Case Report

Left lateral liver lobe torsion in a Siamese cat

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Abstract

A 6-year-old neutered male Siamese cat was presented with an acute onset of vomiting, anorexia and lethargy lasting for four days. An abdominal mass was palpated on physical examination. The cat showed severe anemia, elevated liver enzymes and hypoalbuminemia. Abdominal ultrasonography revealed a suspected hepatic mass without blood flow within the affected region. Computed tomography was performed to better visualize the abdominal cavity and blood flow. Prompt diagnosis of torsion of the left lateral liver lobe was made and immediate surgery for liver lobectomy was performed. Histopathological examination revealed no evidence of neoplasia. The cat remained clinically normal during the follow-up period for six months after the operation.

Keywords: acute, cat, computed tomography, liver lobe torsion, ultrasonography

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Introduction

Liver lobe torsion (LLT) is a rare disease often reported in dogs but rarely in cats (Haider *et al*., 2015; Nazarali *et al*., 2014; Swann and Brown, 2001). Although LLT has been reported commonly in middle to old aged large-breed dogs without gender predisposition, it has also been reported in puppies (von Pfeil *et al*., 2006; Schwartz *et al*., 2006). Its clinical signs may be acute or chronic, including abdominal pain, anorexia, fever, vomiting, lethargy and collapse (Schwartz *et al*., 2006; Swann and Brown, 2001). Pathophysiology of the LLT remains unclear. It may be idiopathic or associated with other conditions such as a congenital absence of ligamentous structures, neoplasia and bacterial peritonitis (McConkey *et al*., 1997; Swann and Brown, 2001). In a previous study, the left lateral lobe (11 of 23 cases) was the most affected, followed by the caudate lobe (5 of 23 cases) and the right lateral lobe (4 of 23 cases) (Swann and Brown, 2001). Diagnosis of LLT is generally made based on clinical signs, laboratory examination, abdominal radiography and abdominal ultrasonography. Doppler assessment is especially useful for identifying the blood flow within the liver lobe (Bhandal *et al*., 2008; Sonnenfield *et al*., 2001). Computed tomography (CT) and magnetic resonance imaging (MRI) can also be used in the diagnosis of LLT (Koumanidou *et al*., 1998). Rapid surgical treatment is recommended to avoid further hepatic necrosis, abscess and infection (Downs *et al*., 1998; McConkey *et al*., 1997). If histopathological examination does not reveal any underlying neoplasia, the prognosis for the patient with LLT who undergoes early liver lobectomy is generally good (Schwartz *et al*., 2006; Swann and Brown, 2001). The present case describes torsion of the left lateral liver lobe in a cat with an unknown cause for the disease.

Case description

A 6-year-old neutered male Siamese cat weighing 8.8 kg was referred to the Veterinary Teaching Hospital for further evaluation after an acute onset of vomiting, anorexia and lethargy. Prior to referral, the patient had been listless and vomiting for four days. Upon presentation, the patient was depressed with an increased respiratory effort. A large mass was palpated in the cranial abdomen. Its heart rate and systolic blood pressure were 184 beats/min and 110 mmHg, respectively. Its rectal temperature was 39.1℃. The patient showed abdominal pain, a pale mucous membrane and 7% dehydration. Complete blood count (CBC) showed leukocytosis, thrombocytopenia and anemia. Biochemical profile showed hypoalbuminemia and increased alanine aminotransferase and aspartate aminotransferase levels. Prolonged activated partial thromboplastin time was confirmed by a coagulation panel (Table 1). Its serum electrolyte was within the reference range. Survey abdominal radiographs revealed a large mass (16 x 10 cm) causing cranial displacement of the gastric axis and caudal displacement of the right kidney and small intestine. Abdominal serosal detail was decreased due to ascites (Fig. 1A). Abdominal ultrasound showed a hypoechoic and cavitated mass in the left lateral liver lobe adjacent to the other normal lobes. The affected lobe was swollen without blood flow within it (Fig. 1B). Moderate free fluid was observed in the abdominal cavity and abdominocentesis was performed. The abdominal effusion was classified as an exudate. Neoplastic cells and infectious agents were not identified. CT was performed the following day. The patient was pre-medicated with butorphanol (0.2 mg/kg IV; Butophan Inj, Myungmoon Pharm, Korea). Anesthesia was induced with propofol (5 mg/kg IV; Provive 1% Inj, Myungmoon Pharm, Korea) and maintained by isoflurane (Forane sol, JW Pharm, Korea). Pre-contrast CT revealed an enlarged and deviating left lateral liver lobe with a well-defined irregular surface margin (Fig. 2A). In post-contrast CT images, enhanced normal contrast was observed in the right medial, right lateral and quadrate lobe. However, no change was identified in the left lateral liver lobe (Fig. 2B, C). A tentative diagnosis of LLT was made followed by an exploratory laparotomy. A standard ventral midline approach from the xiphoid process to the pubis was made and a hemorrhagic peritoneal effusion was removed. The left lateral liver lobe was twisted approximately 360° clockwise around its vascular pedicle (Fig. 3A). Although the left medial lobe was not twisted, it was presumed to have infarction as both lobes were dark red in color with edema. Thus, both lobes were resected using a large-sized metal ligation clip system (Horizon™ Clip, Weck®, USA). Two clips were placed around the twisted vascular pedicle and complete lobectomy was performed (Fig. 3B). No other abnormalities except the LLT were identified. After flushing with warm sterile saline, a closed suction drain (Barovac, Sewoon Medical, Korea) was put in place. The abdominal cavity was closed in a routine manner. The drainage was removed on the 6th day after the operation. When the cat became clinically normal, it was discharged from the hospital at one week after the operation. Follow-up was performed at two weeks after the operation. This revealed loss of the clinical signs of vomiting, anorexia and lethargy. Radiographs showed normal abdominal serosal detail. The right kidney and small intestines were in place. Its CBC and serum chemistry had returned to normal except for low PCV and serum albumin level. As the patient showed loss of clinical signs and good appetite, no additional treatment was performed. Histopathological examination of the resected liver lobe revealed a centrally cavitated coagulative necrosis. The affected lobe contained hemorrhage, fibrin and necrotic debris. Small portions of peripheral hepatic lobules were seen as atrophic. No evidence of neoplastic disease was identified. During the last follow-up of the patient that was done by the local hospital at six months after the operation, the cat was still normal.

Table 1 Pre-and post-operative results of complete blood count, serum biochemistry, and coagulation profiles.

Measurement	Pre-Op	Post-Op	Reference interval
Complete blood count			
White blood cell count (10^3 cells/μL)	22.45	5.86	2.87-17.02
Packed cell volume (%)	14.1	28.3	30.3-52.3
Hemoglobin (g/dl)	4.4	9.0	9.8-16.2
Platelet (10^3 cells/μL)	77	282	151-600
Serum biochemistry			
Total protein (g/dl)	4.7	6.3	5.4-7.8
Albumin (g/dl)	1.4	1.9	2.1-3.3
Alanine aminotransferase (U/L)	1632	50	20-107
Aspartate aminotransferase (U/L)	782	31	6-44
Total bilirubin (mg/dl)	0.7	0.0	0.1-0.5
Coagulation panel			
Activated partial thromboplastin time (sec)	182.5	141.8	86-137

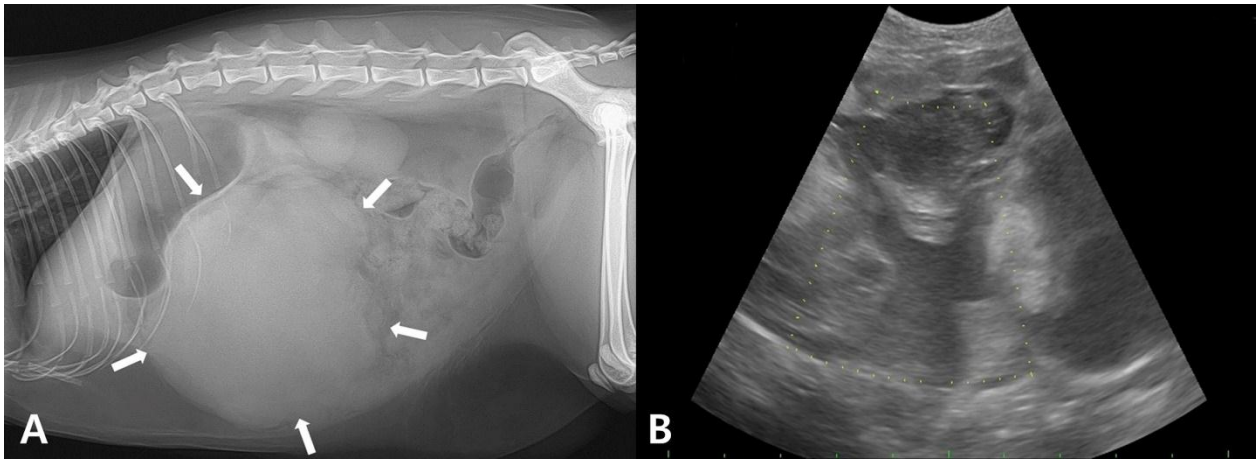

Figure 1 Plain lateral radiograph showing an abdominal mass (arrows) and cranial displacement of the gastric axis (A) and ultrasound image of the left liver lobe. A mixed echogenicity mass without blood flow was seen (B).

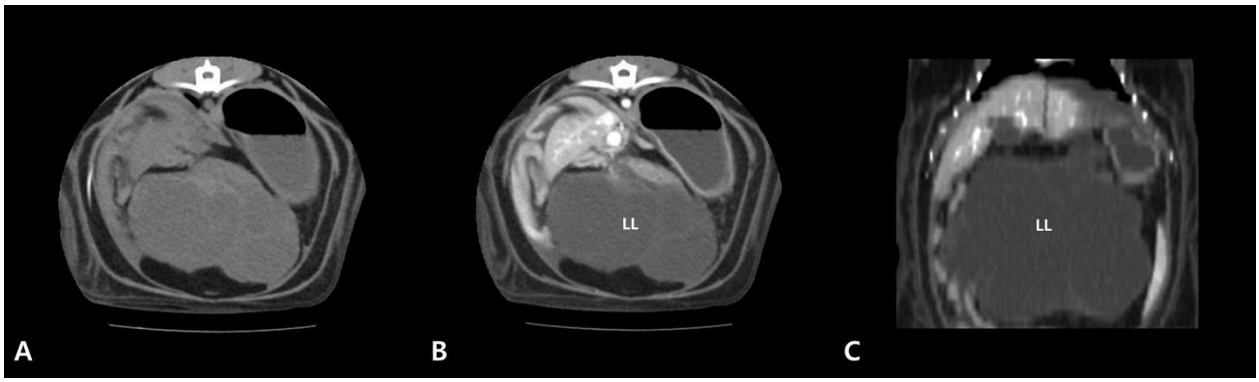

Figure 2 Pre- (A) and post-contrast (B, C) CT images of the abdomen showing an enlargement of the left lateral liver lobe (LL) without any contrast enhancement.

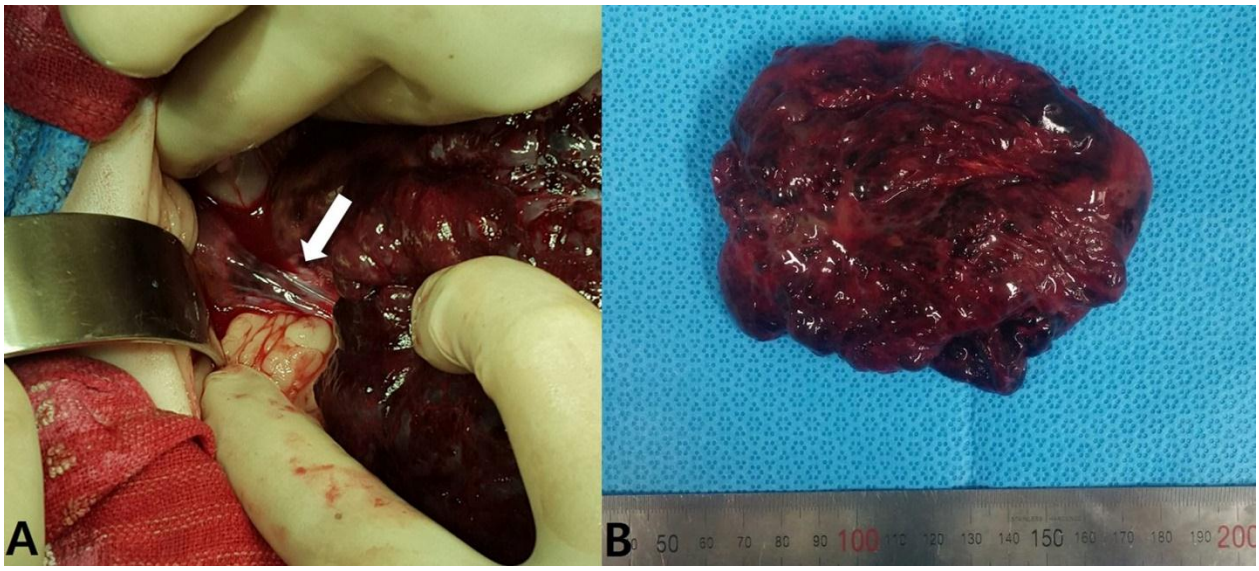

Figure 3 Intraoperative view of the left lateral liver lobe twisted approximately 360° (A) and the resected liver lobe with an irregular margin (B).

Discussion

LLT is a rare condition in cats. It has been reported in only five cases to date. They ranged from 5 to 15 years, consisting of three males (two British shorthair cats and one domestic shorthair cat) and two females (two domestic shorthair cats) (Haider *et al*., 2015; Knight and McClaran, 2020; Nazarali *et al*., 2014; Swann and Brown, 2001; Tsioli *et al*., 2020). Four of these five cats had acute clinical signs of anorexia, lethargy and/or vomiting. One cat had shown chronic clinical signs of vomiting for three months (Nazarali *et al*., 2014). As in most previous studies, the cat in the present study had had acute clinical signs for four days. The predisposition that caused torsion of the hepatic lobe was unclear. A total of four cats including the cat in the present study showed no underlying cause related to the LLT (Schwartz *et al*., 2006). In the other two cats in the previous studies, secondary LLT after a car accident and tumor related LLT were suspected (Swann and Brown, 2001; Tsioli *et al*., 2020). Euthanasia was performed in the cat with suspected tumor related LLT. Post-mortem examination revealed hepatocellular carcinoma and torsion of the right medial liver lobe (Swann and Brown, 2001). Although any hepatic lobe can undergo torsion, the left lateral lobe was the most affected (Swann and Brown, 2001). Based on previous literature and the present study, the left lateral liver lobe was affected in three cats (Haider *et al*., 2015; Nazarali *et al*., 2014). Torsions of the right medial liver lobe and caudate lobe were identified in two cats and one cat, respectively (Knight and McClaran, 2020; Swann and Brown, 2001; Tsioli *et al*., 2020). Four of the five cats were tentatively diagnosed with LLT by ultrasonography and the disease was confirmed through exploratory laparotomy and histopathological examination. Cytological evaluation was performed in one cat. However, it did not discriminate the LLT from neoplasia due to the lack of cellularity (Knight and McClaran, 2020). Differential diagnosis is needed to rule out other liver diseases such as hematoma, granuloma, abscess and neoplasia (Sonnenfield *et al*., 2001). Although evaluating blood flow within the affected liver lobe using Doppler assessment is useful, it has limited specificity to diagnose LLT (Tsioli *et al*., 2020). Thus, advance imaging methods such as CT and MRI are often recommended (Koumanidou *et al*., 1998; Massari *et al*., 2012). In the present study, the cat underwent Doppler assessment. Decreased blood flow within the affected liver lobe was observed, similar to previous reports (Knight and McClaran, 2020; Tsioli *et al*., 2020). Further evaluation using CT was performed to obtain better visualization, evidence of inflammation and overall blood supply. Unlike other liver lobes that showed normal contrast enhancement, contrast enhancement was not identified in the affected left lateral liver lobe. Based on these results, the cat underwent surgery with the highest probability of LLT. Although LLT cannot be diagnosed with CT alone, the specificity of diagnosis increases in conjunction with ultrasonography (Khan *et al*., 2016; Koumanidou *et al*., 1998). Emergency exploratory laparotomy for liver lobectomy is recommended for patients with suspected LLT to reduce the risk of bacterial peritonitis, hemorrhage and disseminated intravascular coagulation (McConkey *et al*., 1997; von Pfeil *et al*., 2006; Swann and Brown, 2001). The cat in the present study underwent surgery at five days after the onset of clinical signs. Fortunately, no sign of infection or neoplasia was confirmed during the operation. Immediate stabilization followed by liver lobectomy can provide an excellent prognosis (von Pfeil *et al*., 2006). In previous reports and the present study of LLT in cats, four of the five cats showed acute clinical signs followed by emergency surgery. Although one cat had chronic clinical signs of vomiting for three months, postoperative prognosis was good for all five cats (Haider *et al*., 2015; Knight and McClaran, 2020; Nazarali *et al*., 2014; Tsioli *et al*., 2020). As in the other literature, the prognosis of LLT with early diagnosis and surgical intervention was good. Thus, ultrasonography combined with CT can be used for prompt diagnosis of LLT.

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