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A case of gastric leiomyosarcoma in a domestic shorthair cat

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Abstract

Case summary A 10-year-old male neutered domestic shorthair cat presented with nausea and 1.2 kg weight loss over a 6 month period. Physical examination was unremarkable, and haematological and biochemical results were considered clinically unremarkable. Abdominal ultrasound revealed an 18 mm diameter heterogeneous mass in the stomach at the pyloric sphincter, protruding into the gastric lumen with loss of gastric wall layering. The remainder of the intestinal tract and abdominal viscera were unremarkable and no free fluid was detected. The mass was surgically resected via celiotomy and the adjacent lymph node excised for histopathology. Histopathology of the mass demonstrated neoplastic spindle cell proliferation, which was considered most likely to be of smooth muscle origin, and so a preliminary diagnosis of gastric leiomyosarcoma was given. Complete excision was confirmed. Immunohistochemistry excluded a gastrointestinal stromal cell tumour as a differential and strongly supported the diagnosis of gastric leiomyosarcoma. The cat recovered well postoperatively with supportive treatment. Repeat abdominal ultrasonography 3 and 6 months postoperatively showed no evidence of mass regrowth. Survival time at the time of reporting is 10 months.
Relevance and novel information To our knowledge, this is the first report of gastric leiomyosarcoma in a cat. Based on this case, gastric leiomyosarcoma should be a differential diagnosis for cats presenting with a gastric mass.

Keywords: Immunohistochemistry; leiomyosarcoma; pylorus; smooth muscle; stomach neoplasm; weight loss

Case description

A 10-year-old male neutered domestic shorthair cat was referred for the investigation of weight loss (1.2 kg over a 6 month period). Lip smacking and nausea were also reported. Before this presentation no significant medical issues were reported, vaccinations were up to date and the cat was housed mainly indoors, with some time spent outside. On physical examination, the cat was bright and alert, well hydrated and had an adequate body condition score (4/9); its body weight was 4.88 kg. Cardiac auscultation revealed tachycardia (heart rate 190 beats per min), with a regular rhythm; no cardiac murmurs were detected. Pulmonary auscultation was unremarkable (respiratory rate 26 breaths per minute), and rectal temperature was 39.0ºC. No abnormalities were found on abdominal palpation.

The cat was admitted for initial investigations. The haematological results were entirely within normal limits

(Table 1). Serum biochemistry, metabolites and electrolyte analysis revealed moderate elevation in creatinine kinase (893 U/l; reference interval [RI] 10–290 U/l), mild hyperglycaemia (7.6 mmol/l; RI 4.2–6.6 mmol/l) and mild hyperlactaemia (3.61 mmol/l; RI 0.6–2.5 mmol/l); all other values were within normal limits (Table 2).

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Table 1 Haematology

Test	Result	Reference interval	Flag
Haemoglobin (g/dl)	10.90	8.1–14.2	–
Haematocrit (%)	34.9	27.7–46.8	–
Red blood cells (×10¹²/l)	7.70	6–10.1	–
Mean cell volume (fl)	45.3	41.3–52.6	–
Mean cell haemoglobin (pg)	14.1	12–16	–
Mean cell haemoglobin concentration (g/dl)	31.2	27–32.8	–
Platelets (×10⁹/l)	307	156–626	–
White blood cells (×10⁹/l)	11.52	6.3–19.6	–
Neutrophils (×10⁹/l)	8.22	3–13.4	–
Lymphocytes (×10⁹/l)	2.19	2–7.2	–
Monocytes (×10⁹/l)	0.33	0–1	–
Eosinophils (×10⁹/l)	0.77	0.3–1.7	–
Basophils (×10⁹/l)	0.00	0–0.1	–

Table 2 Biochemistry, metabolites and electrolytes

Test	Result	Reference interval	Flag
Albumin (g/l)	38	26–40	–
Alkaline phosphatase (IU/l)	18	0–100	–
Alanine transferase (U/l)	40	0–120	–
Amylase (IU/l)	1460	500–1500	–
Aspartate transaminase (µmol/l)	42	0–90	–
Calcium (mmol/l)	2.26	1.9–2.9	–
Cholesterol (mmol/l)	4.9	2–6.5	–
Creatine kinase (U/l)	893	10–290	High
Creatinine (µmol/l)	86	0–200	–
Globulins (g/l)	29	25–50	–
Glucose (mmol/l)	8.3	3.5–7.5	High
Phosphate (mmol/l)	1.34	0.9–2.6	–
Total bilirubin (µmol/l)	10	0–12	–
Total protein (g/l)	67	53–77	–
Urea (mmol/l)	7	2.8–11	–
Na⁺ (mmol/l)	153.3	140.0–153.0	High
K⁺ (mmol/l)	4.15	3.60–4.60	–
Ca⁺⁺ (mmol/l)	1.24	1.13–1.33	–
Cl⁻ (mmol/l)	120	106–120	–
Anion gap (mmol/l)	23.6	–	–
Lactate (mmol/l)	3.61	0.60–2.50	High

Table 3 Cobalamin, folate and thyroxine

Test	Result	Reference interval	Flag
Vitamin B12 (cobalamin) (pmol/l)	490	231–617	–
Folate (nmol/l)	28.2	19–31	–
Thyroxine (nmol/l)	21.4	15–60	–

Novartis) by a board-certified radiologist using a Logiq E R7 ultrasound scanner. A well-circumscribed 18 mm diameter mass was detected in the stomach at the level of the pyloric sphincter. The mass had heterogeneous echogenicity with a focal hypoechoic area and loss of distinction in the local gastric wall layering. The mass protruded into the gastric lumen (Figure 1). No lymph adenopahty was noted and the adjacent pancreas was free of pathology. No other lesions were noted in the remainder of the intestinal tract, there was no free fluid in the abdominal cavity and the remainder of the abdominal viscera was unremarkable. Thoracic radiographs were obtained to screen for pulmonary metastasis or concurrent abnormalities, but no pathology was seen.

Fine-needle aspirates were taken of the mass via ultrasonic guidance. Cytological analysis found that the nucleated cells in the samples consisted predominantly of degenerate neutrophils, in a higher concentration than would be expected from peripheral blood. These cells often contained intracytoplasmic bacterial cocci, with free cocci also noted in small numbers in the background– evidence of septic neutrophilic infiltration of the mass. Occasional small, round cells were also reported, arranged in tightly cohesive clusters, likely gastric epithelial cells. There was minimal anisokaryosis
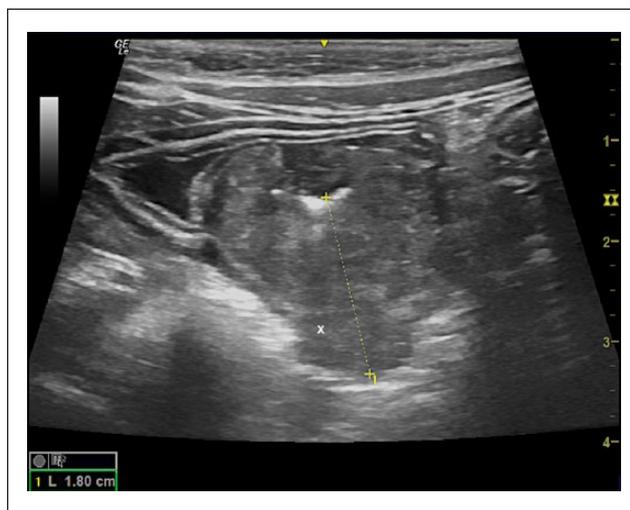
Figure 1 Ultrasonographic image of the gastric mass located at the pyloric sphincter. The mass can be seen projecting into the gastric lumen. There is localised disruption of gastric wall layering (x)

Serum folate and cobalamin concentrations were within their respective RIs, as was total thyroxine (Table 3). The cat was also found to be negative for feline immunodeficiency virus and feline leukaemia virus (FIV/FeLV Witness Test Kit; Zoetis).

An abdominal ultrasound was performed under intravenous (IV) sedation with butorphanol (0.2 mg/kg Torbugesic; Zoetis) and acepromazine (5 µg/kg, ACP;

Figure 2 Histological image of duodenal mucosa and the spindle cell neoplasia. The villi and crypts lie on the left and the t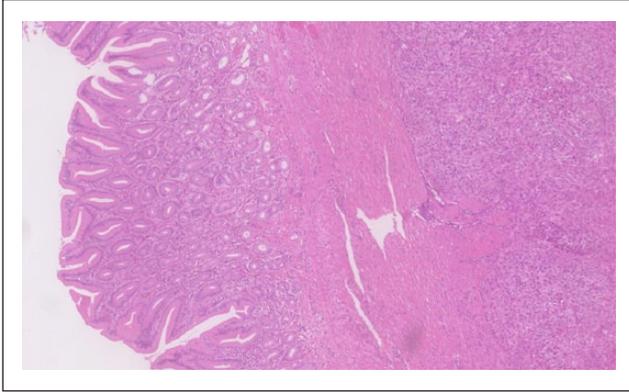umour can be seen on the right of the image, deep to the submucosa and muscularis layers. Stained with haematoxylin and eosin, × 40 magnification
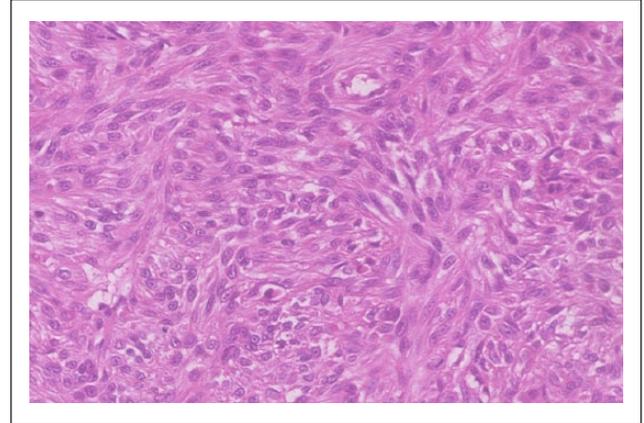

Figure 3 A representative section of the gastric tumour, showing the neoplastic spindle cell population in whorls and streams. Stained with haematoxylin and eosin, × 400 magnification

or anisocytosis, so malignant transformation was not evident in these cytological samples but could not be eliminated.

The cat underwent surgical excision of the mass the following day. Dexmedetomidine (2 µg/kg Dexdomitor; Vetoquinol) and buprenorphine (0.02 mg/kg Vetergesic; Ceva) were selected for the premedication protocol and induction was with 3 ml propofol (6 mg/kg PropoFlo; Zoetis). An epidural using methadone (0.1 mg/kg Physeptone; Martindale Pharma) and bupivacaine (1 mg/kg Marcain 0.25%; AstraZeneca) was administered. Isoflurane was used for maintenance and the volatile agent and oxygen were supplied by a mini circle breathing system. The general anaesthetic was unremarkable. Amoxicillin/clavulanic acid (20 mg/kg IV Augmentin; GlaxoSmithKline) was chosen for perioperative antibiosis, initially administered 30 mins prior to the first incision, followed by repeated doses every 90 mins for the duration of the procedure.

A celiotomy was performed from the xiphoid process to caudal to the umbilicus. Exploration of the abdomen was unremarkable except for the known gastric mass and mild associated lymphadenopathy. The blood vessels on the lesser and greater curvature of the stomach were divided using electrosurgery and Enseal (Ethicon). Bowel clamps were placed on the proximal stomach, descending duodenum and at the margins of the area for resection. The mass and excess gastric mucosa were resected with 5 cm macroscopic margins, being cautious to ensure the major duodenal papilla was not involved. The gastric mucosa and submucosa were closed with 4-0 PDS suture material in a simple continuous pattern until reaching the duodenal opening, and the serosa and muscularis layers were closed in a continuous Cushing pattern. 4-0 PDS was used to place a modified horizontal mattress suture at the junction between the incision

closure and the duodenum. Anastomosis was performed with 4-0 PDS in a simple continuous pattern either side of a mesenteric suture. The lymph node adjacent to the mass on the lesser curvature was excised and preserved for histopathology. The lesser omentum was re-attached with simple interrupted 4-0 PDS sutures. The abdomen was lavaged with 500 ml Hartmann's crystalloid fluid, which was removed with suction. The anastomosis site was omentalised and the abdominal wall and skin were closed routinely. A nasogastric tube was placed for nutritional support. The margins of the gastric mass were marked with India ink and impression smears made from the incised surface of the mass.

A 75 mm × 35 mm × 25 mm section of tissue, including the pyloric mass, was fixed (10% formal saline), as was a specimen of orad mucosa and a local lymph node; representative portions were processed and submitted for histological examination.

Each section of the pyloric mass was lined with histologically unremarkable pyloric (and focally duodenal) mucosa (Figure 2). The neoplastic mass was unencapsulated and poorly demarcated, forming a multilobular, densely cellular structure, which caused focally marked expansion of the gastric wall. The neoplastic cells were spindle-shaped with sparse palely eosinophilic faintly fibrillar cytoplasm arranged in bundles, whorls and dense streams (Figure 3). The cells had indistinct cell borders, with oval-to-elongated blunt-ended nuclei containing stippled to dispersed chromatin and multiple small nucleoli. Nine mitoses were observed per 10 high power (× 400) fields. In the centre of the mass was prominent necrosis with accumulations of haemorrhage and proteinaceous fluid. Multifocally the neoplastic cells infiltrated deeply into the muscularis and subserosal layers (Figure 4). The lymphatic vessels in these areas
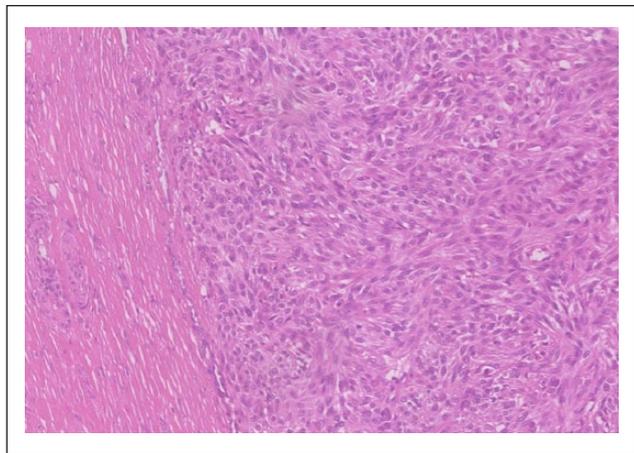
Figure 4 Histological image of the interface between the gastric tumour and the submucosal collagenous connective tissue and unaffected smooth muscle of the muscularis layer. The mass does not have a discrete border; instead, there is local infiltration of the neoplastic cells into these layers. Stained with haematoxylin and eosin, × 200 magnification

Figure 5 The neoplastic cells showed marked cytoplasmic labelling with the smooth muscle actin antibody (× 400 magnification)

were widely patent and multifocally neoplastic cells were densely clustered around the vessels. Necrosis effaced the luminal mucosal epithelium and there was accumulated serocellular crusting of the denuded surface.

The excised lymph node showed peripheral germinal follicles with numerous medullary small lymphocytes with expected polarity. The fundic mucosal samples had intact tall columnar epithelium with rare intraepithelial lymphocytes (fewer than 1 per × 400 field). The superficial lamina propria contained occasional small lymphocytes and plasma cells and there were mild lymphoid vessel dilation and focal discrete lymphoid aggregates in the deep lamina propria. The muscularis and subserosal layers were unremarkable.

There was no evidence of neoplastic cells in either the submitted lymph node or orad gastric mucosa samples, nor in sections from the excision edges of the pyloric specimen, confirming completeness of the excision.

The histological features of the pyloric mass were consistent with a neoplastic proliferation of spindle cells, considered most likely to be of smooth muscle origin. The high level of mitotic activity of the cells, the abundant central necrosis and infiltration of the mass into surrounding tissue suggested malignancy and the initial diagnosis of gastric leiomyosarcoma was made, with consideration of a gastrointestinal stromal tumour (GIST) as a differential diagnosis.

Immunohistochemistry was performed on the tissue sections, and the neoplastic cells showed strong cytoplasmic labelling with anti-smooth muscle actin (SMA) antibody (Figure 5). There was also variable pale labelling with vimentin antibody (indicating mesenchymal cells). The cells did not label with S100 or CD117 antibodies
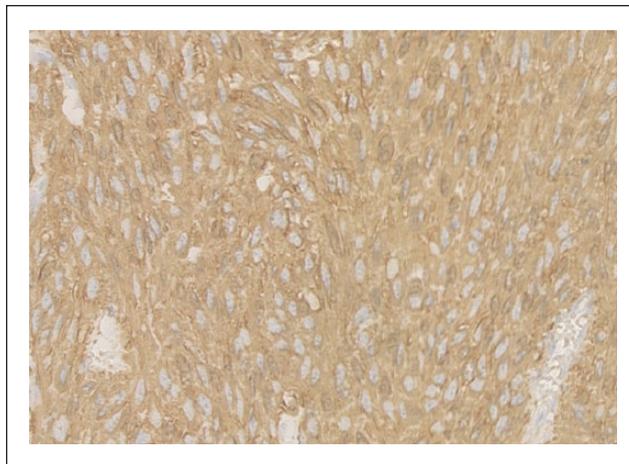
(Figure 6), which, if present, would have suggested a GIST; therefore, the immunohistochemistry was strongly supportive of the histopathological diagnosis of gastric leiomyosarcoma.

Postoperatively, the cat was supported with multi-modal analgesia (methadone [0.3 mg/kg IV Comfortan; Dechra] and ketamine [3 µg/kg/h Narketan; Vetoquinol] on a constant rate infusion [CRI]), fluid therapy (4 ml/kg/h Hartmann's; Vetivex), amoxicillin/clavulanic acid (20 mg/kg IV Augmentin; GlaxoSmithKline), omeprazole (1 mg/kg IV; Star Pharmaceuticals) and metoclopramide (1 mg/kg/h CRI; Hameln). There was good postoperative clinical improvement, but signs of continued nausea were noted, so maropitant (1 mg/kg Cerenia; Zoetis) and mirtazapine (2 mg PO; Summit) were also introduced. The cat was discharged 6 days postoperatively with oral formulations of omeprazole, metoclopramide and cisapride. A feeding plan was devised to ensure that full resting energy requirements were met.

At the 7 day follow-up check, oral medications were stopped as there had been no further vomiting or nausea, and at the 3 month check-up the owners reported that the cat had a good appetite and no vomiting had been seen. A follow-up abdominal ultrasound scan was performed, which found no evidence of mass regrowth. A nodule (7.6 mm × 5.0 mm) was detected in the pancreas adjacent to the duodenum–a novel finding since the previous scan. There was good integrity in the duodenal-gastric anastomosis and the rest of the abdomen was unremarkable. As the cat was clinically well, it was decided to monitor this nodule with a repeat scan 3 months later (6 months postoperatively); this scan showed no evidence of change or growth in the pancreatic lesion nor any change in the associated duodenum (Figure 7). There was also no gastric mass regrowth or
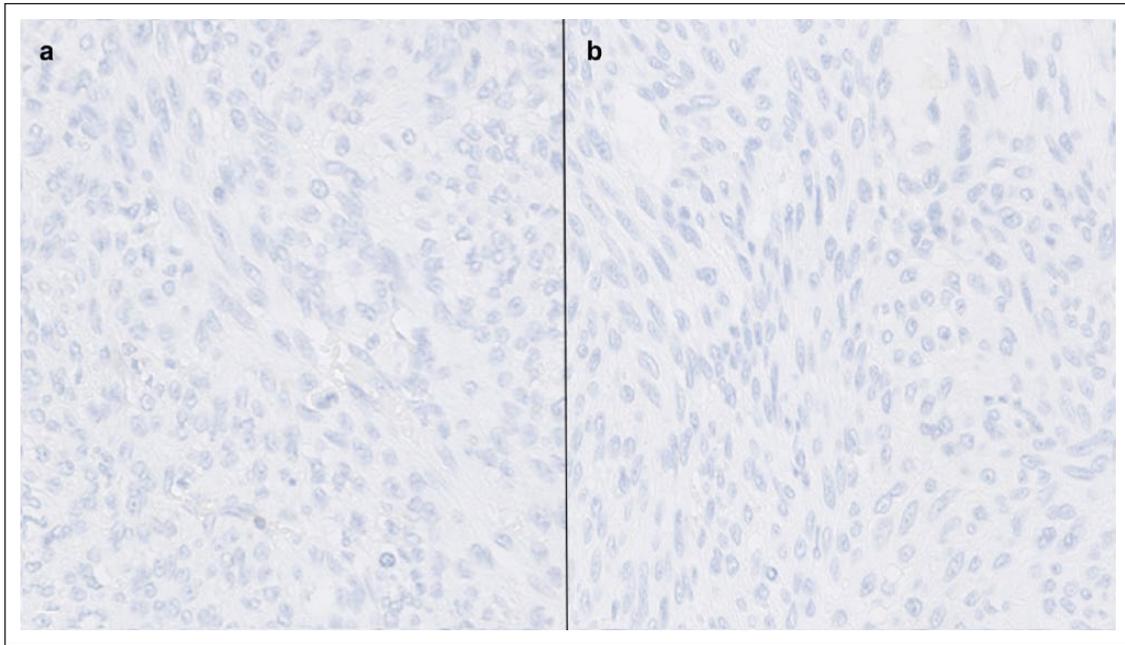
Figure 6 The neoplastic spindle cells showed no labelling with the (a) SD100 marker or the (b) CD117 marker, indicating that the tumour is not likely to be a gastrointestinal stromal tumour (GIST)
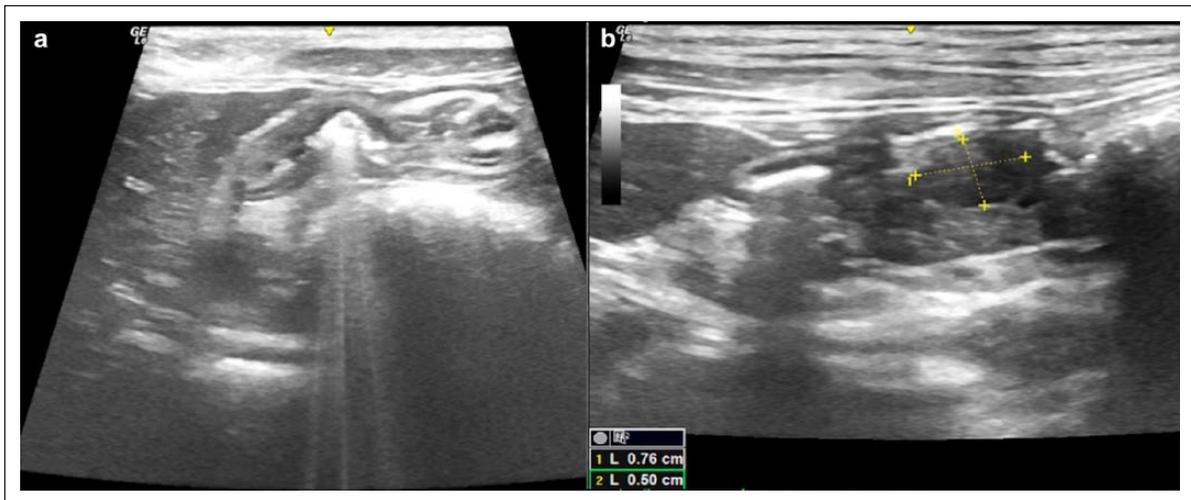

Figure 7 Six month postoperative ultrasound images showing (a) the stomach with normal wall structure and no evidence of mass regrowth, and (b) the pancreatic nodule, which remained unchanged in dimension and appearance between the 3 month and 6 month follow-up scans

change to the stomach at this time, and the rest of the abdominal viscera were unremarkable.

Discussion

Neoplasia of the gastrointestinal tract is uncommon in small animals, representing only 2% of all tumours detected.[1,2] Lymphoma accounts for nearly 30% of all feline neoplasia and is the most common feline gastrointestinal tumour: a 2011 retrospective study reported 47% of all feline intestinal neoplasia as lymphoma.[3] Adenocarcinomas account for the majority of primary feline non-lymphoid gastrointestinal tumours,[4,5] with 22/289 (7.6%) feline intestinal tumours diagnosed as adenocarcinomas in a 1976 study.[6] Feline adenocarcinomas develop 20 times less frequently in the stomach compared with the intestine.[4,7]

Alimentary neoplasia most commonly arises from the small intestine in cats, irrespective of neoplastic aetiology;

conversely, colorectal neoplasia is the most prevalent gastrointestinal neoplasm in dogs. The stomach is the least common gastrointestinal site to be affected in cats: gastric tumours represent only 0.4–0.7% of all feline neoplasias.[1,2,7,8]

Leiomyosarcomas are malignant tumours of smooth muscle. Locally invasive and slow-growing, they are usually slow to metastasise.[2] In dogs, leiomyosarcoma is well recognised as the most commonly seen intestinal sarcoma and the second most common intestinal neoplasm.[9] Leiomyomas and leiomyosarcomas reportedly represent 19% and 8% of gastric neoplasia in dogs, respectively.[7] Gastric leiomyosarcomas are most prevalent in older dogs and most commonly have indistinct margins, infiltrating throughout the gastric wall.[7,9] In canine cases, clinical signs of lethargy, weight loss, anorexia, vomiting and abdominal distension were most commonly seen, with the majority of cases experiencing acute or subacute presentations.[10] Surgical excision is the treatment most commonly utilised for canine gastrointestinal leiomyosarcoma. However, there is significant variation between studies in reported postoperative prognosis, with median survival times ranging from 4 weeks to 7 years. Multiple compounding factors such as euthanasia and metastasis to the liver and distal gastrointestinal tract limit the interpretation of these figures.[9–11]

Intestinal leiomyosarcoma in cats has been much less commonly reported, and usually only as part of a larger, non-specific case series studying feline neoplasia.[3,4,12] In a study that included 1129 feline cases of intestinal neoplasia, only 14 were diagnosed with leiomyosarcoma (1.2%), with equal frequency in the colon and the small intestine.[3] There are reports of feline non-intestinal leiomyosarcomas, such as those involving the urinary bladder,[13] kidney,[14] female reproductive tract[15] and liver.[16] There are no reported cases of feline gastric leiomyosarcoma. Of the reported intestinal leiomyosarcoma cases, no breed disposition was identified, but cats over the age of 8 years were over-represented, consistent with this case. Presenting clinical signs were mostly non-specific, such as lethargy, chronic vomiting, weight loss and inappetance, as seen here; in some cases, an abdominal mass could be palpated on clinical examination.[2,3,17]

Historically, gastrointestinal spindle cell neoplasm was considered to be smooth muscle in origin based on the histopathological appearance of the neoplastic cells. However, the advent of immunohistochemistry and electron microscopy has allowed recognition of GISTs as a distinct subset of gastrointestinal tumours derived from the interstitial cells of Cajal. The expression of the CD117 kit antigen is the hallmark of a GIST on immunohistochemistry.[18–20] Unlike leiomyosarcomas, GISTs are positive for CD117 kit antigen, CD34, the progenitor cell antigen, but negative for the smooth muscle markers desmin and SMA.[21] In this case, a gastric GIST was ruled out as a differential as there was strong immunohistochemical labelling with SMA, but the cells were negative for the CD117 kit marker, confirming the diagnosis of a feline gastric leiomyosarcoma.

The prognosis for feline gastric leiomyosarcoma is not known owing to the absence of previous reports. The case of feline jejunal leiomyosarcoma in the 1981 study by Turk et al[4] stated that there was tumour metastasis, but the metastatic site and post-diagnosis survival time were not reported. The need for radical surgical excision in feline cases is implied by the local recurrence of the tumour in the case described by Barrand and Scudmore[17] following incomplete excision.

Conclusions

This case report describes a cat that presented for investigation of weight loss and nausea. A gastric mass at the level of the pyloric sphincter was detected on abdominal ultrasound. The mass was removed surgically, and histopathology suggested that the mass was a gastric leiomyosarcoma; this was confirmed with immunohistochemistry. The cat responded well postoperatively and achieved full clinical resolution. The postoperative survival time at the point of writing is 10 months, with no evidence of mass recurrence or metastasis at the 6 month postoperative ultrasound scan.

To our knowledge, this is the first report of gastric leiomyosarcoma in a cat. Previous case reports have described intestinal leiomyosarcoma in feline patients but never with gastric involvement. Therefore, gastric leiomyosarcoma should be a differential diagnosis for a gastric mass in feline patients. Based on this case, prognosis can be considered good if surgical resection is complete, but future reports into feline gastric leiomyosarcoma would provide more insight regarding presentation, survival times and prognosis.

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