

CASE REPORT

Mesenteric lymph node abscesses due to *Escherichia coli* in a cat

Kosei Sakai¹  | Ryoji Kanegi¹ | Tomoyo Nabetani¹ | Toshiyuki Tanaka¹ | Shunsuke Shimamura¹ | Terumasa Shimada¹ | Kikuya Sugiura² | Shingo Hatoya²

¹Veterinary Medical Center, Graduate School of Life and Environmental Sciences, Osaka Prefecture University, Izumisano, Osaka, Japan

²Laboratory of Cell Pathobiology, Graduate School of Life and Environmental Sciences, Osaka Prefecture University, Izumisano, Osaka, Japan

Correspondence

Kosei Sakai, Veterinary Medical Center, Graduate School of Life and Environmental Sciences, Osaka Prefecture University, 1-58 Rinku, Ourai Kita, Izumisano, Osaka 598-8531, Japan.

Email: sakai@vet.osakafu-u.ac.jp

Abstract

A 3-year-old, castrated male mixed-breed cat presented with an almost 2-year history of chronic loose stools. On radiography and ultrasound examination, there were two masses in the centre of the abdomen. Contrast-enhanced computed tomography revealed that the masses were enlarged mesenteric lymph nodes with fluid accumulation. Percutaneous lesion drainage yielded pus-like fluid. Fluid cytology revealed numerous neutrophils and Gram-negative rods. Pus culture identified *Escherichia coli* as the causative organism. Consequently, mesenteric lymph node abscesses were definitively diagnosed. Since computed tomography showed that the abscesses adhered to the surrounding tissues, it was difficult to remove them surgically. With drainage and antimicrobial therapy, the mesenteric lymph nodes gradually decreased in size. However, loose stools persisted. The cat's diet was changed to a hydrolysed diet, and the clinical symptoms improved, suggesting food-responsive enteropathy. This may be an underlying disease of lymph node abscesses. Lymph node abscesses limited to the mesenteric lymph nodes rarely occur in veterinary medicine, and this is the first report in cats.

KEYWORDS

antimicrobial therapy, cat, drainage, *Escherichia coli*, mesenteric lymph node abscess

1 | INTRODUCTION

Infectious lymphadenitis and lymph node abscesses limited to intra-abdominal lymph nodes, especially mesenteric lymph nodes (MLNs), rarely occur in both human and veterinary medicine. In small animals such as dogs and cats, all publications on these diseases are single case reports and small case series (Binagia et al., 2020; Engelmann et al., 2014; Fluen et al., 2019; Malik et al., 1999; Schmitz, 2016), with limited information. Only one report has addressed three cases of mesenteric lymphadenitis caused by *Listeria monocytogenes* in cats (Fluen et al., 2019). To our knowledge, no lymph node abscess cases limited to the MLNs have been reported in cats. Herein, we describe a case of feline MLN abscesses due to *Escherichia coli*.

2 | CASE PRESENTATION

A 3-year-old, castrated male mixed-breed cat was referred to the Veterinary Medical Center, Osaka Prefecture University, Japan, with an almost 2-year history of chronic loose stools. Although antidiarrhoeal agents and antitflatulents had been administered for 10 days prior to the visit to our clinic, the clinical symptoms did not improve. The cat's general condition was good, except for loose stools. The cat was fed commercial dry food. On physical examination, the cat weighed 3.95 kg and had a body condition score of 3/5. A mass of ~3 cm diameter was palpated at the centre of the abdomen. There were no significant findings on urinalysis and stool tests. Complete blood count and serum biochemistry results were within the reference ranges.

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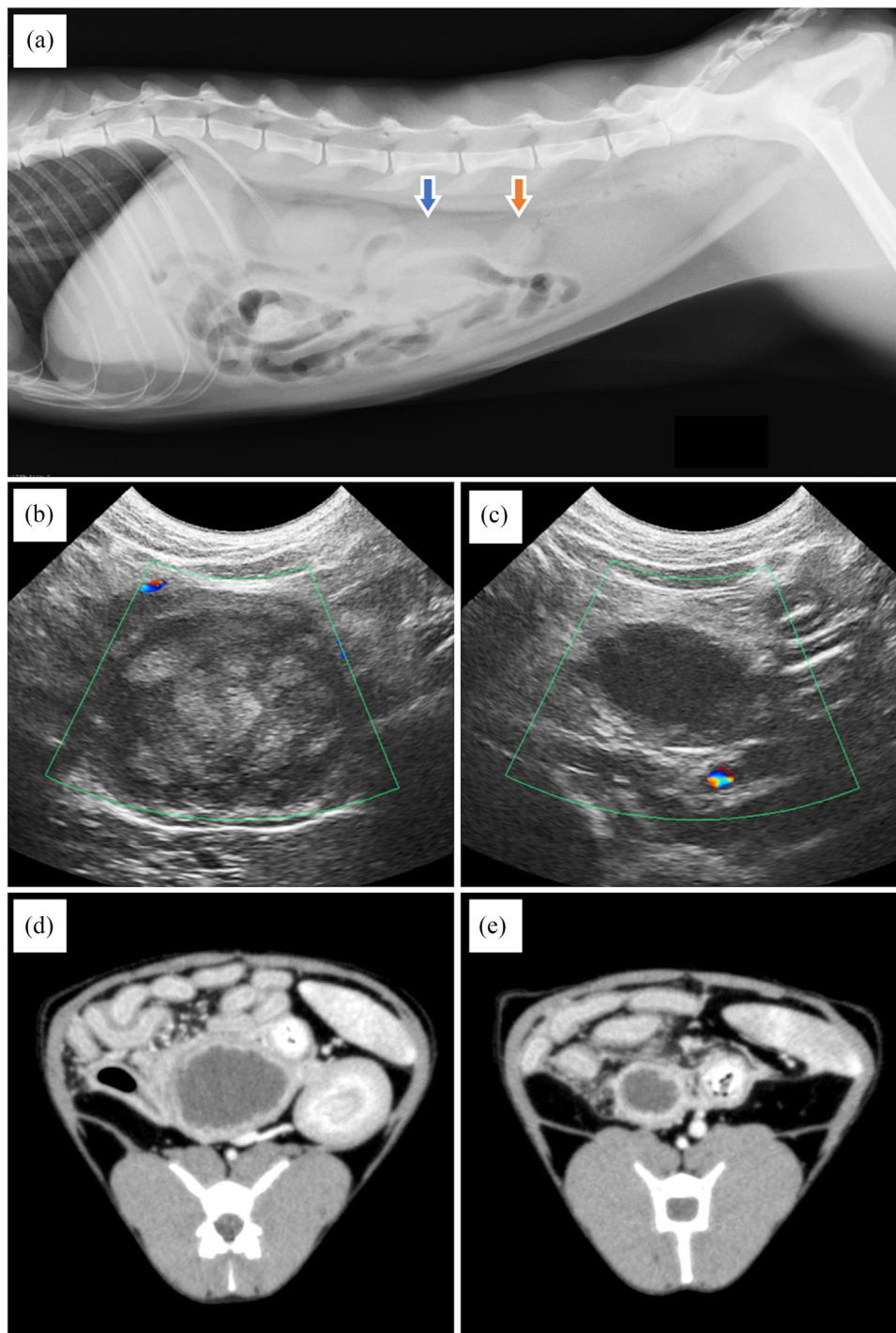


FIGURE 1 Imaging evaluation of the abdominal masses in the cat. (a) A right lateral abdominal radiograph identified two round masses (blue and orange arrows) at the centre of the abdomen. (b, c) Ultrasonography of the two masses revealed a larger mass with a mosaic pattern (b), and a smaller mass with hypoechogenicity (c). No blood vessels were observed within each lesion during the colour Doppler ultrasound examination. (d, e) Contrast-enhanced computed tomography revealed the large (d) and small (e) masses had fluid within them. The lesions adhered to the surrounding tissues. The increased intensity of the surrounding adipose tissue suggested peritonitis

Feline leukaemia virus antigen and feline immunodeficiency virus antibody test results were negative. Radiography revealed no chest abnormalities. Conversely, there were two masses in the centre of the abdomen (Figure 1a). On abdominal ultrasound examination, the larger mass showed a mosaic pattern (Figure 1b), and the smaller one showed

hypoechogenicity (Figure 1c). No blood vessels were observed within the lesions during the colour Doppler ultrasound examination. The adipose tissues surrounding the two masses showed increased echogenicity, suggesting peritonitis. Moreover, multiple MLNs were enlarged. Contrast-enhanced computed tomography (CT) under general

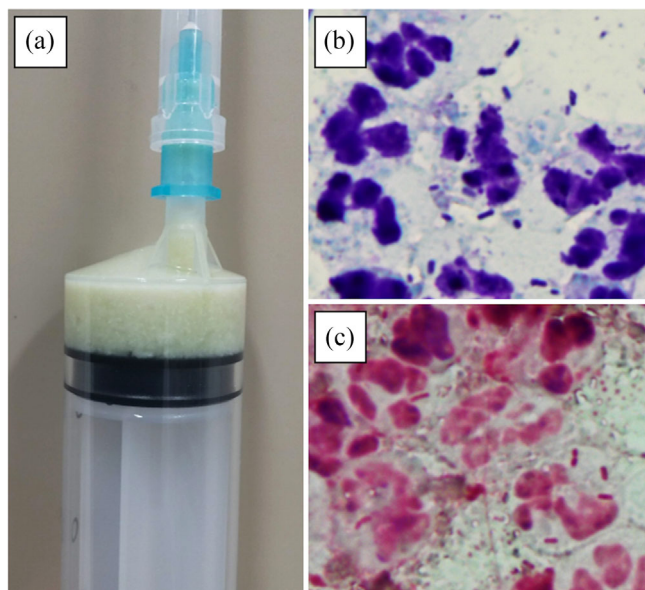


FIGURE 2 Fluid drained from the masses in the cat. (a) Macroscopically, a white-green fluid was collected. (b) Numerous neutrophils and bacteria were observed in the direct smears stained with Hemacolor. (c) The bacteria were classified as Gram-negative rods on Gram staining

anaesthesia revealed that the two masses contained fluid inside (Figure 1d and e) and originated from part of MLNs. The masses adhered to the surrounding tissues. Percutaneous drainage yielded a white-green fluid from each lesion (Figure 2a). Numerous neutrophils and Gram-negative rods were observed in the direct smears of the fluid (Figure 2b and c). Consequently, MLN abscesses were definitively diagnosed. The pus drained from the two masses were subjected to aerobic and anaerobic cultures with susceptibility testing to a commercial laboratory (Japan Clinical Laboratories Inc., Kyoto, Japan), identifying *Escherichia coli* as the causative organism, which was sensitive to various antimicrobials (Table 1). Peripheral blood was also cultured; however, no bacteria were detected. Feline infectious peritonitis (FIP) was differentiated as an underlying disease causing the MLN abscesses. The alpha 1-acid glycoprotein concentration and feline coronavirus antibody titre in serum samples were 1020 $\mu\text{g/ml}$ and 1:1600, respectively. Moreover, FIP virus was not detected in the pus sample. Hence, FIP was ruled out according to the diagnostic algorithm proposed by a commercial laboratory (Marupi Lifetech Co., Ltd., Osaka, Japan).

Since the abscesses adhered to the surrounding tissues, they were difficult to remove surgically. Thus, orally administered amoxicillin/clavulanic acid (Augmentin, GlaxoSmithKline plc, London, UK) and amoxicillin (Amoxiclear, Kyoritsu Seiyaku Corporation, Tokyo, Japan), as empiric antimicrobial therapy, were started on the first day. Augmentin has a high content of clavulanic acid (125 mg of clavulanic acid to 250 mg of amoxicillin), which can cause gastrointestinal symptoms such as vomiting and diarrhoea. The ratio of amoxicillin to clavulanic acid was adjusted to 10:1, and the total amoxicillin dose was set to 15 mg/kg, q8hr to avoid aggravating the gastrointestinal symp-

TABLE 1 Results of drug susceptibility testing against *Escherichia coli* detected in abscesses

Antibiotic	MIC	Interpretation
Ampicillin	≤ 2	S
Piperacillin	≤ 4	S
Amoxicillin/clavulanate	≤ 2	S
Cefazolin	≤ 4	S
Cefmetazole	≤ 1	S
Cefotiam	≤ 8	S
Latamoxef	≤ 4	S
Ceftazidime	≤ 1	S
Ceftriaxone	≤ 1	S
Cefepime	≤ 1	S
Minocycline	≤ 1	S
Gentamicin	≤ 1	S
Amikacin	≤ 2	S
Sulphamethoxazole trimethoprim	≤ 20	S
Levofloxacin	≤ 0.12	S
Fosfomycin	≤ 16	S
Aztreonam	≤ 1	S
Meropenem	≤ 0.25	S

MIC, minimum inhibitory concentration; S, susceptible.

toms. On day 14, drainage was performed under medetomidine sedation. Additionally, the antimicrobial regimen was switched to amoxicillin (15 mg/kg, q8hr) according to the results of bacterial cultures with susceptibility testing. Although the masses gradually decreased in size post-treatment (Figure 3), loose stools persisted. On day 27, the cat's diet was changed to a hydrolysed diet (Hydrolyzed Protein Dry, ROYAL CANIN JAPON, Inc., Tokyo, Japan), and the clinical symptoms improved by day 52, suggesting food-responsive enteropathy (FRE). On day 91, antimicrobial therapy was discontinued because the masses were not detected by ultrasonography.

On day 119, two enlarged MLNs were detected (Figure 3), including originally and newly enlarged MLNs. No gastrointestinal symptoms, such as loose stools, were observed. On day 127, contrast-enhanced CT was performed under general anaesthesia, revealing no significant findings other than the enlarged MLNs and the surrounding peritonitis. The originally enlarged MLN contained fluid, whereas the newly enlarged MLN did not. Although drainage for the originally enlarged MLN was attempted, little fluid was aspirated. Gastrointestinal endoscopy and fine-needle aspiration (FNA) of the enlarged MLNs were performed to differentiate underlying diseases (e.g., lymphoma) causing lymph node enlargement. Histopathological examination of the gastrointestinal tract revealed mild-to-moderate lymphocytic-plasmacytic enteritis in the small and large intestines. Cytological analysis using FNA samples showed numerous neutrophils

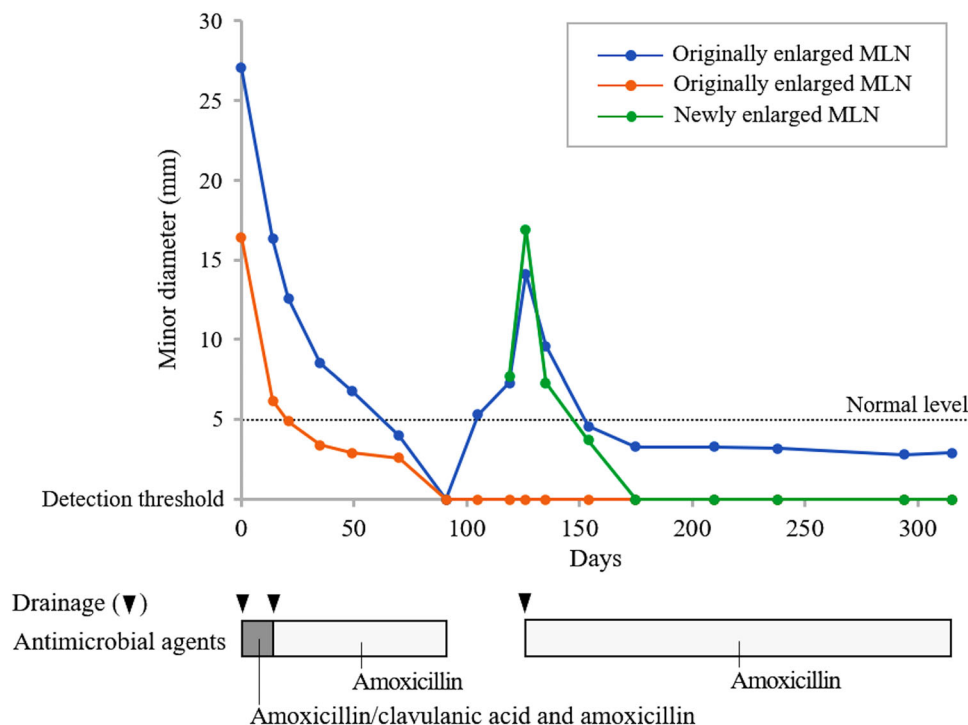


FIGURE 3 Treatment of the enlarged mesenteric lymph nodes (MLNs) and changes in their size. The minor diameter was measured via an ultrasound system

and eosinophils. Neutrophils often phagocytose Gram-negative rods. Consequently, infectious mesenteric lymphadenitis and/or lymph node abscess was definitively diagnosed. The FNA sample was subjected to aerobic and anaerobic cultures with susceptibility testing to a commercial laboratory (Japan Clinical Laboratories Inc.), and orally administered amoxicillin as empiric antimicrobial therapy was concurrently restarted. Since the cultures identified *Escherichia coli* as the causative organism, which was sensitive to various antimicrobials as in the initial visit, the antimicrobial agent was not changed. The enlarged MLNs gradually decreased and reached the normal sizes (minor diameter < 5 mm) on day 154 (Figure 3) (Morgan et al., 2018; Schreurs et al., 2008). Per the owner's request, amoxicillin administration was to be continued until a recurrence was observed. At the time of this manuscript preparation, 315 days have passed since the initial visit, and the cat has survived without enlarged MLNs and gastrointestinal symptoms.

3 | DISCUSSION

In dogs, there have been several reports on infectious mesenteric lymphadenitis and lymph node abscesses. The causative agents included *Salmonella* spp., *Serratia marcescens*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Staphylococcus canis*, *Escherichia coli*, *Prevotella* spp., *Mycobacterium tuberculosis* and *Cryptococcus neoformans* (Binagia et al., 2020; Engelmann et al., 2014; Malik et al., 1999; Schmitz, 2016). In cats, there has been only one report on three cases of mesenteric lymphadenitis caused by *Listeria monocytogenes* (Fluen et al., 2019). *Yersinia*

is a major causative agent of infectious mesenteric lymphadenitis and lymph node abscesses in humans but not in small animals such as dogs and cats (Itakura et al., 2017; Schapers et al., 1981; Watanabe et al., 2014; Zińczuk et al., 2015). To our knowledge, this is the first report on MLN abscesses in cats. The causative agent was *Escherichia coli*, which is commonly found in the intestines of humans and animals.

Infectious mesenteric lymphadenitis and lymph node abscesses are theorised to occur when bacteria cross the intestinal mucosal barrier to MLNs in association with diffuse inflammatory gastrointestinal diseases (Qin et al., 2002; Schmitz, 2016; Unterer et al., 2015). In this case, loose stools improved via a hydrolysed diet, which may indicate the presence of FRE as an underlying disease. Moreover, the clinical symptoms persisted for almost 2 years. This may have resulted in intestinal barrier failure and bacterial translocation. FRE is the most common form of feline chronic enteropathy (Guilford et al., 2001), and most cats with FRE show dramatic improvement in clinical symptoms within 2 weeks of an elimination diet (Guilford et al., 2001; Jergens et al., 2010). However, a prolonged period without appropriate treatment may lead to mesenteric lymphadenitis and lymph node abscesses in cats.

In general, human patients with mesenteric lymphadenitis receive antimicrobial therapy, and those with MLN abscess receive lymph node excision, abscess drainage, and/or antimicrobial therapy (Itakura et al., 2017; Takahashi et al., 2021), whereas surgical and antimicrobial therapy are commonly performed for both diseases in small animals. In a retrospective study of 14 dogs with mesenteric lymphadenitis or lymph node abscesses, 10 received surgical and antimicrobial therapy. Three dogs relapsed 1–5 months post-discharge, all of which were

successfully managed with antimicrobial therapy (Schmitz, 2016). In a case report of three cats with mesenteric lymphadenitis, all received surgical and antimicrobial therapy. Two cats experienced a relapse 6 weeks and approximately 6 months post-surgery, respectively, both of which were successfully managed with surgical or antimicrobial therapy (Fluen et al., 2019). Therefore, we considered surgical intervention in this case. However, since the abscesses adhered to the surrounding tissues, surgical therapy was not applicable. Therefore, abscess drainage and antimicrobial therapy were performed, eventually leading to remission. This result suggests that an MLN abscess in small animals can be managed with non-surgical therapy as well as surgical therapy. However, further studies are needed to clarify whether surgical or non-surgical therapy is more effective for treating MLN abscesses.

No standard duration of antimicrobial therapy for an MLN abscess has been identified. Currently, the duration depends on the physician's and veterinarian's discretion. Herein, since the masses were not detected by ultrasonography at 13 weeks after initiating antimicrobial therapy, antimicrobial therapy was discontinued. However, the cat had a relapse of MLN abscesses 4 weeks later, suggesting that the discontinuation of the antimicrobial agent was early. Thus, we carefully considered the therapeutic strategy after the second remission. Ultimately, we could not investigate the appropriate duration of antimicrobial therapy for an MLN abscess because the antimicrobial therapy was continued according to the owner's request until an MLN abscess relapse or antimicrobial agent-associated adverse effects occurred. Further studies are needed to determine the appropriate duration of antimicrobial therapy for an MLN abscess.

4 | CONCLUSION

While rare, MLN abscess should be a differential diagnosis for abdominal lymphadenomegaly in cats. Abscess drainage and antimicrobial therapy may be effective for affected cats.

ACKNOWLEDGEMENTS

We thank our staff of the Veterinary Medical Centre of Osaka Prefecture University for their help with the clinical data.

CONFLICT OF INTEREST

The authors have no conflicts of interest directly relevant to the content of this article.

AUTHOR CONTRIBUTIONS

Kosei Sakai: Conceptualization; Data curation; Funding acquisition; Investigation; Project administration; Resources; Writing – original draft; Writing – review & editing. **Ryoji Kanegi, Tomoyo Nabetani, Toshiyuki Tanaka, Shunsuke Shimamura, Terumasa Shimada and Kikuya Sugiura:** Investigation; Writing – review & editing. **Shingo Hatoya:** Investigation; Resources; Writing – review & editing.

FUNDING STATEMENT

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ETHICS STATEMENT

The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered to. No ethical approval was required as this study did not include any experimentation on animals, and all data were generated from a part of daily clinical activities.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1002/vms3.840>

ORCID

Kosei Sakai  <https://orcid.org/0000-0002-9357-9394>

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How to cite this article: Sakai, K., Kanegi, R., Nabetani, T., Tanaka, T., Shimamura, S., Shimada, T., Sugiura, K., & Hatoya, S. (2022). Mesenteric lymph node abscesses due to *Escherichia coli* in a cat. *Veterinary Medicine and Science*, 8, 1611–1616. <https://doi.org/10.1002/vms3.840>