



Case Report

Synchronous Low-Grade Alimentary Lymphoma and Gastrointestinal Mast Cell Tumor with a Collision Pattern in a Cat

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Simple Summary

Cats occasionally develop more than one intestinal tumor simultaneously; however, these cases are rare and can be challenging to diagnose. This report describes a case of synchronous low-grade alimentary lymphoma and gastrointestinal mast cell tumor in a cat. Histopathologic examination revealed that the two tumors occupied different layers of the intestinal wall, consistent with a collision pattern, with the two neoplastic populations remaining largely separate despite focal contact. Surgical removal of the affected intestinal segment was followed by chlorambucil and prednisolone treatment. No evidence of local recurrence of the gastrointestinal mast cell tumor or clinical or imaging progression of the intestinal lymphoma was detected during the 14-month follow-up period. This case provides additional information on concurrent intestinal tumors in cats and emphasizes the importance of obtaining full-thickness intestinal biopsies when imaging findings are complex or involve multiple intestinal wall layers. Improved recognition of concurrent intestinal tumors may help veterinarians achieve more accurate diagnoses and develop appropriate treatment plans.

Abstract

Synchronous low-grade alimentary lymphoma and gastrointestinal mast cell tumor have recently been described in cats. This report describes synchronous low-grade alimentary lymphoma and gastrointestinal mast cell tumor involving the jejunum in a cat. A 2.3 kg, 15-year-old, spayed female Chinchilla Persian cat presented with vomiting, diarrhea, anorexia, and lethargy. Ultrasonography and computed tomography demonstrated diffuse intestinal wall thickening and a focal jejunal lesion characterized by marked transmural thickening with loss of wall layering. Exploratory laparotomy and full-thickness intestinal biopsies were conducted. Histopathologic and immunohistochemical examination revealed two morphologically distinct neoplastic populations involving different jejunal wall layers. The two populations were anatomically adjacent but remained distinct without convincing intermingling in the examined histologic sections. These findings supported the interpretation of a lesion most consistent with a collision pattern. The affected intestinal segment was surgically resected, and chlorambucil and prednisolone were administered postoperatively. Clinical signs resolved, imaging abnormalities improved, and no evidence of local gastrointestinal mast cell tumor recurrence or progression of low-grade alimentary lymphoma was detected during the 14-month follow-up

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period. This case expands the currently recognized morphologic spectrum of synchronous feline intestinal neoplasia and highlights the importance of comprehensive histopathologic assessment and full-thickness intestinal biopsies for accurate diagnosis.

Keywords: low-grade alimentary lymphoma; gastrointestinal mast cell tumor; collision tumor; synchronous tumors; cat

1. Introduction

Feline alimentary lymphoma (AL) is the most common intestinal neoplasm in cats, accounting for approximately 55% of gastrointestinal (GI) tumors [1]. Among its subtypes, low-grade AL (LGAL) accounts for approximately 50–80% of feline ALs [2,3]. LGAL most commonly affects the small intestine, particularly the jejunum and ileum, and is typically composed of small mature T lymphocytes with an indolent biologic behavior [2–4]. Chlorambucil and glucocorticoids are considered the standard therapeutic approach. Previous studies have reported a median clinical remission of 786 days and a median progression-free survival of 1078 days following this treatment protocol [5,6].

GI mast cell tumor (MCT) is a less common feline intestinal neoplasm, accounting for approximately 4% of GI tumors [1]. Feline GI MCT has historically been associated with a poor prognosis; however, retrospective studies have reported prolonged survival in some cats treated with surgical resection and/or chemotherapy, despite considerable variability in survival times among reported cases [7–9]. Similar to LGAL, GI MCT most frequently occurs in the small intestine [7].

Synchronous tumors are defined as two or more independent neoplasms diagnosed within 6 months, and may occur as distinct lesions or as a single gross lesion composed of histologically different tumors. When different neoplastic populations occur within the same lesion, they may be further classified as collision, combined, colonized, or biphenotypic tumors based on their morphologic relationships [10,11]. According to the classification proposed by Hohenhaus et al., combined tumors are characterized by intermingled neoplastic populations, whereas collision tumors comprise two histologically distinct neoplasms that are juxtaposed without intermingling at their border [10]. Synchronous LGAL and GI MCT have recently been described in cats, with distinct and combined tumors representing the predominant morphologic patterns reported to date [10,12].

However, the morphologic spectrum of synchronous feline intestinal tumors remains incompletely characterized. Most reported cases of synchronous LGAL and GI MCT have included predominantly distinct and combined morphologic patterns; however, other morphologic patterns may also occur. The recognition of these patterns may improve diagnostic interpretation and contribute to a better understanding of the biologic relationships between synchronous neoplasms.

This report describes a case of synchronous LGAL and GI MCT involving the jejunum in a cat. Histopathologic examination revealed predominant mucosal involvement by LGAL and predominant muscularis propria and serosa involvement by the MCT, findings that were considered most consistent with a collision pattern. This case provides an additional morphologic description of synchronous feline intestinal neoplasia and emphasizes the importance of comprehensive imaging assessment, careful histopathologic evaluation, and appropriate tissue sampling for accurate diagnosis.

2. Case Presentation

A 15-year-old, 2.3 kg, spayed female Chinchilla Persian cat presented with a 3-day history of diarrhea, vomiting, lethargy, and anorexia. Physical examination revealed a body condition score of 3/9, a heart rate of 240 beats per min, and a rectal temperature of 39.3 °C. The respiratory rate was within normal limits. Information regarding previous body weight, duration of weight loss, and muscle condition score was unavailable. Although the gastrointestinal signs were acute in onset, the low body condition score may have reflected an underlying chronic disease process preceding the 3-day clinical presentation.

Complete blood count results were within the reference intervals (RIs). Serum biochemistry revealed increased aspartate aminotransferase activity (100.15 U/L; RI: 12–46 U/L), whereas all remaining biochemical variables were within their respective RIs. Feline pancreatic lipase immunoreactivity was 4.4 ng/mL, which was within the equivocal range (3.6–5.3 ng/mL). Feline leukemia virus antigen and feline immunodeficiency virus antibody testing demonstrated negative results. Thoracic radiographs revealed a diffuse bronchial pattern without other clinically significant abnormalities.

An Aplio i800 ultrasound system (Canon Medical Systems, Otawara, Japan) was used for abdominal ultrasonography. The examination revealed decreased GI motility with luminal retention, diffuse intestinal wall thickening, and increased duodenal mucosal echogenicity. A solitary focal mass-like lesion, characterized by segmental loss of wall layering and asymmetric thickening of the jejunal muscularis, was identified within the right caudal abdomen. Enlargement of mesenteric, ileocecolic, and jejunal lymph nodes was observed, whereas the pancreas appeared normal (Figure 1). An Alexion Advance CT scanner (Toshiba Medical Systems, Otawara, Japan) was used for computed tomography (CT). CT confirmed the solitary focal mass-like lesion as asymmetric thickening of the mid-jejunum, with the muscularis propria measuring 6.4 mm in thickness over a 1 cm segment (total wall thickness, 7.8 mm vs. 2.3 mm in the opposite wall). In addition, diffuse thickening of the ascending duodenum and distal ileum was present, and several intestinal segments were mildly dilated. Additional findings were abdominal lymphadenopathy, mild mesenteric fat stranding, and heterogeneous splenic enhancement (Figure 2). Liver and spleen fine-needle aspiration revealed no cytologic evidence of neoplastic infiltration. The 6 cm jejunal segment containing the solitary focal mass-like lesion was surgically resected with approximately 2 cm gross margins on either side of the lesion. No gross intestinal obstruction or intra-abdominal dissemination was identified intraoperatively. A biopsy specimen from the duodenum and an enlarged jejunal lymph node were obtained for histopathologic assessment. The jejunal segment was selected for resection because it represented the most severe focal imaging abnormality, whereas the duodenal biopsy was obtained to evaluate the diffuse intestinal abnormalities. Although diffuse mural thickening of the ileum was also identified on imaging, the ileal changes were considered similar to the diffuse jejunal abnormalities during surgical planning, and an additional ileal biopsy was therefore not performed. Only the enlarged jejunal lymph node was sampled for histopathologic evaluation, and the remaining enlarged abdominal lymph nodes were not assessed histopathologically.

Histopathologic examination of the jejunal segment identified two distinct neoplastic populations involving different intestinal wall layers (Figure 3). One population consisted of a monomorphic infiltrate of small mature lymphocytes expanding the intestinal mucosa, leading to lamina propria expansion and crypt separation, with occasional epitheliotropism. In some areas, the neoplastic lymphocytes extended into the submucosa and serosa. The neoplastic lymphocytes had scant eosinophilic cytoplasm, round to polygonal nuclei with coarsely stippled chromatin, and mild anisocytosis and anisokaryosis. Immunohistochemically, these cells were diffusely positive for CD3 and negative

for PAX5, supporting a diagnosis LGAL. The mitotic count was 0 per 2.37 mm² (equivalent to ten 400× high-power fields). Neoplastic lymphocytes extended to the jejunal surgical margins, consistent with diffuse intestinal involvement rather than incomplete excision of a focal lesion. The second population comprised a densely cellular, unencapsulated infiltrate of round cells predominantly arranged in sheets within the muscularis and serosa. The neoplastic cells had granular eosinophilic cytoplasm, round to polygonal nuclei with coarsely stippled chromatin, and mild anisocytosis and anisokaryosis. Rare eosinophils were present within the lesion. Immunohistochemically, these cells were diffusely positive for KIT and negative for CD3 and PAX5, supporting a diagnosis of GI MCT diagnosis. The mitotic count was 0 per 2.37 mm² (equivalent to ten 400× high-power fields). No vascular invasion was observed. Neoplastic mast cells did not extend to the surgical margins, although the lesion closely approached the serosal surface.

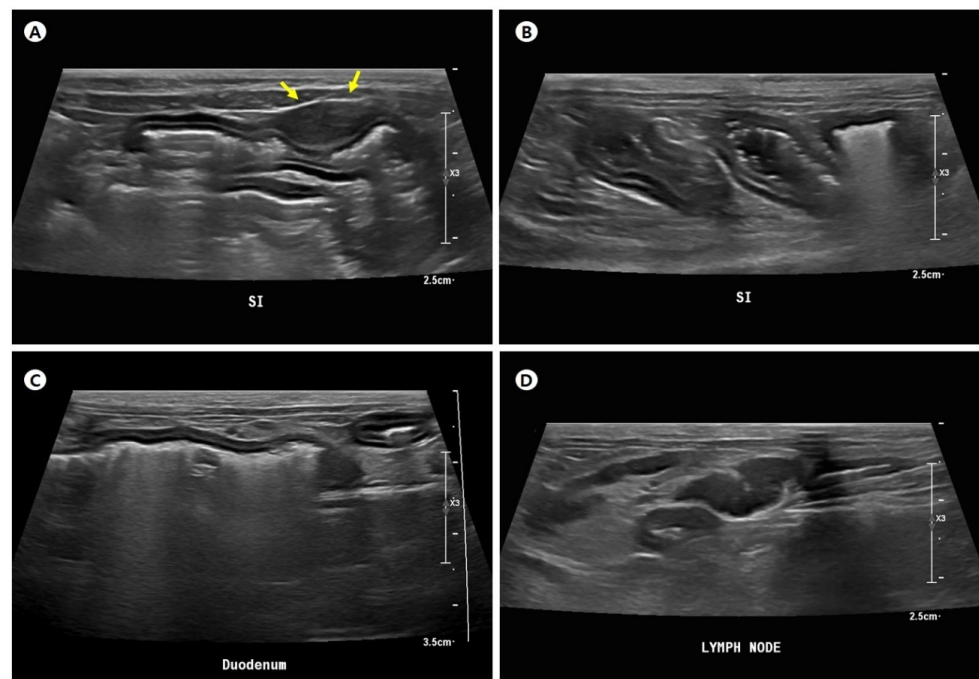


Figure 1. Asymmetric focal thickening of the jejunal muscularis with segmental loss of wall layering (arrows). Diffuse muscular thickening is present proximal and distal to the lesion (A). The jejunum shows generalized muscular thickening with increased echogenicity and luminal fluid retention due to decreased motility (B). The duodenum demonstrates diffuse mucosal hyperechogenicity with reduced motility and marked luminal gas accumulation (C). The jejunal lymph node is mildly enlarged and elongated (D).

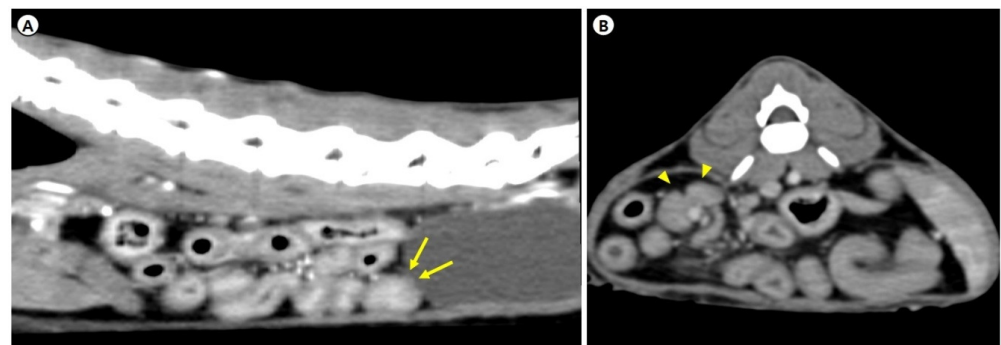


Figure 2. Post-contrast CT images. The only focal mass-like lesion was characterized by of asymmetric thickening of the jejunal wall in the right caudal abdomen (arrows). The affected muscularis propria in the mid-jejunum measured approximately 1 cm in length and measured 6.4 mm in

thickness ((A), sagittal image). Mildly to moderately enlarged jejunal lymph nodes measured 17.4×7.9 mm and 20.1×6.4 mm ((B), transverse image; arrowheads).

Histopathologic examination of the jejunal lymph node revealed reactive lymphoid hyperplasia without evidence of neoplastic infiltration. The two neoplastic populations came into focal contact within the jejunal lesion. The evaluation of the examined histologic sections revealed that the lymphoid and mast cell populations remained morphologically distinct without convincing intermingling. Complete serial sectioning of the lesion was not performed; thus, the lesion findings were considered most consistent with synchronous LGAL and GI MCT with a collision pattern.

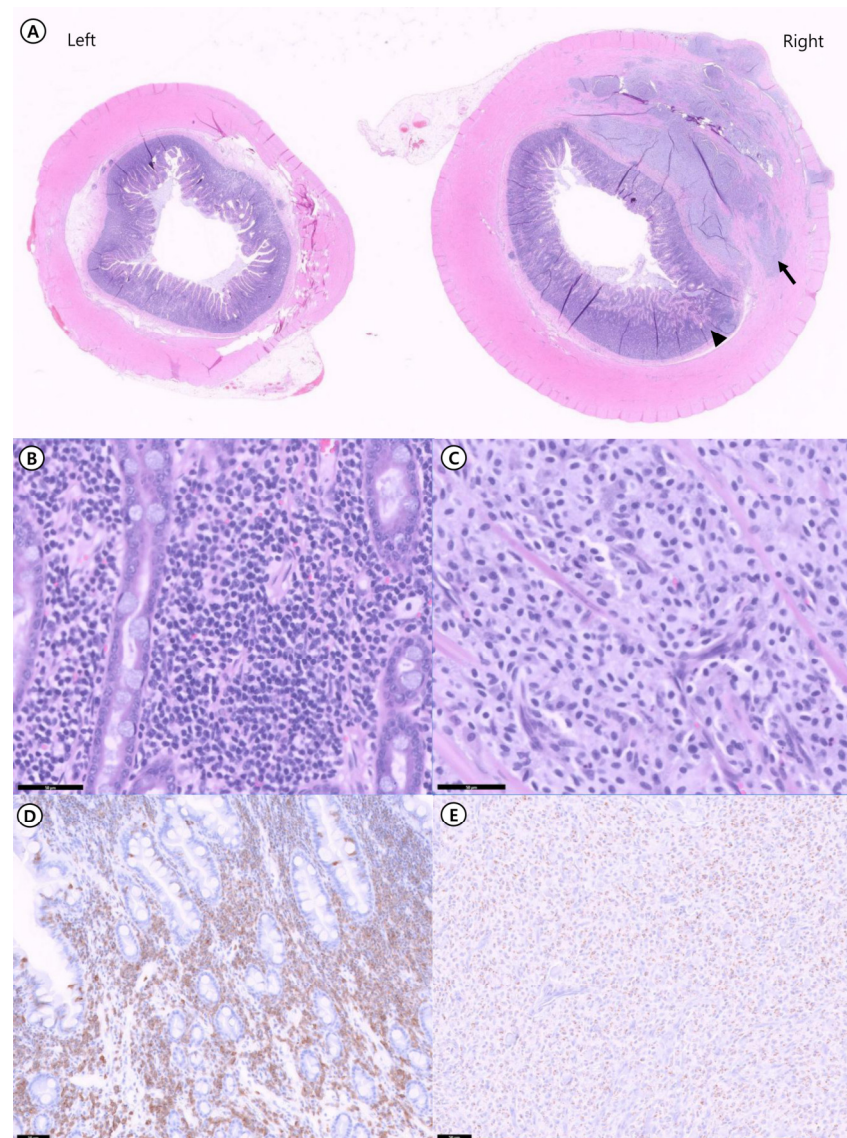


Figure 3. Histopathologic and immunohistochemical findings of the jejunal lesion. Low-power examination of two cross-sections of the resected jejunum revealed asymmetric mural expansion involving one portion of the intestinal wall in the right section, whereas the left section was comparatively unaffected (A). In panel (A), the arrowhead indicates the mucosal infiltrate of neoplastic lymphocytes, whereas the arrow denotes the mast cell tumor centered in the muscularis propria and serosa. Histopathologic examination revealed lamina propria expansion and intestinal crypt separation by a monomorphic population of small lymphocytes within the jejunal mucosa, supporting a diagnosis of LGAL (B). Conversely, neoplastic mast cells infiltrated the muscularis propria and serosa, with occasional eosinophils (C). Immunohistochemistry confirmed diffuse CD3

immunoreactivity of the mucosal lymphoid population consistent with LGAL (D), whereas the neoplastic mast cell population infiltrating the muscularis propria and serosa demonstrated positive KIT immunoreactivity (E). The distinct histologic and immunophenotypic features of these two neoplastic populations supported the diagnosis of synchronous LGAL and GI MCT. Scale bar = 2 mm (A); 50 μ m (B–E).

Chlorambucil (20 mg/m² [approximately 3.5 mg/cat] orally [PO] every 2 weeks; Leukeran®, GlaxoSmithKline, Brentford, UK) and prednisolone (2 mg/kg PO once daily, tapered by 25% every 2 weeks; Solondo®, Yuhan Corp., Seoul, Korea) were administered postoperatively. Supportive medications included metronidazole (10 mg/kg PO twice daily [BID]; Hurasinil®, HK inno.N Corp., Seoul, Korea) for suspected intestinal dysbiosis, administered for 2 weeks, in addition to omeprazole (1 mg/kg PO BID, Omed®, SK Chemicals Co., Ltd., Seongnam, Korea) for gastroprotection; silymarin (10 mg/kg PO BID, ELT Science Co., Ltd., Daejeon, Korea) for hepatoprotection; and mosapride (1 mg/kg PO BID, GasMotin®, Daewoong Pharmaceutical Co., Ltd., Seoul, Korea) for GI motility promotion, each administered for 4 weeks. Clinical signs resolved within 2 weeks after treatment initiation, and appetite and activity normalized. No chemotherapy-related adverse events were observed during serial complete blood count and serum biochemistry monitoring was performed every 2–4 weeks. Four weeks after surgery, ultrasonography demonstrated decreased jejunal wall thickness, improved intestinal echogenicity, and reduced lymphadenopathy. The cat had gained weight from 2.3 kg to 2.6 kg, and the body condition score had improved from 3/9 to 4/9, 14 weeks postoperatively. The cat remained clinically stable, with sustained improvement of the imaging abnormalities. Prednisolone was gradually tapered and discontinued 4 months after treatment initiation. At the time of manuscript submission, 14 months after surgery and chemotherapy initiation, chlorambucil administration was ongoing at 20 mg/m² PO every 2 weeks. Follow-up physical examination, complete blood count and serum biochemistry revealed no clinically significant abnormalities. Ultrasonography showed persistent diffuse muscular thickening without recurrence of the focal mass-like jejunal lesion. No evidence of local GI MCT recurrence or clinical or imaging progression of LGAL was detected.

3. Discussion

Synchronous LGAL and GI MCT have recently appeared as a distinct form of feline intestinal neoplasia. Hohenhaus et al. proposed a standardized classification system for synchronous feline GI tumors and demonstrated that concurrent LGAL and GI MCT may occur within the same intestinal lesion [10]. They reported that six cats had distinct tumors, six had combined tumors, and three demonstrated both distinct and combined patterns. The present case also involved these two neoplasms; however, its morphologic architecture substantially differed from the patterns most commonly reported.

Histopathologic examination demonstrated that the two neoplastic populations occupied largely distinct compartments of the intestinal wall. LGAL predominantly involved the mucosa and lamina propria, whereas the MCT infiltrated the muscularis propria and serosa. The lesions were anatomically adjacent and came into focal contact; however, no definitive evidence of intermingled growth was identified. Based on available histopathologic findings and the currently accepted classification system, this lesion was considered most consistent with synchronous LGAL and GI MCT with a collision pattern rather than a combined pattern [10,11]. Collision tumors are generally considered as independent neoplastic processes that separately originate and subsequently encounter one another, whereas combined tumors demonstrate intimate admixture of distinct neoplastic populations within a shared lesion [11,13]. Reports of synchronous LGAL and

GI MCT with a collision pattern remain limited in the veterinary literature. This case adds to the limited literature describing synchronous LGAL and GI MCT with a collision pattern in cats.

The distinction between collision and combined tumors is based on a morphologic classification. Combined tumors refer to the coexistence of different neoplastic populations within a common tumor microenvironment, whereas collision tumors represent independent neoplastic events that anatomically converge during disease progression [10,11]. Complete serial sectioning of the entire lesion was not performed; thus, microscopic intermingling between the two populations cannot be completely excluded. Therefore, the present lesion was considered most consistent with a collision pattern according to the available histopathologic findings. Future studies incorporating extensive serial sectioning and molecular characterization are warranted to clarify the association between these morphologic patterns.

The pathogenesis of synchronous LGAL and GI MCT remains unclear. A previous retrospective study identified a concurrent LGAL in 4 of 14 cats with intestinal MCT [12]. However, this observation was derived from a selected retrospective study population and should not be interpreted as an estimate of disease prevalence in the general feline population. Additional studies are warranted to better define the frequency and clinical significance of synchronous intestinal neoplasia in cats.

Potential biologic interactions between mast cells and neoplastic T lymphocytes have been proposed in other species and tumor types [14–16]. However, direct evidence supporting these mechanisms in feline synchronous LGAL and GI MCT remains currently unavailable. Therefore, any biologic relationship between these two neoplasms remains speculative, and further studies are warranted to clarify the molecular and immunologic mechanisms underlying synchronous tumor development.

Moreover, the present case highlights the diagnostic importance of obtaining full-thickness intestinal biopsies. In this case, LGAL predominantly involved the mucosa, whereas the MCT component was primarily confined to the muscularis propria and serosa. Had only endoscopic mucosal biopsies been obtained, the MCT component may have remained undetected and the synchronous nature of the disease overlooked. Consistent with previous reports describing the limitations of endoscopic biopsy for diagnosing feline AL [17], the present case indicates that concurrent lesions involving deeper intestinal layers may be missed. The 2023 American College of Veterinary Internal Medicine consensus statement recommends that the choice of biopsy technique should be individualized based on the clinical presentation, imaging findings, and procedural risks [18]. Therefore, full-thickness biopsies may provide additional diagnostic information when focal transmural lesions, loss of wall layering, or discordant imaging findings are present. Although PARR was not performed to confirm T-cell clonality, the diagnosis of LGAL was supported by the characteristic histopathologic features and CD3 immunoreactivity. Nevertheless, the lack of clonality testing represents a limitation of the present case.

Treatment decisions were based on the available literature for LGAL and GI MCT. Chlorambucil combined with prednisolone remains the most extensively applied treatment protocol for feline LGAL and is associated with favorable response rates and prolonged remission durations [2–6]. Similarly, chlorambucil has been administered in cats with GI MCT after surgical excision [9]. In the present case, surgical resection of the focal jejunal lesion followed by chlorambucil and prednisolone administration led to resolution of GI signs within 2 weeks and progressive improvement of imaging abnormalities without detectable adverse effects. However, complete surgical excision and postoperative chlorambucil treatment were performed concurrently; thus, the specific contribution of chlorambucil to the control of the GI MCT cannot be identified from this single case.

Further, the favorable outcome should not be interpreted as evidence of chlorambucil efficacy against both neoplasms.

The prognostic significance of synchronous LGAL and GI MCT remains unclear because of the limited number of reported cases. In human oncology, the biologic behavior of the more aggressive neoplasm present within the tumor combination frequently influenced the prognosis in patients with synchronous tumors [13,19,20]. Previous studies have indicated that the prognosis of cats with synchronous LGAL and GI MCT may be comparable to that of cats with either neoplasm alone. However, these findings should be interpreted with caution because of the small sample size, wide survival variability, and lack of matched controls [10]. In the present case, GI MCT demonstrated a mitotic count of 0 per 2.37 mm², no vascular invasion, and complete surgical excision, whereas the LGAL responded favorably to chemotherapy. At the time of manuscript submission, the patient remained alive without clinical or imaging evidence of local GI MCT recurrence or LGAL progression 14 months after surgery and initiation of chemotherapy. Additional long-term follow-up and further studies are warranted; however, the favorable clinical course observed in the present case adds to the limited clinical experience with synchronous LGAL and GI MCT.

In conclusion, this case provides an additional morphologic description of synchronous feline LGAL and GI MCT by documenting the lesion most consistent with a collision pattern. The present case emphasizes the value of comprehensive imaging assessment, careful histopathologic examination, and appropriate biopsy selection for the diagnosis of synchronous intestinal neoplasia. These findings add to the limited literature describing synchronous LGAL and GI MCT with a collision pattern in cats.

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Informed Consent Statement: Written informed consent was obtained from the owner of the animal for publication of this case report.

Data Availability Statement: The de-identified imaging data, histopathologic findings, treatment protocols, and follow-up data supporting the conclusions of this article are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

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