µg/kg q8h IV, metamizole sodium (Metapyrin 500 mg/kg; Serumwerk Bernburg) 50 mg/kg SC, prednisolone (prednisolone 5 mg, CP-Pharma) 0.8 mg/kg q24h PO and continuous infusion with isotonic crystalloid infusion solution (Ringer's lactate according to Hartman B Braun; Braun Melsungen) 3 ml/kg/h was continued.

A histopathological examination revealed an eosinophilic supporting framework interspersed with multiple lymphocytes, plasma cells, and some granulocytes and macrophages. In addition, interspersed smaller vessel

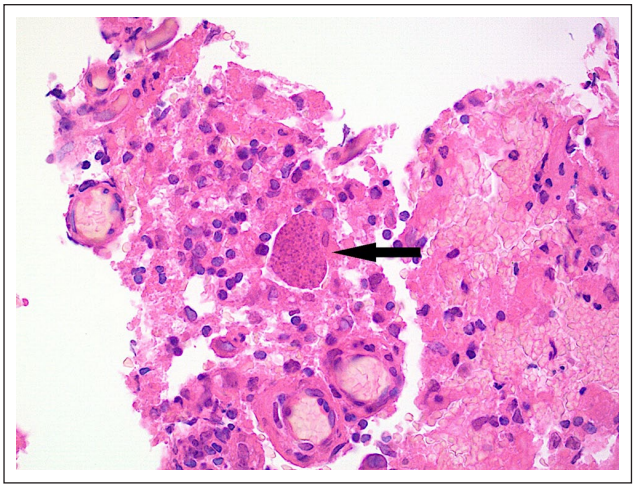

Figure 2 Representative histopathological image of the resected mass located in the spinal canal. Note the cystic formation with granular content in the middle, being identified as bradyzoites (arrow)

incisions, as well as isolated necrosis, could be found. Furthermore, individual globular structures or cystic formations with granular contents (most likely bradyzoites) could be identified (Figure 2). Histopathologically, a diagnosis of high-grade mixed-cell, chronic purulent and necrotising, partially granulomatous inflammation due to toxoplasmosis was made. Subsequently, a blood test and antibody determination by immunofluorescence (IDEXX Laboratories) confirmed, with IgM-IFT being negative and IgG-IFT being strongly positive with values of >1:1024. A subsequent PCR investigation of the granuloma tissue (SYNLAP.vet) was also positive for *T gondii*.

Based on the histopathological and laboratory results, therapy was changed to clindamycin (Cleorobe 75 mg; Zoetis or Zodon 25 mg/ml; Ceva Tiergesundheit) 22 mg/kg q12h PO for 6 weeks. Prednisolone was discontinued after 5 days and after a washout period of 48 h, and meloxicam (Metacam suspension 0.5 mg/ml; Boehringer Ingelheim) 0.1 mg/kg q24h PO was administered for a total of 2 weeks.

A recheck examination was performed 5 weeks after discharge at our hospital. According to the owner, the cat's neurological function improved initially but then remained stagnated. At the recheck, mild pelvic limb ataxia was detectable, proprioception and spinal reflexes showed no deficits in all four limbs. However, because of persisting pelvic limb ataxia and concern for residual compression by or recurrence of the granuloma, a follow-up CT scan was performed under general anaesthesia using the same drug regime and inhalation as before. The follow-up CT scan showed a small, enhancing soft-tissue lesion in the left epidural space at T9, measuring 0.8 (W) × 3.4 (H) × 7 (L) mm, resulting in mild left lateral compression of the spinal cord. Contrast enhancement of the soft tissues could also be demonstrated in the region of the left hemilaminectomy and left lateral side along the spinous process of T9 (surgical approach).

Subsequent telephone updates by the owner revealed that the cat's gait gradually improved further, but a mild gait abnormality remained. Nine months after surgery, the cat's neurological condition acutely deteriorated and it was euthanased at the owners' request without further clinical assessment. The owners refused a pathological examination.

Discussion

According to the study by Marioni-Henry,[1,2] the prevalence for infectious spinal diseases in cats is 32%. Another study of MRI examinations due to suspected spinal disease in cats revealed a prevalence of 14% for inflammatory/infectious diseases.[7] *T gondii* infection is considered to be the second most frequently diagnosed parasite disease of the central nervous system in cats, representing 6% of central nervous disorders.[2,4,5,8] However, to the authors' knowledge, this is the first reported case of a spinal *T gondii* granuloma in a cat.

Infection with *T gondii* can occur in all mammals. Cats are the only definitive hosts, whereas other warm-blooded animals are considered intermediate hosts. Infection can occur diaplancentary and lactogenic or by oral ingestion of oocysts or other developmental stages; for example, through infected intermediate hosts, water, plants or soil. The most common route of entry of the parasite is thought to be through ingesting infected intermediate hosts.[6,9–11]

Toxoplasmosis is a common worldwide parasite disease, and depending on geographic location, a very high proportion of felids, especially older male cats, are seropositive.[12] Globally, a seroprevalence of antibodies to *T gondii* among cats is thought to be approximately 35%.[13] Symptomatic cats present with dyspnoea, polypnea, abdominal discomfort, fever, anorexia, lethargy, vomiting, dermatitis, paresis or icterus. Intraocular inflammation due to multifocal iridochoroiditis was also evident in one or both eyes in 81.1%.[14,15] In addition, gastrointestinal, cardiac, muscular, cutaneous and pulmonary diseases have been described.[16–24] On the other hand, neurological signs, such as in the presented case, are rare with toxoplasmosis. In a study of 100 histologically proven infected cats, only 7% showed neurological signs, even though *T gondii* were detected in 80% of 55 examined brains.[14] The symptomatology in neurologically manifested toxoplasmosis appears highly variable. Anisocoria, torticollis, changes of behaviour, paresis secondary to segmental non-suppurative myelitis, distal polyneuropathy and seizures due to intracranial granulomas caused by *T gondii* have been reported in cats.[25–30]

Extradural spinal granulomas have not been reported due to *T gondii*, but due to a variety of other infectious organisms, such as *Cryptococcoma*, *Coccidioides immitis*, *Histoplasma capsulatum* and *Mycobacterium microti*.[27,30–34] To determine the aetiology of the extradural soft-tissue mass in this cat, a decompressive hemilaminectomy and tissue sampling were performed. Although the mass occupied approximately two-thirds of the vertebral canal, the cat showed only mild neurological signs, similar to some of the already reported extradural spinal granulomas due to parasite disease.[31,32] In relation to the severe spinal cord compression, more severe neurological deficits could have been suspected. This leads to the assumption that the compression has developed over a longer period, so that the nerve tissue could adapt slowly. Once toxoplasmosis was confirmed, recommended antibiotic treatment with clindamycin was started.[35] The influence of viral diseases and clinical toxoplasmosis is controversial. There is evidence that an infection with feline leukaemia virus (FeLV) or feline immunodeficiency virus (FIV) can trigger an acute generalised toxoplasmosis, but in the general population, this could not be identified.[36–39] The presented cat was not tested, because it was regularly vaccinated against FeLV and FIV. Retrospectively, however, it would have been of interest if there was a concurrent infectious disease with impact on the immune system. Moreover, especially referring to cats and the fact that neurological disorders are often of infectious origin, a complete analysis of cerebrospinal fluid (CSF) should be done generally.[40] MRI is considered the diagnostic tool of choice for disorders of the central nervous system.[41] In contrast, CT is currently superior to MRI for imaging bony structures. Since spinal tumours are often associated with osseous lesions and MRI was not available at our hospital, a CT scan was performed in the case described.[42]

Unfortunately, the cat showed significant neurological deterioration 9 months postoperatively and it was euthanased without further diagnostics. Based on the evidence of recurrence of an extradural soft-tissue mass on the 5-week postoperative CT scan, it is likely that clinically significant regrowth of the mass occurred. Retrospectively, a repeated determination of antibodies at the time of the second CT scan could have been of interest. More sensitive would have been an analysis of CSF or fine-needle aspiration of the previous granuloma location.[35] Revision surgery or repeated treatment with clindamycin alone or with a second anti-*T gondii* drug could have been considered for a possible longer survival time, free of clinical signs.

Conclusions

An extradural granuloma caused by *T gondii* can be the cause for gait abnormalities in cats due to spinal cord compression. A hemilaminectomy and mass debulking can lead to temporary improvement of clinical signs.

Conflict of interest The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding The authors received no financial support for the research, authorship, and/or publication of this article.

Ethical approval The work described in this manuscript involved the use of non-experimental (owned or unowned) animals. Established internationally recognised high standards ('best practice') of veterinary clinical care for the individual patient were always followed and/or this work involved the use of cadavers. Ethical approval from a committee was therefore not specifically required for publication in *JFMS Open Reports*. Although not required, where ethical approval was still obtained, it is stated in the manuscript.

Informed consent Informed consent (verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (experimental or non-experimental animals, including cadavers) for all procedure(s) undertaken (prospective or retrospective studies). For any animals or people individually identifiable within this publication, informed consent (verbal or written) for their use in the publication was obtained from the people involved.

References

1 Marioni-Henry K. **Feline spinal cord diseases.** *Vet Clin North Am Small Anim Pract* 2010; 40: 1011–1028.
2 Marioni-Henry K, Vite CH, Newton AL, et al. **Prevalence of diseases of the spinal cord of cats.** *J Vet Intern Med* 2004; 18: 851–858.
3 Mella SL, Cardy TJ, Volk HA, et al. **Clinical reasoning in feline spinal disease: which combination of clinical information is useful?** *J Feline Med Surg* 2020; 22: 521–530.
4 Singh M, Foster D, Child G, et al. **Inflammatory cerebrospinal fluid analysis in cats: clinical diagnosis and outcome.** *J Feline Med Surg* 2005; 7: 77–93.
5 Negrin A, Lamb CR, Cappello R, et al. **Results of magnetic resonance imaging in 14 cats with meningoencephalitis.** *J Feline Med Surg* 2007; 9: 109–116.
6 Calero-Bernal R and Gennari SM. **Clinical toxoplasmosis in dogs and cats: an update.** *Front Vet Sci* 2019; 6. DOI: 10.3389/fvets.2019.00054.
7 Gonçalves R, Platt SR, Llabrés-Díaz FJ, et al. **Clinical and magnetic resonance imaging findings in 92 cats with clinical signs of spinal cord disease.** *J Feline Med Surg* 2009; 11: 53–59.
8 Bradshaw J, Pearson G and Gruffydd-Jones T. **A retrospective study of 286 cases of neurological disorders of the cat.** *J Comp Pathol* 2004; 131: 112–120.

9 López Ureña NM, Chaudhry U, Calero Bernal R, et al. **Contamination of soil, water, fresh produce, and bivalve mollusks with *Toxoplasma gondii* oocysts: a systematic review.** *Microorganisms* 2022; 10.DOI: 10.3390/microorganisms10030517.

10 Lappin MR. **Update on the diagnosis and management of Toxoplasma gondii infection in cats.** *Top Companion Anim Med* 2010; 25: 136–141.

11 Dubey JP, Lindsay DS and Lappin MR. **Toxoplasmosis and other intestinal coccidial infections in cats and dogs.** *Vet Clin North Am Small Anim Pract* 2009; 39: 1009–1034.

12 Vollaire MR, Radecki SV and Lappin MR. **Seroprevalence of Toxoplasma gondii antibodies in clinically ill cats in the United States.** *Am J Vet Res* 2005; 66: 874–877.

13 Montazeri M, Galeh TM, Moosazadeh M, et al. **The global serological prevalence of Toxoplasma gondii in felids during the last five decades (1967–2017): a systematic review and meta-analysis.** *Parasit Vectors* 2020; 13: 82. DOI: 10.1186/s13071-020-3954-1.

14 Dubey J and Carpenter J. **Histologically confirmed clinical toxoplasmosis in cats: 100 cases (1952-1990).** *J Am Vet Med Assoc* 1993; 203: 1556–1566.

15 Dubey J, Cerqueira-Cézar C, Murata F, et al. **All about toxoplasmosis in cats: the last decade.** *Vet Parasitol* 2020; 283. DOI: 10.1016/j.vetpar.2020.109145.

16 Cohen TM, Blois S and Vince AR. **Fatal extraintestinal toxoplasmosis in a young male cat with enlarged mesenteric lymph nodes.** *Can Vet J* 2016; 57: 483–486.

17 Peterson J, Willard M, Lees G, et al. **Toxoplasmosis in two cats with inflammatory intestinal disease.** *J Am Vet Med Assoc* 1991; 199: 473–476.

18 McConnell JF, Sparkes AH, Blunden AS, et al. **Eosinophilic fibrosing gastritis and toxoplasmosis in a cat.** *J Feline Med Surg* 2007; 9: 82–88.

19 Simpson KE, Devine BC and Gunn-Moore D. **Suspected toxoplasma-associated myocarditis in a cat.** *J Feline Med Surg* 2005; 7: 203–208.

20 Butts DR and Langley-Hobbs SJ. **Lameness, generalised myopathy and myalgia in an adult cat with toxoplasmosis.** *J Feline Med Surg* 2020; 6. DOI: 10.1177/2055116920909668.

21 McKenna M, Augusto M, Suárez-Bonnet A, et al. **Pulmonary mass-like lesion caused by Toxoplasma gondii in a domestic shorthair cat.** *J Vet Intern Med* 2021; 35: 1547–1550.

22 Anfray P, Bonetti C, Fabbrini F, et al. **Feline cutaneous toxoplasmosis: a case report.** *Vet Dermatol* 2005; 16: 131–136.

23 Kul O, Atmaca HT, Deniz A, et al. **Clinicopathologic diagnosis of cutaneous toxoplasmosis in an Angora cat.** *Berl Munch Tierarztl Wochenschr* 2011; 124: 386–389.

24 Park C-H, Ikadai H, Yoshida E, et al. **Cutaneous toxoplasmosis in a female Japanese cat.** *Vet Pathol* 2007; 44: 683–687.

25 Lindsay SA, Barrs VR, Child G, et al. **Myelitis due to reactivated spinal toxoplasmosis in a cat.** *J Feline Med Surg* 2010; 12: 818–821.

26 Dubey J and Fenner W. **Clinical segmental myelitis associated with an unidentified toxoplasma-like parasite in a cat.** *J Vet Diagn Invest* 1993; 5: 472–480.

27 Alves L, Gorgas D, Vandevelde M, et al. **Segmental meningomyelitis in 2 cats caused by Toxoplasma gondii.** *J Vet Intern Med* 2011; 25: 148–152.

28 Pfohl JC and Dewey CW. **Intracranial Toxoplasma gondii granuloma in a cat.** *J Feline Med Surg* 2005; 7: 369–374.

29 Falzone C, Baroni M, De Lorenzi D, et al. **Toxoplasma gondii brain granuloma in a cat: diagnosis using cytology from an intraoperative sample and sequential magnetic resonance imaging.** *J Small Anim Pract* 2008; 49: 95–99.

30 Mari L, Shelton GD and De Risio L. **Distal polyneuropathy in an adult Birman cat with toxoplasmosis.** *J Feline Med Surg* 2016; 2. DOI: 10.1177/2055116916630335.

31 Belluco S, Thibaud J, Guillot J, et al. **Spinal cryptococcoma in an immunocompetent cat.** *J Comp Pathol* 2008; 139: 246–251.

32 Foureman P, Longshore R and Plummer SB. **Spinal cord granuloma due to *Coccidioides immitis* in a cat.** *J Vet Intern Med* 2005; 19: 373–376.

33 Martín-Ambrosio Francés M, Pradel J, Domínguez E, et al. **Clinical resolution of systemic mycobacterial infection in a cat with a suspected spinal granuloma.** *Vet Rec Case Rep* 2023; 11. https://doi.org/10.1002/vrc2.576.

34 Vinayak A, Kerwin SC and Pool RR. **Treatment of thoracolumbar spinal cord compression associated with *Histoplasma capsulatum* infection in a cat.** *J Am Vet Med Assoc* 2007; 230: 1018–1023.

35 Hartmann K, Addie D, Belák S, et al. **Toxoplasma gondii infection in cats: ABCD guidelines on prevention and management.** *J Feline Med Surg* 2013; 15: 631–637.

36 Heidel J, Dubey J, Blythe L, et al. **Myelitis in a cat infected with Toxoplasma gondii and feline immunodeficiency virus.** *J Am Vet Med Assoc* 1990; 196: 316–318.

37 Davidson M, Rottman J, English R, et al. **Feline immunodeficiency virus predisposes cats to acute generalized toxoplasmosis.** *Am J Pathol* 1993; 143: 1486–1497.

38 Dorny P, Speybroeck N, Verstraete S, et al. **Serological survey *Toxoplasma gondii* of a on feline immunodeficiency virus and feline leukaemia virus in urban stray cats in Belgium.** *Vet Rec* 2002; 151: 626–629.

39 Pena HFdJ, Evangelista CM, Casagrande RA, et al. **Fatal toxoplasmosis in an immunosuppressed domestic cat from Brazil caused by *Toxoplasma gondii* clonal type I.** *Rev Bras Parasitol Vet* 2017; 26: 177–184.

40 Gunn-Moore DA and Reed N. **CNS disease in the cat: current knowledge of infectious causes.** *J Feline Med Surg* 2011; 13: 824–836.

41 Lane B. **Practical imaging of the spine and spinal cord.** *Top Magn Reson Imaging* 2003; 14: 438–443.

42 da Costa RC and Samii VF. **Advanced imaging of the spine in small animals.** *Vet Clin North Am Small Anim Pract* 2010; 40: 765–790.