Presentation, diagnosis, treatment and outcome of primary gastric lymphoma in 13 cats

Primary gastric lymphoma is a well-characterised disease in humans, but is poorly characterised in cats. This study retrospectively describes the presentation, diagnosis, treatment and outcome of cats with primary gastric lymphoma in a UK referral hospital. Medical records of cats diagnosed with primary gastric lymphoma, without ultrasonographic involvement of the intestinal tract, between 2009 and 2020 were reviewed. A total of 13 cats met the inclusion criteria. All cases were of large cell lymphoma. Cytology alone was diagnostic in nearly all cases (10/11). At diagnosis six cats were euthanised. The remaining seven cats were treated with a multiagent chemotherapy protocol (5/7) or a combination of prednisolone and chlorambucil (2/7). Median overall survival time was 300 days (ranging from 30–1980 days). The two cats treated with prednisolone and chlorambucil survived for 300 and 480 days respectively. This study raises awareness of feline primary gastric lymphoma for veterinary surgeons in clinical practice. Although an uncommon disease presentation, primary gastric lymphoma has unique characteristics that may differ from the high-grade intestinal form. Further studies are needed to evaluate the optimum therapeutic approach.

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Primary gastric lymphoma is the most common form of extra-nodal non-Hodgkin's lymphoma in humans, accounting for 30–40% of cases (D'Amore et al, 1994), although primary gastric lymphoma is considered rare, accounting for only 2–8% of cases of primary gastric cancer overall (Doglioni et al, 1992). All histological categories of lymphoma may also arise in the stomach but the main two histological subtypes, accounting for more than 90% of cases, are mucosa-associated lymphoid tissue that is considered 'low-grade' or indolent, and diffuse large B-cell lymphoma that is considered 'high-grade' or aggressive (Koch et al, 2001). A wide variety of treatment options exist for individuals with primary gastric lymphoma, including observation alone, antibiotic therapy, surgery, chemotherapy and radiation therapy, but there is no consensus as to the optimal treatment protocol (Ferrucci and Zucca, 2006; Juárez-Salcedo et al, 2018).

Feline primary gastric lymphoma, without intestinal involvement, appears to be uncommon and poorly characterised in cats. In one study looking at the immunophenotypical and histological classification of feline gastrointestinal lymphoma cases, approximately a quarter of cats (24%) had gastric tumours but only 18% of cats had gastric lymphoma without intestinal involvement (Pohlman et al, 2009).

Gastrointestinal lymphoma in cats is most commonly categorised into three types based on histopathology and immunohistopathology: low-grade alimentary lymphoma, intermediate- or high-grade alimentary lymphoma and large granular lymphoma (Moore et al, 2012). The above classification is frequently simplified using the term 'small cell' for the low-grade alimentary lymphoma to imply indolent behaviour, greater response to treatment and overall survival time.

(Kiselow et al, 2008) and 'large cell' for the intermediate- or high-grade alimentary lymphoma and low-grade alimentary lymphoma to imply aggressive behaviour, partial to poor response to treatment and significantly shorter survival time (Finotello et al, 2018). Small cell lymphoma tends to respond well to treatment with prednisolone and chlorambucil alone (Stein et al, 2010), while large cell lymphoma is usually treated with more aggressive

chemotherapy protocols such as cyclophosphamide, doxorubicin, vincristine and prednisolone (CHOP), or cyclophosphamide, vincristine, prednisone (COP) (Zwahlen et al, 1998). Only two studies report the histological characterisation of feline primary gastric lymphoma, and both reported all cases were classified as intermediate- or high-grade alimentary lymphoma or large cell lymphoma (Pohlman et al, 2009; Gustafson et al, 2014). Therefore, primary gastric lymphoma would be expected to be aggressive in nature and respond partially or poorly to chemotherapy.

Currently, there is only one study in the literature describing the clinical course, response to treatment and outcome in cats with primary gastric lymphoma (Gustafson et al, 2014). This study suggested a prognosis comparable to that of cats with intermediate- or high-grade alimentary lymphoma or large cell intestinal lymphoma (Milner et al, 2005). The majority of cats (15/16 cases) in this study were treated with multiagent chemotherapy (a CHOP-based protocol +/- L-asparaginase; a COP-based protocol; or a protocol using vincristine, cyclophosphamide and doxorubicin followed by long-term maintenance therapy with methotrexate) (Gustafson et al, 2014). A single cat was treated with oral prednisolone and chlorambucil. Two cats in the study had partial gastrectomy before multiagent chemotherapy treatment.

Given the limited data, the optimal treatment for feline primary gastric lymphoma is unknown. It is unclear whether a more intensive multiagent protocol will result in improved outcomes for clinical cases. To the authors' knowledge, the outcome of further feline primary gastric lymphoma cases that receive a less intensive chemotherapy protocol (with oral prednisolone and chlorambucil) or no treatment at all has not been reported.

This study described the signalment, clinical presentation, physical examination, diagnostic imaging and clinicopathological abnormalities in 13 cats with primary gastric lymphoma presented in a referral hospital in the UK. The treatment protocols and outcomes were also reported for all cats, regardless of their staging. The hypothesis, based on the existing literature, was that primary gastric lymphoma would be uncommon, high-grade and would demonstrate an aggressive clinical behaviour, similar to the high-grade intestinal form of the disease. Consequently, cats treated with a CHOP or COP chemotherapy protocol would have more favourable outcomes compared to those treated with oral prednisolone and chlorambucil, or no treatment at all.

Materials and methods

Study design

The medical records of client-owned cats diagnosed with feline primary gastric lymphoma at a veterinary referral hospital in the UK were reviewed. The hospital database was searched for 'feline', 'cat' and 'gastric lymphoma'. Cases were recruited from 1 January 2009 through to 1 January 2020. Ethical approval from the relevant ethical committee was obtained.

Inclusion and exclusion criteria

For inclusion in the study, cases were required to have a complete medical history, complete hospital records, complete abdominal ultrasonographic imaging reports, diagnosis of primary gastric lymphoma following cytological or histological examination of gastric samples and cytological or histological reports, and follow-up information regarding their treatment, response to treatment and outcome. The abdominal ultrasonography and the gastric fine-needle aspiration were performed by veterinary diagnostic imaging specialists certified by the European College of Veterinary Diagnostic Imaging, or a resident under their supervision. Endoscopic gastric biopsies were collected by veterinary internal medicine specialists certified by the European College of Veterinary Internal Medicine, or a resident under their supervision. Cats were excluded from the study if their medical files or imaging records were not available. Cases were also excluded if the ultrasonographic examination suggested intestinal or other organ involvement.

Data extracted

Data regarding age, breed, sex, presenting clinical signs, physical examination findings, retroviral status, diagnostic tests, serum vitamin B12, serum folate, treatment, response to treatment and survival were recorded. Feline leukaemia virus and feline immunodeficiency virus (FIV) testing was performed using enzyme-linked immunosorbent assay (ELISA)-based methods to assess the presence of FeLV antigenaemia and the presence of FIV antibodies. Not all cases had retroviral testing.

Treatments administered

Chemotherapy protocols used included the following: CHOP protocol consisted of cyclophosphamide (Baxter) 200–250 mg/m^2 orally or intravenously in weeks 2, 7, 13 and 21; doxorubicin (doxorubicin hydrochloride; Pfizer), 1 mg/kg intravenously in weeks 4, 9, 17 and 25; vincristine (vincristine sulphate; Hospira UK), 0.5–0.7 mg/m^2 intravenously in weeks 1, 3, 6, 8, 11, 15, 19 and 23; and prednisolone (Millpledge Veterinary) 2 mg/kg orally once a day for 7 days, then 1.5 mg/kg orally once a day for 7 days, 1 mg/kg orally once a day for 7 days, then 1 mg/kg orally every other day until the protocol's end. The COP protocol consisted of cyclophosphamide (Baxter) 200–250 mg/m^2 orally or intravenously in weeks 1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49 and 52; vincristine (vincristine sulphate; Hospira UK) 0.5–0.7 mg/m^2 intravenously weeks 1, 2, 3, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49 and 52; and prednisolone (Millpledge Veterinary) 2 mg/kg orally once a day for 7 days, then 1.5 mg/kg orally once a day for 7 days, 1 mg/kg orally once a day for 7 days, then 1 mg/kg orally every other day until the protocol's end. Finally, chlorambucil (Leukeran; GlaxoSmithKline) 20 mg/m^2 orally every 2 weeks or 2 mg orally every other day in combination with prednisolone (Millpledge Veterinary) 1–2 mg/kg orally daily reduced to 0.5–1 mg/kg every other day for the long-term (Lynch, 2016). The decision to choose between a CHOP or COP-based protocol was at the discretion of the clinician in charge of the case. An oral chlorambucil/prednisolone protocol was based on owner preference.

Outcome measures

Data were reported as median, range and percentages. When available, remission status was defined as complete, partial or no remission, based on the clinical signs reported by owners and physical examination findings. Survival was defined as the time

from the date of diagnosis of gastric lymphoma until death from any cause. The cause of death was recorded as lymphoma-related, other (if known) or unknown.

Results

Signalment

During the study period, 14 cats with primary gastric lymphoma were identified. The requirements for entry into this retrospective study were met by 13 cats. All cats had either cytological or histopathological diagnosis of gastric lymphoma without ultrasonographical or histopathological evidence of intestinal lymphoma. The median age of the cats was 8 years (range 5–16 years). Of the 13 cats, seven were male and all were neutered. Domestic shorthair was the predominant breed (10/13).

Clinical signs

The most common sign before diagnosis of primary gastric lymphoma was weight loss (9/13). Other common signs included vomiting (8/13), haematemesis (6/13) and hyporexia (4/13). Physical examination revealed palpable abdominal mass in 8/13 cats. The median duration of clinical signs before the diagnosis was 30 days (ranged from 7–540 days).

Diagnostic findings

All 13 cats had complete blood count, chemistry and ionised calcium measured at the time of diagnosis. Anaemia was the most common abnormality detected (n=8) and this was a regenerative anaemia in five cats. No thrombocytopenia or neutropenia were noted at any time. The most common abnormalities identified in chemistry results were low creatinine level (5/13) and hypoalbuminaemia (6/13). Ionised hypercalcaemia was reported in 3/13 cases. Of the cats, six were tested for feline leukaemia virus and FIV and they were all negative. Serum cobalamin and folate levels were measured in eight cats. The serum cobalamin level was below the reference range in a single cat (1/8), within the reference range in three cats (3/8) and above the reference range in four cats (4/8). The serum folate level was above the reference range in four cats (4/8) and within the reference range in the remaining four cats (4/8).

All cats underwent complete abdominal ultrasonographic examination. All cats had abnormal ultrasonographic appearance of the stomach. A number of cats had diffuse gastric thickening (n=9) and the remaining cats had a discrete gastric mass visible (n=4). Enlargement of the lymph nodes adjacent to the stomach was seen (n=12). The remaining cat had normal ultrasonographic appearance of the local lymph nodes. None of the cats had ultrasonographic findings consistent with intestinal or other intra-abdominal involvement apart from the regional lymphadenopathy. Based on the limited staging information available, all cats were stage 1 or 2 (*Table 1*) (Mooney and Hayes, 1986; Vail and Pinkerton, 2020) but fine-needle aspiration of the liver and spleen were not performed, so higher stage disease was not discounted. Clinical signs, duration of clinical signs, clinicopathological abnormalities and diagnostic findings are summarised in *Tables 2* and *3*.

Primary gastric lymphoma was diagnosed via ultrasound guided fine-needle aspiration in the majority of cats (n=10) (*Table 4*). Cytology alone was diagnostic in nearly all the cats where it was performed (10/11 cases, 90.9%). One cat had concurrent cytology and histopathology, owing to clinician preference, with large cell lymphoma identified on both showing excellent agreement. Three more of the 13 cats were diagnosed by endoscopically guided gastric biopsies. All cats were diagnosed with large cell or high-grade lymphoma. Two of the cats that had endoscopic gastric biopsies taken had concurrent duodenal biopsies taken. Histopathological examination found no evidence of lymphoma in these duodenal biopsy samples. None of the cats had a cellular immunophenotype determined.

Table 1. Clinical staging system for feline lymphoma

Stage 1	• A single tumour (extranodal) or single anatomical area (nodal) • Includes primary intrathoracic tumours
Stage 2	• A single tumour (extranodal) with regional lymph node involvement • Two or more nodal areas on the same side of the diaphragm • A resectable primary gastrointestinal tract tumour, usually in the ileocaecal area, with or without involvement of associated mesenteric nodes only
Stage 3	• Two single tumours (extranodal) on opposite sides of the diaphragm • Two or more nodal areas above and below the diaphragm • All extensive primary unresectable intra-abdominal disease • All paraspinal or epidural tumours, regardless of other tumour site/sites
Stage 4	• Stages 1–3 with liver and/or spleen involvement
Stage 5	• Stages 1–4 with initial involvement of central nervous system or bone marrow or both

Adapted from Mooney and Hayes (1986)

Treatment and outcome

Of the 13 cats, six had been euthanised within 48 hours of diagnosis because of clinical deterioration or at the owner's request. Of the remaining seven cats, four were treated with a COP protocol, one was treated with a CHOP protocol and the remaining two cats were treated with a combination of prednisolone and chlorambucil. Median overall survival duration of the cases that underwent treatment was 300 days (ranging from 30–1980 days). Of the two cats with the longest survival, one was treated with a COP protocol (survived 1980 days) and the other was treated with oral prednisolone and chlorambucil (survived 480 days). The method of diagnosis, treatment, duration of treatment, remission, survival time and cause of death are summarised in *Table 4*.

Discussion

Evidence from human medicine suggests that primary gastric lymphoma should be considered a separate disease entity (Doglioni et al, 1992; Ferrucci and Zucca, 2006). The results of this study suggest that this may also be the case in cats. Although

Table 2. Signalment, clinical signs, physical examination findings and diagnostic investigations in 13 cats with primary gastric lymphoma

Cat	Signalment	Clinical signs	Physical examination findings	Duration of clinical signs before presentation (days)	Ultrasonographic abnormalities
1	16-year-old female-neutered Domestic Short Hair	Haematemesis, vomiting, hyporexia	Unremarkable	21	Diffuse gastric wall thickening, enlarged gastric lymph nodes
2	15-year-old male-neutered Domestic Short Hair	Vomiting	Palpable goitre	90	Diffuse gastric wall thickening, enlarged gastric lymph nodes
3	8-year-old male-neutered Maine Coon	Weight loss	Palpable abdominal mass	21	Gastric mass, enlarged gastric lymph nodes
4	11-year-old female-neutered Domestic Short Hair	Vomiting, haematemesis, weight loss	Palpable abdominal mass	540	Gastric mass, enlarged gastric lymph nodes
5	7-year-old male-neutered Oriental	Vomiting, weight loss	Palpable abdominal mass	90	Diffuse gastric wall thickening, enlarged gastric lymph nodes
6	6-year-old male-neutered Domestic Short Hair	Lethargy, haematemesis	Palpable abdominal mass	14	Diffuse gastric wall thickening, enlarged gastric lymph nodes
7	7-year-old female-neutered Domestic Short Hair	Weight loss, hyporexia	Palpable abdominal mass	60	Diffuse gastric wall thickening, enlarged gastric lymph nodes
8	8-year-old male-neutered Domestic Short Hair	Weight loss, vomiting	Palpable abdominal mass	21	Diffuse gastric wall thickening
9	5-year-old female-neutered British Blue	Haematemesis, lethargy, hyporexia, weight loss	Palpable abdominal mass	21	Diffuse gastric wall thickening, enlarged gastric lymph nodes
10	9-year-old female-neutered Domestic Short Hair	Weight loss, hyporexia vomiting	Unremarkable	7	Diffuse gastric wall thickening, enlarged gastric lymph nodes
11	10-year-old male-neutered Domestic Short Hair	Vomiting, haematemesis, weight loss	Unremarkable	90	Gastric mass, enlarged gastric lymph nodes
12	11-year-old female-neutered Domestic Short Hair	Tachypnoea	Palpable abdominal mass, dyspnoea	30	Diffuse gastric wall thickening, enlarged gastric lymph nodes
13	5-year-old male-neutered Domestic Short Hair	Vomiting, haematemesis weight loss	Unremarkable	90	Gastric mass, enlarged regional lymph nodes

feline primary gastric lymphoma is high-grade, there appears to be important differences between cats with purely gastric involvement and those with high-grade lymphoma developing elsewhere in the gastrointestinal tract.

First, primary gastric lymphoma appears to be an uncommon disease with only 14 cases identified over 10 years in the present UK study. The previous study from the USA reported a similarly low incidence: 16 cases from two referral centres reported over a 6-year period (Gustafson et al, 2014). In contrast, gastrointestinal or alimentary lymphoma appears to be the most common gastrointestinal tumour in this species (Rissetto et al, 2011). Second, vomiting (8/13) and haematemesis (6/13) were common presenting signs in this study. This finding was consistent with a previous study by Gustafson et al (2014) of feline primary gastric lymphoma but is in contrast to cats with gastrointestinal lymphoma, where vomiting and haematemesis are infrequently reported (Fondacaro et al, 1999). Although not all patients had cobalamin levels measured, the results from this patient population suggest that hypocobalaminaemia is not a common feature of primary gastric lymphoma, which is relevant to the general practitioner that has to prioritise diagnostics within potential financial limitations. Only one cat had a cobalamin concentration below the reference. This case had duodenal histopathology performed and no evidence of lymphoma was identified in the samples. Interestingly, this particular case also had hyperthyroidism. Although a neoplastic infiltration of the ileum cannot be ruled out in this case, chronic

Table 3. Clinicopathological abnormalities identified in 13 cats with primary gastric lymphoma

Most common clinicopathological abnormalities	Number of cases affected (*n*= 13)	Percentage (%)
Non-regenerative anaemia	3	23
Regenerative anaemia	5	38.4
Neutrophilia	3	23
Lymphopenia	2	15.3
Hypoalbuminaemia	6	46.1
Low urea level	4	30.7
Low creatinine level	5	38.4
Increased serum cobalamin level	4	30.7
Increased serum folate level	4	30.7
Increase alanine aminotransferase activity	4	30.7
Ionised hypercalcaemia	3	23

inflammatory enteropathy and hyperthyroidism were considered more likely explanations. This is in contrast to cats with alimentary lymphoma, where cobalamin concentration is expected to be significantly lower in cats with lymphoma compared with other gastrointestinal neoplasia (Jugan and August, 2017). The clinical significance of the four cases with increased serum cobalamin concentration remains unclear, but hypercobalaminaemia in cats has been associated with hepatic or neoplastic disease in one study (Trehy et al, 2014). Retroviral testing was only performed in six of the cases, but these were all negative. This finding was in agreement with the previous primary gastric lymphoma study that also reported negative results in all cats tested (Gustafson et al, 2014). All cats with primary gastric lymphoma in the present study had abnormal ultrasonography of the stomach, which varied from thickening to a discernible mass. This is in agreement with the previous primary gastric lymphoma study by Gustafson et al (2014). On the contrary, cats with gastrointestinal lymphoma may have very diverse ultrasonographic and physical examination findings depending on the histopathological classification. Those with low-grade, small cell lymphoma may have unremarkable ultrasound and physical examination findings, whereas cats with high-grade large cell lymphoma may have a markedly abnormal and diffusely diseased gastrointestinal tract (Barrs and Beatty, 2012a).

Finally, previous studies (Pohlman et al, 2009; Gustafson et al, 2014) have classified cases of primary gastric lymphoma as high-grade or large cell lymphoma. Based on the authors' hypothesis, an aggressive clinical course and partial or poor response to chemotherapy would be expected for the cats in the present study. Interestingly, four of the seven treated cases survived longer than expected compared to intermediate- or high-grade alimentary lymphoma or large cell alimentary lymphoma (Milner et al, 2005), even with less intensive chemotherapy protocols (COP in four cases and oral prednisolone and chlorambucil in two cases) compared to the previous study of feline primary gastric

Table 4. Diagnosis, treatment and outcome in 13 cats with primary gastric lymphoma

Cat	Mode of diagnosis	Treatment	Duration of treatment (days)	Remission	Survival (days)	Cause of death
1	Cytology	Euthanasia	0	No remission	0	Lymphoma-related
2	Cytology, histopathology	Prednisolone/chlorambucil	300	Partial	300	Lymphoma-related
3	Cytology	Cyclophosphamide, vincristine, prednisone	60	Partial	60	Lymphoma-related
4	Cytology	Cyclophosphamide, doxorubicin, vincristine, and prednisolone	Lost to follow up	Complete	Minimum of 360	Lost to follow up
5	Cytology	Euthanasia	0	No remission	0	Lymphoma-related
6	Cytology	Euthanasia	0	No remission	0	Lymphoma-related
7	Cytology	Cyclophosphamide, vincristine, prednisone	600	Complete	1980	Unknown
8	Histopathology	Prednisolone/chlorambucil	480	Complete	480	Lymphoma-related
9	Cytology	Euthanasia	0	No remission	0	Lymphoma-related
10	Histopathology	Cyclophosphamide, vincristine, prednisone	180	Complete	180	Lymphoma-related
11	Histopathology	Euthanasia	0	No remission	0	Lymphoma-related
12	Cytology	Cyclophosphamide, vincristine, prednisone	30	Partial remission	30	Congestive heart failure
13	Cytology	Euthanasia	0	No remission	0	Lymphoma-related

lymphoma where all cases received a CHOP protocol (Gustafson et al, 2014). The cat that survived 1980 days presented with weight loss, vomiting, regenerative anaemia and ionised hypercalcaemia and was diagnosed with primary gastric lymphoma following fine needle aspiration of a focal gastric mass. The cat received a COP protocol and achieved ultrasonographic and clinical remission within 4 weeks of treatment. After 18 months on the COP protocol, and discussion with the owner, treatment was withdrawn. Following treatment discontinuation, the cat remained in remission for 5 years before it was euthanised as a result of progressive azotaemia. Further studies are needed to evaluate whether feline primary gastric lymphoma has a more favourable prognosis compared with the gastrointestinal form of the disease.

The current study builds on the evidence and understanding of feline primary gastric lymphoma identified by Gustafson et al (2014) and offers a UK perspective for veterinary surgeons in practice. For example, ultrasound-guided fine-needle aspiration of the gastric wall was diagnostic in all but one case where it was performed (10/11). This finding is consistent with previous studies of large cell or intermediate- or high-grade alimentary lymphoma (Collette et al, 2016; Jugan and August, 2017) but it was only attempted in 2/16 cases in the USA study (Gustafson et al, 2014). Furthermore, Turner et al (2021) recently showed that ultrasound-guided fine-needle cytological aspirates of all type of gastrointestinal masses provided a clinically useful sample in two-thirds of cases. This suggests that the clinician should consider obtaining a cytological diagnosis first before performing more invasive and expensive diagnostic investigations such as endoscopy or surgery. A cytological diagnosis may be a more realistic option in many clinical situations.

Although multiagent chemotherapy is considered more likely to achieve remission for cases of intermediate- or high-grade alimentary lymphoma or large cell lymphoma (Barrs and Beatty, 2012b), some owners may not pursue this treatment because of financial or other concerns (Slater et al, 1996). The prognosis for feline primary gastric lymphoma treated with alternative, less aggressive protocols or no treatment alone needs to be established. In this study, six cases were euthanised shortly after diagnosis as a result of the owners' deciding not to pursue further treatment. However, two cats were treated with a combination of oral prednisolone and chlorambucil and survived 480 and 300 days respectively. This is longer than the previously reported median survival time of cats with primary gastric lymphoma (171 days) (Gustafson et al, 2014) and high-grade alimentary lymphoma (210 days) (Milner et al, 2005). A combination of oral prednisolone and chlorambucil may be a viable alternative for patients with primary gastric lymphoma where the owner does not want to pursue more intensive protocols because of welfare or cost concerns. A prospective study including a larger number of cats would improve the understanding of feline primary gastric lymphoma and whether the prognosis is more favourable compared to high-grade alimentary lymphoma, and whether multiagent chemotherapy is the optimal treatment.

The current study has several important limitations, mainly owing to its retrospective nature and the small number of cases. First, the low number of cases limits more powerful conclusions or further statistical analysis. Second, being a retrospective study, important information such as the duration of partial or complete remission and quality of life during treatment is not available. Histopathology was only performed in a small number of cases included in this study (3/13). A definitive diagnosis of small cell low-grade alimentary lymphoma can be challenging to differentiate from lymphocytic inflammation and invariably requires histopathology or additional diagnostic tests such as immunohistochemistry or clonality testing to be confirmed (Barrs and Beatty, 2012a). However, large cell lymphoma can often be diagnosed on aspirate cytology (Barrs and Beatty, 2012a). Colette and colleagues reported cytology alone was enough to diagnose 96 out of 119 (81%) of cases with feline intermediate- or high-grade alimentary lymphoma (Collette et al, 2016). In 10 of the 13 cases, the clinician felt confident with the cytological diagnosis and based their case management on this. In three cases, both cytology and histopathology were performed with perfect agreement on the diagnosis. As this was a retrospective study, a histopathological diagnosis could not be confirmed in the other cases.

The 'gold standard' for diagnosis of high-grade lymphoma would be to perform complete staging and further analysis such as cellular immunophenotyping or clonality testing. Prospective studies investigating feline lymphoma would be expected to include these data. However, this study reported the signalment, clinical presentation and diagnostic investigation findings that were readily available in general practice. The aim was to make practising veterinary surgeons aware of the condition and that a cytological diagnosis could be achieved safely without referral or specialist skills. Having achieved a definitive diagnosis cytologically, immunophenotyping or clonality testing may not be pursued by many owners as the decision to treat is influenced by other factors such as cost, patient compliance and welfare. There is no evidence in the literature to support altering the chemotherapy protocol in cats based on the immunophenotype or that this influences the outcome in feline lymphoma cases (Barrs and Beatty, 2012b). Patterson-Kane et al (2004) found no prognostic significance in immunophenotyping of feline alimentary lymphoma cases. Further research into feline primary gastric lymphoma and the prognostic significance of immunophenotyping is needed but was beyond the scope of this retrospective study.

Conclusions

The results of this study suggest that feline primary gastric lymphoma is uncommon but that it may be a distinct disease entity that veterinary surgeons in practice may encounter. The gastric changes may be evident on abdominal palpation or ultrasonographic examination may reveal diffuse or focal gastric wall changes. Clinical diagnosis can be made with cytological examination of gastric fine needle aspirates in >90% of cases. Cats with primary gastric lymphoma may experience longer survival times compared to the high-grade intestinal form of lymphoma. Further comparative prospective studies are needed to evaluate the optimum therapeutic approach.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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KEY POINTS

- Feline primary gastric lymphoma, without intestinal involvement, is currently considered uncommon and is poorly characterised.
- Feline primary gastric lymphoma appears to be high-grade and may present with distinct marked gastric wall changes evident on abdominal palpation or ultrasound.
- Fine-needle aspirates of the gastric wall appear to be adequate for diagnosis in the majority of cases, similar to high-grade intestinal lymphoma.
- The optimum therapeutic approach is currently unknown but some cats with primary gastric lymphoma may experience long survival times for a high-grade lymphoma.
- Although uncommon, clinicians in practice should be aware of this presentation in cats.

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