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Diagnosis and Treatment of Constipation and Bladder Contusion Hematuria Due to Trauma in a Cat

(DIAGNOSIS DAN PENGOBATAN KONSTIPASI DAN MEMAR HEMATURIA PADA VESICA URINARIA AKIBAT TRAUMA PADA KUCING)

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ABSTRACT

A two-year-old, spayed female, calico, domestic shorthair cat (*Felis catus*) was admitted to IPB University Veterinary Teaching Hospital with a history of hematuria, constipation, and inappetence after being hit by a car. Clinical examination showed pyrexia and the presence of pain when the patient was palpated in the abdomen. Laboratory results showed leukocytosis, lymphocytosis, increased glutamic-oxaloacetic transaminase, increased blood urea nitrogen, proteinuria, over-creatinine, as well as blood and struvite in the urine. The radiographic analysis reported abnormalities in *os vertebrae lumbalis I* and radiolucent of the colon and rectum. Sonographic findings were cholecystitis, cholelithiasis, nephritis, enteritis, and cystitis. The treatments given were intravenous infusion with normal saline, a single Melovem® injection 0.35 cc, Dulcolax® one 5 mg tablet SID for two days, Samylin® Medium Breed ½ tablet once a day, Cystaid Plus® for cats SID one tab, phytomenadione injection 3 mg/kg SID for two days, Claneksi® syrups 20 mg/kg of body weight per oral BID for five days, Renate® SID per oral for eight days. On the second day of hospitalization, the patient had not pooped, so intra-rectal flushing with physiologic saline was performed, and the patient pooed with normal consistency each day after the enema procedure. Hematuria was observed during the first two days of hospitalization, while no hematuria was observed on the third day. The patient recovered after three days of hospitalization with no hematuria or other abnormal clinical signs or complications. The veterinarian discharged the patient with home treatment with the remaining oral medications.

Keywords: cholelithiasis, constipation, cystitis, hematuria

ABSTRAK

Seekor kucing domestik (*Felis catus*) betina berumur dua tahun yang sudah disteril, dibawa ke Rumah Sakit Hewan Pendidikan IPB University dengan riwayat hematuria, konstipasi, dan kurang nafsu makan setelah ditabrak mobil. Pemeriksaan klinis menunjukkan demam dan adanya nyeri pada saat pasien dipalpasi pada bagian perut. Hasil laboratorium menunjukkan leukositosis, limfositosis, peningkatan *serum glutamic-oxaloacetic transaminase*, peningkatan nitrogen urea darah, proteinuria, kreatinin berlebih, serta ditemukan darah dan *struvite* dalam urin. Hasil roentgen menunjukkan kelainan pada *os vertebra lumbalis I* dan radiolusen kolon dan rektum. Temuan ultrasonografi yakni kolesistitis, kolelitiasis, nefritis, enteritis, dan sistitis. Pengobatan yang diberikan yakni infus intravena dengan *normal saline*, suntikan Melovem® tunggal 0,35 cc, Dulcolax® satu

tablet 5 mg SID selama dua hari, Samylin® Medium Breed SID ½ tablet, Cystaid Plus® untuk kucing SID satu tab, *phytomenadione* suntik 3 mg/kg SID selama dua hari, Claneksi® sirup 20 mg/kg bobot badan per oral setelah makan BID selama lima hari, Renate® SID per oral setelah makan selama delapan hari. Pada hari kedua rawat inap, pasien belum defekasi, sehingga dilakukan pembilasan intra-rektal dengan larutan NaCl fisiologis, dan pasien mengalami defekasi dengan konsistensi normal setiap hari setelah prosedur enema. Hematuria diamati selama dua hari pertama rawat inap, sedangkan tidak ada hematuria yang diamati pada hari ketiga. Pasien pulih setelah tiga hari dirawat di rumah sakit tanpa hematuria atau tanda-tanda klinis abnormal atau komplikasi lainnya. Dokter hewan memulangkan pasien dengan perawatan di rumah dengan sisa obat oral.

Kata-kata kunci: kolelitiasis, sistitis, hematuria, konstipasi

INTRODUCTION

Multi-trauma in cats has been reported before to cause problems in several organ systems, such as respiratory, neural, cardiovascular, gastrointestinal, genitourinary, and musculoskeletal systems. However, there is a lack of reports about the global prevalence of multi-trauma in the cat species. Cats with a multi-trauma history should be evaluated for life-threatening emergency conditions (Adamantos and Corr, 2007). Because cats have a smaller blood capacity than dogs, calculating shock dosages in emergencies is critical to preventing fluid overload. After trauma, careful monitoring of urine production and adequate urination is required to ensure early detection of urinary tract disruption (Bray, 2015).

Constipation in cats is a temporary loss of significant bowel function brought on by various issues, with no preference for age, sex, or breed. Constipation can cause irregular fecal contents, such as small, spherical, or ribbon-like feces, difficulty defecating, atypical defecation, abdominal swelling, tenesmus, and infrequent defecation (Thanaboonnipat *et al.*, 2021). Constipation can occur due to several reasons, such as refusal to defecate due to inability to posture to defecate, orthopedic problems, or neurologic problems (Thompson, 2014). Constipation can be a fatal illness in cats if its eventual progression to obstipation and megacolon may, in a miserable number of cases, culminate in euthanasia. So, it is essential for early detection and first aid in case of accidents, both from anamnesis considerations and from the results of physical and supporting examination to determine the decision on successful treatment.

Feline urinary syndrome (FUS) frequently affects cats' urinary bladders and/or urethras. Clinical signs of cats contracting feline urinary syndrome include hematuria, dysuria, pollakiuria, periuria, and stranguria. Hematuria is a common symptom for pet owners to visit veterinarians immediately. Veterinarians must consider cat patients' urinary bladder or other urinary organs and other aspects of the patient's health, including environmental factors (Buffington *et al.*, 2014). Hematuria due to blunt trauma in cats is rarely reported in journal articles (Thompson, 2014). Blunt trauma can cause bloody cystitis and/or urinary bladder contusion hematuria bladder, and bloody cystitis can also result in feline lower urinary tract disease. Diagnostic tests for feline urinary syndrome include anamnesis, physical examination, urinalysis, quantitative urine culture (cfu/mL) and antimicrobial susceptibility testing, imaging (some combination of radiography, contrast urography, ultrasonography, and/or uro-endoscopy), and biopsy. A correct diagnosis is required to manage feline urinary syndrome in cats efficiently. Even though there are no unique clinical signs in feline urinary syndrome, the history of the disease, the timing of the illness, urine culture, and urinary tract imaging results are all helpful in making a diagnosis (Buffington *et al.*, 2014).

Several elements, including trauma, metabolic problems, anatomical anomalies, neoplasia, bacterial urinary tract infections, and iatrogenic causes, are implicated in the etiology (Ergin *et al.*, 2018). In addition, bladder contusion is an intramural hematoma commonly seen but not classified as a rupture because of incomplete bladder mucosa damage. This study first reported a case of constipation and bladder contusion in a cat after being hit by a car. The results of urinalysis, hematology, blood chemistry, radiography, and sonography were also reported.

CASE HISTORY

Anamnesis

The owner reported a known traumatic event on the cat patient due to a hit-by-car. The owner brought the patient to a veterinary clinic the day after the accident. The owner reported that the

veterinarian at that clinic gave anti-inflammatory drugs, and the patient was not hospitalized. After returning home from the other veterinary clinic, the owner observed the event of hematuria and no poop for two days. On the third day after the accident, the owner reported hematuria, anorexia, and lethargy, so the owner brought the patient to the Veterinary Teaching Hospital (VTH) of IPB University for further examination.

Physical Examination

On physical examination, the cat showed abdominal cramping and pain when palpated in the vertebral lumbal and abdominal region. According to physical examination using the feline grimace scale (FGS), the patient's FGS was 5 (pain ≥ 4). The body weight was 3.54 kg, while the body's temperature was slightly fever of 39.5 °C. The respiratory rate was 36 x/minute, while the heart rate was 156 x/minute. on the first day and the second day of hospitalization (Figure 1).

Laboratory Results

The result of the hematology examination showed that the patient was in a state of leukocytosis (22.1 x 10^3/µL) and lymphocytosis (11.2 x 10^3/µL). A borderline decrease in mean corpuscular hemoglobin concentration (MCHC) (31.7 %) was observed. The other values in hematology were within the normal range. The percentage of lymphocytes was the highest (50.7%) or lymphocytosis, with other white blood cell percentages within the normal range (Table 1). Blood chemistry analysis showed increased serum glutamic pyruvic transaminase/alanine aminotransferase (SGPT/ALT), borderline increase of blood urea nitrogen (BUN), and borderline decrease in creatinine. However, the other results were within the normal values (Table 2).

Figure 1. The patient had bloody urine (hematuria) during the first day of hospitalization.

The result of urinalysis was shown in Table 3. The urinalysis showed that the urine's color was red, which was abnormal. The normal color of cat urine was pale yellow to dark yellow. Watery urine consistency was observed. The transparency of the urine was turbid. The normal transparency of cat urine was transparent. The urinalysis showed proteinuria, abnormal urinary creatinine, hematuria, and urolithiasis. The microscopy of sediments showed struvite and red blood cells. Other parameters were within the normal value of cat urine (Table 3; Figure 2).

Radiography of Thorax and Abdomen

The radiographic result of the thorax showed that there were no abnormalities at the clock analogy of the heart chamber. The long axis of the vertebral heart scale (VHS) was 5.2 V, while the short axis of VHS was 2.8 V. The total VHS (addition of long axis with short axis) was 8V (Figure 3). Based on the VHS calculation, results show no enlargement of the patient's heart organ. The VHS of the patient is within the normal value in cats (VHS ≤ 8.1 V) (Guglielmini *et al.*, 2014). There were no abnormalities in blood vessels, lung fields, pleural spaces, or mediastinum radiography.

Abnormalities were found in the descending colon and rectum. A change of opacity becoming radiolucent of these two organs was observed (Figure 4). Gas accumulation was the leading possible cause of the difference in the colon and rectum's opacity. The radiography of the abdominal region shows an abnormality in *os vertebrae lumbalis I*, with a change of shape and margination. In Figure 5, a radiolucent area (yellow arrow) was observed in the superior articular process of the left cranial part, which a fracture of the superior articular process can cause. No abnormalities can be observed in the radiography of other abdominal organs (liver, stomach, left and right kidneys, spleen, urinary bladder, peritoneum, and reproductive organs).

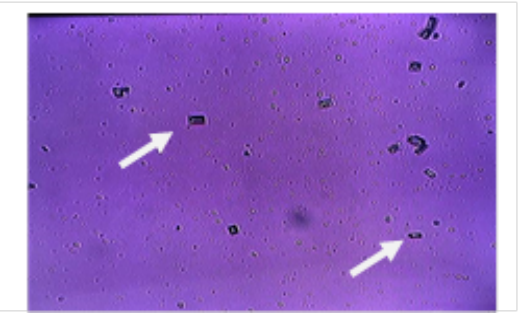


Figure 2. The presence of struvite in the urine of the cat patient (white arrows).

Table 1. Hematology of the cat patient in comparison with reference

Type of Examination	Unit	Examination Result	Normal Value in Cats*	Interpretation
RBC	/µL	7.84 x 10^6	5.00–11.00 x 10^6	Normal
Hb	g/dL	11.4	8.00–15.00	Normal
HCT	**%**	35.9	25.00–45.00	Normal
MCV	fL	45.9	39.00–50.00	Normal
MCH	Pg	14.5	19.50–24.50	Normal
MCHC	g/dL	31.7	33.00–38.00	**Low (Borderline)**
RDW	%	15.3	14.00–18.00	Normal
PLT	/µL	192 x 10^3	200–500 x 10^3	Normal
MPV	fL	10.8	5.00–11.80	Normal
PDW	%	15.3	0.00–50.00	Normal
PCT	%	0.207	0.10–0.50%	Normal
WBC	/µL	22.1 x 10^3	5.50–19.50 x 10^3	**Leukocytosis**
Lymphocytes	/µL	11.2 x 10^3	1.00–4.80 x 10^3	**Lymphocytosis**
Monocytes	/µL	1.2 x 10^3	0.20–1.50 x 10^3	Normal
Granulocytes	/µL	9.7 x 10^3	3.00–12.00 x 10^3	Normal
Lymphocytes	%	50.7	12.00–30.00	**Lymphocytosis**
Monocytes	%	5.3	2.00–9.00	Normal
Granulocytes	%	44.0	35.00–85.00	Normal
Eosinophils	%	0.2	0.00–10.00	Normal

Note = RBC: Red blood cells; Hb: Hemoglobin; HCT: Hematocrit/Packed Cell Volume (PCV); mean corpuscular volume (MCV); mean corpuscular hemoglobin (MCH); mean corpuscular hemoglobin concentration (MCHC); red cell distribution width (RDW); Platelets or thrombocytes (PLT); mean platelet volume (MPV); platelet distribution width (PDW); procalcitonin (PCT); White blood cells or leukocytes (WBC). *(Thrall *et al.*, 2012)

Table 2. Blood chemistry result of the cat patient in comparison with reference value

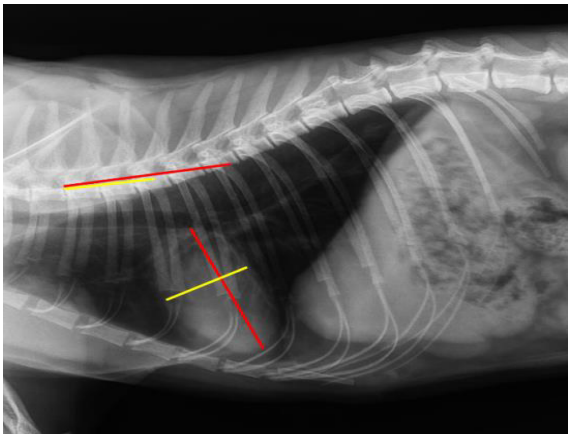
Type of Examination	Unit	Examination Result	Normal Value in Cats *	Interpretation
ALP	U/L	88	11–210	Normal
SGPT/ALT	U/L	79	30–100	Normal
SGOT/AST	U/L	92	14–38	**High**
Total Protein	g/dL	7.6	5.9–8.1	Normal
Glucose	mg/dL	98	67–124	Normal
BUN	mg/dL	34	17–32	**High**
Creatinine	mg/dL	0.8	0.9–2.1	**Low**

Note = ALP: Alkaline Phosphatase; SGPT/ALT: serum glutamic pyruvic transaminase/ alanine aminotransferase; SGOT/AST: serum glutamic-oxaloacetic transaminase/aspartate transaminase; BUN: blood urea nitrogen. *(Thrall *et al.*, 2012)

Table 3. Urinalysis result of the cat patient

Type of Examination	Unit	Examination Result	Normal Value in Cats ([IDEXX], n.d.)	Interpretation
Macroscopic observation				
- Color		Red	Pale yellow–dark yellow	**Abnormal**
- Consistency		Watery	Watery	Normal
- Transparency		Turbid	Transparent	**Abnormal**
Urinalysis kit				
- Urine Protein Creatinine (UPC)		0.30 (+)	0–1	Normal
- u-Glucose	mg/dL	Negative	Negative	Normal
- u-Protein	mg/dL	1000 or positive (++++)	Negative	**Proteinuria**
- u-Albumin	mg/dL	< 300	< 300	Normal
- u-Bilirubin	mg/dL	0	Negative	Normal
- u-Creatinine	mg/dL	Over	Negative	**Abnormal**
- u-Ketone	mg/dL	0	Negative	Normal
- u-Blood	mg/dL	1 (+++)	Negative	**Hematuria**
- u-Nitrite	mg/dL	0	Negative	Normal
- pH value		7.5	6.0–7.5	Normal
Microscopy				
- Urinary Crystals		Struvite (+++)	Negative	**Urolithiasis**
- Blood		> 5 per HPF (or +++)	≤ 5 per HPF	**Hematuria**

Note = u-Glucose: urinary glucose, u-Protein: urinary protein; u-Albumin: urinary albumin; u-Bilirubin: urinary bilirubin; u-Creatinine: urinary creatinine; u-Ketone: urinary ketone; u-Blood: urinary blood; u-Nitrite: urinary nitrite; HPF: high power field; n.d. not defined.



Figures 3. Radiograph of the thoracic cavity. The red color was long axis (5.2 V), while the yellow color was short axis (2.8 V). The vertebral heart score (long axis + short axis) was 8 V.

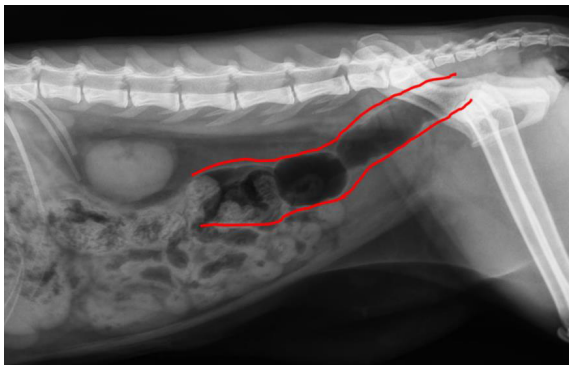


Figure 4. Radiograph of the abdominal cavity with a megacolon (red lines). The radiograph of the urinary bladder was normal, not ruptured.

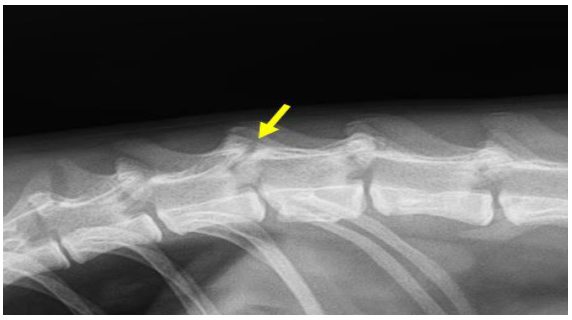


Figure 5 Radiograph of *os vertebrae lumbalis I* with a change of shape and margination. A radiolucent area (yellow arrow) was observed in the superior articular process of the left cranial part, possibly due to a fracture.

Ultrasonography

Ultrasonography of the liver reported that the wall thickness of the right liver lobe (RLL), left liver lobe (LLL), and middle liver lobe (CLL) was normal (≤ 1 mm). The RLL, LLL, and CLL textures were not homogenous and hypoechoic. There is no abnormality of the hepatic and portal vein, with a hypoechoic thin wall and flat surface (Figure 6, Figure 7, and Figure 8). The size of the stomach and the layers of the stomach were normal. The thickness of the gastric wall in the fundus part was 1.8 mm (2–4 mm) (Figure 9). The ultrasonogram of the gall bladder showed a hyperechoic gall bladder sac wall with a wall thickness of 1 mm, inner surface flat, filled with black anechoic bile, visible part of the cystic duct, and there was precipitate of about 40% by volume (Figure 10). The ultrasonographic diagnoses of abnormality in the gall bladder were cholecystitis and cholelithiasis.

The ultrasonography of the patient's spleen showed no abnormalities in the spleen capsule, the cranial part of the spleen, the spleen's corpus, and the caudal part of the spleen (Figure 11). The spleen's size is within the cat's normal range (5.1–9.1 mm) (Sayre and Spaulding 2014). The spleen capsule was a thin layer with a hyperechoic and flat surface. The cranial part of the spleen is triangular, the position is posterior to the stomach, and the texture is homogenous hypoechoic into hyperechoic. The splenic corpus elongated on the left lateral side with hypoechoic into hyperechoic homogenous texture. The caudal part of the spleen is located on the left lateral or medial side of the animal, and its texture is homogeneous hypoechoic into the hyperechoic and sharp tip with no abnormalities (Figure 11).

The ultrasonogram of the left kidney showed no abnormalities in the capsule, cortex, and medulla. The left kidney capsule was a thin hyperechoic layer with a flat surface and a non-homogeneous hypoechoic cortex texture. The medulla was the anechoic to hypoechoic homogeneous texture. The boundary between the cortex and medulla is clear, and no abnormalities exist. However, there is a hypoechoic mass inside. The long dimension of the left kidney is normal at 3.7 cm (Figure 12). This dimension is within the normal range (3.0–4.3 cm), as the sonograms that previous studies have reported (Dennis, 2010; Martinez *et al.*, 2022; Penninck & d'Anjou, 2022). The result of ultrasonography of the right kidney showed a normal appearance of the capsule, cortex, and medulla. The capsule of the right kidney was a thin, hyperechoic layer with a flat surface. The textural cortex of the right kidney was hypoechoic in-homogeneous, while the medulla was anechoic into hypoechoic homogenous texture. The boundary between the cortex and medulla of the right kidney was clear, with no abnormalities. The long dimension of the right kidney was normal (3.4 cm) (Figure 13), and it is within the normal range (3.0–4.3 cm) (Dennis, 2010; Martinez *et al.*, 2022; Penninck & d'Anjou, 2022). However, the ureteral diameter of the right kidney was 1.6 mm. The ureter is not typically seen in cats. However, the dilated ureter can be seen using ultrasonography, and the dilated ureter should be distinguished from veins and arteries of the kidney, usually single on each side. It can be followed from the hilus to the *vena cava caudalis* and aorta (Penninck & d'Anjou, 2022). The renal pelvis was normal in size and shape (Figure 14). When employing a transverse plane, the pelvic height of cats is often less than 2 mm, while it can occasionally be greater than 3 mm (Penninck & d'Anjou, 2022). Thus, the diagnosis of nephritis was made.

This case study reported thickening of urinary bladder wall thickness (2.1–7.9 mm), while the normal wall thickness was between 1.3 and 1.7 mm (Hecht 2015; Penninck & d'Anjou 2022). In addition, this study reported a hypoechoic mass inside the urinary bladder. The mucosal surface of the urinary bladder was flat hypoechoic with no abnormalities. The appearance of a homogenous anechoic black urine was observed, with the presence of a hypoechoic mass inside the urinary bladder

(Figure 15). According to observation, there is an impression of irregular shape and size of the urinary bladder with the differential diagnosis of cystitis and neoplasia. However, according to the history of hit-by-car, clinical examination, and other diagnostics, the most possible diagnosis was cystitis.

The size of the small intestine and the mucosal and serosa layers of the intestine were normal. The thickness of the small intestine wall was 2.9 mm (bigger than normal size; normal size was 2.2–2.8 mm) (Di Donato *et al*., 2014). The size of the large intestine and the layers (mucosa and serosa) were normal (<1.5 mm). Intestinal peristaltic shows no abnormalities or anti-peristaltic movement in the intestines (Figure 16). According to the ultrasonography, the differential diagnosis of the gastrointestinal tract was enteritis.

In the ultrasonography, the patient's pancreas was within the normal thickness of the cats (left 5.8 mm; body 6.2 mm; right 4.4 mm). The shape of the pancreas of all lobes (right, middle, and left lobes) is thin, elongated, amorphous, and normal, without abnormality. An echo texture of hypoechoic to slightly hyperechoic parenchyma of the pancreas was observed. The duodenal pancreatic vein appears as an echoic rounded appearance in the right lobe of the pancreas.

Treatments and Results

The patient was given anti-constipation (Dulcolax®), a 5-milligram tablet once daily for two days, and intra-rectal flushing enema procedure with warm physiologic saline (0.9% NaCl) on the second day of hospitalization. The cat was fed a commercial wet food (Recovery® Royal Canin) a can per day. Other medications are amoxicillin-clavulanic acid (Claneksi®) syrups 20 mg/kg of body weight per oral after meal twice a day for five days; Renate® once a day per oral after meal for eight days; Samylin® Medium Breed ½ tablet once a day per oral after meal for 12 days; Cystaid Cat® one tab once daily per oral after meal for ten days; intravenous infusion with 0.9% NaCl (during three days of hospitalization); Phyto-menadione subcutaneous injection 3 mg/kg once daily for two days during hospitalization; anti-inflammatory/analgesic meloxicam (Melovem®) 0.35 cc once. The day after the enema procedure, the patient pooped voluntarily (Figure 17). In addition, after two days of hospitalization, the cat showed no hematuria. After three days of hospitalization, the patient recovered with no hematuria or other abnormal clinical signs or complications. The veterinarian discharged the patient with home treatment with the remaining oral medications.

DISCUSSIONS

The patient was diagnosed with constipation and bladder contusion hematuria after physical-, laboratory-, and diagnostic imaging- examinations. The veterinarian treated the patient for constipation and concurrent urogenital disease (Olah, 2018). In this case report, constipation can be due to abdominal pain after a hit-by-car traumatic injury. However, constipation can occur due to neuromuscular conditions, for instance, the lumbosacral spinal cord illness that affects the innervation of the colon, which can make the cats difficult to stance for proper defecation (Akhter, 2017).

The patient felt pain during palpation of the lumbar area and has not defecated for several days. According to physical examination using the feline grimace scale (FGS), the patient scored 5 (ears 1, eyes 1, muzzle 1, whiskers 1, and head 1). As FGS score ≥ 4, it can be concluded that the cat was feeling painful and the FGS can be the scientific reasoning of the analgesics treatment to the patient. As the history reported hit-by-car injury, the patient was recommended to be examined with further examination (blood work, blood chemistry, and radiologic imaging). The hematology showed leukocytosis and lymphocytosis that can be caused by acute infection. Blood chemistry analysis displayed an increased glutamic-oxaloacetic transaminase (SGOT) and blood urea nitrogen (BUN), indicating acute hepatic and renal injury consecutively. Urinalysis or urine examination is frequently conducted to look for cat health issues. In this patient's case, urinalysis was used to further identify the cause of macroscopic hematuria. The urinalysis result confirms the presence of a high number of red blood cells in the urine (hematuria) (more than five red blood cells (RBCs) in a high-power (40 x 10) field in fresh, centrifuged urine), struvite in the urine, and proteinuria. The acute renal injury in this study was probably the cause of the increasing level of SGOT (Prasetyo & Darmono, 2017). In addition, liver problems such as hepatitis, biliary and portal cirrhosis can also cause moderate SGOT increase (Firdaus *et al.*, 2012). In addition, the increase in blood urea nitrogen indicates kidney disorders. Kidneys

excrete the urea product when damaged, and the urea will accumulate in the blood circulation (Stockham & Scott, 2008). The urinalysis also confirmed the presence of bladder contusion and urinary bladder wall thickening, which showed the possibility of a rupture because of incomplete bladder mucosa damage (Robakiewicz & Halfacree, 2023). In addition, the diagnosis of urinary bladder contusion in the lumen was made due to the observation of the normal margin of the urinary bladder in the abdominal radiograph. Radiographic image of the thorax and abdomen exposed changes in shape and margination in the first lumbar vertebrae. There is a radiolucent area in the superior articular process of the left cranial part of *os vertebrae lumbalis I*. The abdominal radiograph's change into the descending colon and rectum radiolucent indicated a megacolon. Ultrasonographic findings on the first day of hospitalization are non-homogeneous liver structure, 40% sediment in the gallbladder, and non-homogenous texture on the left and right kidneys. The texture is hypoechoic on the left kidney, and the diameter of the ureter on the right kidney is 1.6 mm. The impression of the shape and size of the urinary bladder is irregular. Urinary bladder wall thickness varies between 2.1 and 7.9 mm, and a hypoechoic mass is inside the urinary bladder.

This patient's constipation was treated by injecting warm water and isotonic saline enemas 5-10 mL/kg into the patient's anus (Little, 2019) on the second day of hospitalization. Enema solutions (sterile normal saline/NaCl 0.9%) were administered with a well-lubricated rubber catheter. The colon is flushed with water or saline as the fecal bulk is manually decreased by abdominal palpation (Washabau, 2001). This study reported that the patient was in pain when palpated in the abdomen. The feline grimace scale was 5, confirming the pain. Constipated cats, predictably, were more likely to be uncomfortable on abdominal palpation. Painful cats were less likely to have a successful enema, probably due to abdominal muscle contractions/ spasms that prevented defecation (Benjamin & Drobatz, 2020). However, the procedure of enema in this case is successful. The additional treatment of analgesics and anti-inflammatory (Meloxicam) in this study was appropriate for the trauma and the patient's constipation for addressing abdominal tension and discomfort that can improve the efficacy of enema (Benjamin & Drobatz, 2020).

Ultrasonographic findings on the second day of hospitalization are non-homogeneous liver structures. Non-homogeneous liver structure observations can explain the increase in serum glutamic-oxaloacetic transaminase/ aspartate transaminase (SGOT/AST), 92 IU/L, RI, 9–40 IU/L. A factor that can cause an increase in liver enzymes, such as SGOT, and the presence of liver damage is the process of pathogens entering the patient's body, such as viruses, fungi, bacteria, and parasites (Carreira *et al.*, 2008; Desiandura *et al.*, 2022; Flatland, 2009; Palermo *et al.*, 2019; Peters *et al.*, 2016). During liver damage, enzymes such as SGOT, lactate dehydrogenase, SGPT, gamma-glutamyl transaminase, and arginase are free to exit the cells and enter the blood vessels, increasing their concentration in the blood. Because increased SGOT can remain in circulation for 2-5 days, it is utilized as a biochemical marker to detect the presence of necrosis in liver cells. Changes in permeability or damage to liver cell walls cause the indicators of liver cell abnormalities (hepatocellular), which increase SGPT or SGOT (Desiandura *et al.*, 2022). Other causes of an increase in liver enzymes are liver diseases in cats, such as liver ischemia caused by acute heart failure and prolonged hypotension, viral liver disease, and heart damage due to toxins or drugs (Desiandura *et al.*, 2022; Hall & Cash, 2012).

The ultrasonographic finding of this study was 40% of sediment in the gallbladder, so the patient was diagnosed with cholelithiasis. Cholelithiasis in cats is uncommon and may not show symptoms (Mayhew *et al.*, 2002). Additionally, abnormal gallbladder incidence in cats is usual (Choi *et al.*, 2020; Otte *et al.*, 2017). Cholelithiasis in cats may occur due to or cause extrahepatic biliary obstruction (EHBO) (Mayhew *et al.*, 2002). The present study showed gallstones in the ultrasound. In addition to finding gallstones, ultrasound can reveal indications of cholecystitis, such as gallbladder wall thickening, pericholecystic fluid, and an impacted stone in the gallbladder neck. Extrahepatic (>10 mm) or intrahepatic (>4 mm) bile duct dilation indicates biliary blockage (Selvakumar, 2020). A previous study reported cholelithiasis composition that was to be one hundred percent calcium carbonate. That study also reported bacterial culture from the cholelithiasis samples, namely *Escherichia coli* and *Enterococcus* (Mayhew *et al.*, 2002).

This case study also reported cholecystitis of the gall bladder. Cholecystitis can occur due to fungal, parasitic, bacterial, and viral infections (Brain *et al.*, 2006; Lo Piccolo *et al.*, 2019; Mayhew *et al.*, 2002; Palermo *et al.*, 2019). Cholecystitis and cholelithiasis were reported as co-occurrences, as reported by a previous study. According to this study, cholecystitis may be part of the underlying pathogenic process that causes cholangiohepatitis due to extrahepatic biliary blockage (Mayhew *et al.*, 2002). All cholelith samples from the cat patients reported by Mayhew *et al.* (2002) were positive for bacterial growth.

The ultrasonographic finding of this study reported non-homogeneous texture on the left and right kidneys. The texture is hypoechoic on the left kidney, and the diameter of the ureter on the right kidney is 1.6 mm. According to ultrasound findings, the patient was diagnosed with acute kidney injury or acute nephritis. These ultrasonographic findings aligned with a slight increase in blood urea nitrogen (BUN) 34 mg/dL, indicating acute kidney injury (Thrall *et al.*, 2012). In cats with urinary tract trauma, increased blood urea nitrogen on serum biochemistry results from urine leakage that can lead to post-renal azotemia (Robakiewicz & Halfacree, 2023). Urinary tract injuries cannot be diagnosed or treated before the shock, respiratory distress, or continuous bleeding are treated. Urinary tract injuries are easily ignored in trauma patients because clinical indications are ambiguous and are frequently overwhelmed by more apparent injuries or life-threatening illnesses (Robakiewicz & Halfacree, 2023). The current study gave the patient a normal saline infusion to prevent shock and phytomenadione and stop continuous urinary tract bleeding.

This case study reported an irregular impression of urinary bladder shape and size. This case study reported thickening of urinary bladder wall thickness (2.1–7.9 mm), while the normal wall thickness was 1.3–1.7 mm (Griffin, 2020; Penninck & d'Anjou, 2022). As this study reported, diffuse urinary bladder wall thickening can occur due to severe cystitis, which is linked to the loss of bladder wall layering. It's possible to find intraluminal material that looks like inflammatory debris (Griffin, 2020). As the approach used by this study, the diagnosis of urinary tract illness can be carried out using clinical symptoms, anamnesis, urinalysis, period of the disease, and urinary tract imaging should be evaluated (Ergin *et al.*, 2018; Lekcharoensuk *et al.*, 2001). Ultrasonography can be used to examine the urinary bladder, including its wall's thickness, integrity, and the presence of intraluminal alterations such as cellular debris, cystoliths, blood clots, tumors, and lipid droplets (Biedak *et al.*, 2023; Penninck & d'Anjou, 2022).

Wall layering is not always apparent, especially in a swollen bladder (Biedak *et al.*, 2023). The urinary bladder wall thickens extensively irregularly and hypo-echoically most frequently because of cystitis. The urinary bladder's cranioventral portion is often the thickest (Penninck & d'Anjou, 2022). As a result, in this case study, the early stabilization of trauma patients should entail re-establishing tissue perfusion, which can be accomplished by providing isotonic crystalloids.

In this case study, the signs of urinary tract trauma were hematuria and abdominal pain. However, it is critical to remember that the capacity to urinate and the existence of a palpable bladder do not rule out urinary tract injuries (Meeson & Corr, 2011; Robakiewicz & Halfacree, 2023). Furthermore, because the leaking urine may seep subcutaneously, rupture of the intrapelvic or penile urethra may not result in immediately identifiable free peritoneal fluid. The ensuing subcutaneous swelling and fluid collection may not be immediately apparent and/or may be mistaken for bruises caused by external trauma (Addison *et al.*, 2014; Robakiewicz & Halfacree, 2023). The bladder or urethra is the most prevalent site of urinary tract damage, which can be explored with a positive contrast retrograde urethrocystogram; however, a urethrocystogram was not conducted in this case study. The presence of contrast outside of the bladder or urethra indicates rupture. Suppose a rupture is highly suspected, but no contrast is seen outside the bladder on the initial radiographs. In that case, the cat should be left in the appropriate position, and a small volume (2–5 mL, depending on the cat's weight) of positive contrast should be administered into the bladder, followed by repeat radiographs (Meeson & Corr, 2011). However, this study's diagnosis was hematuria bladder contusion, and the cat has a normal urinary function. In cases of bladder contusion, such as this one, the patient should be treated conservatively. Small tears in the bladder wall may go undiagnosed and will heal on their own (Meeson & Corr, 2011).

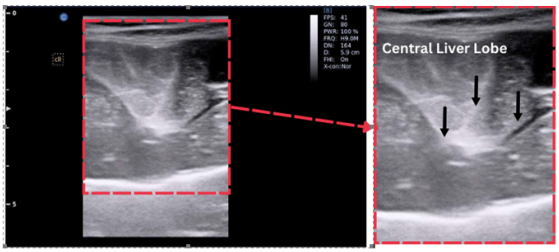


Figure 6. Sonogram of the central lobe of the liver (CLL). The texture is non-homogenous (black arrows).

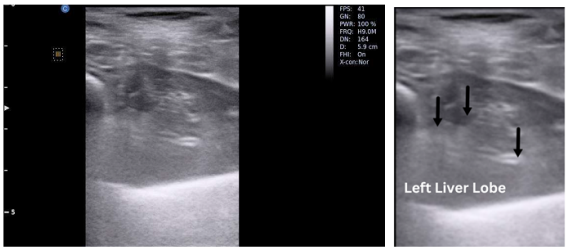


Figure 7. Ultrasonogram of the left lobe of the liver (LLL). The texture is non-homogenous (black arrows).

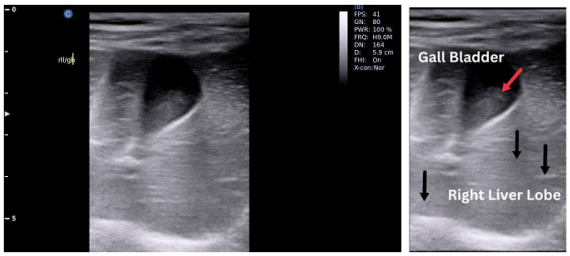


Figure 8. Sonogram of the right liver lobe (RLL) and gall bladder (GB). The texture of the right liver love is non-homogenous (black arrows). The gall bladder sac wall is hyperechoic with a wall thickness of 1 mm; the inner surface is flat, contains anechoic black bile fluid, part of the cystic duct is visible, and there is sediment around 40% of the volume (red arrow).

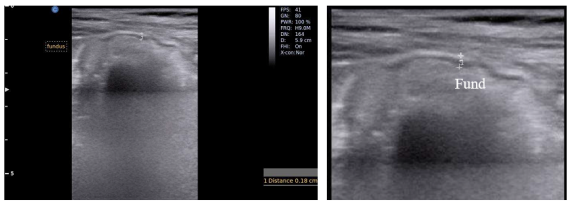


Figure 9. Sonogram of the fundus part of the stomach (Fund), and the wall thickness of the fundus is within the normal range for cats (double-sided white arrow).

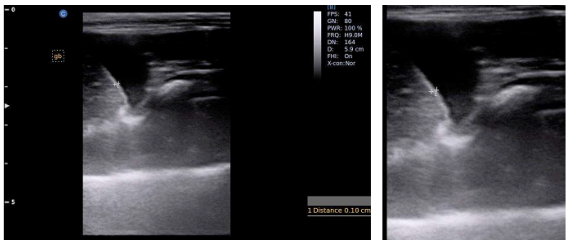


Figure 10 Sonogram of gallbladder. Hyperechoic gallbladder wall thickness was within the normal range (white arrow). There is a mass inside the gall bladder (yellow arrow).

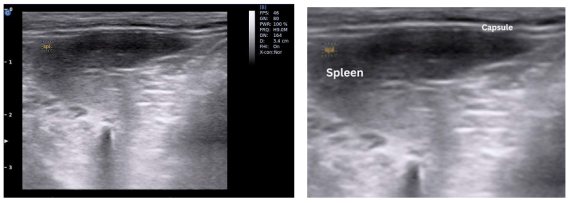
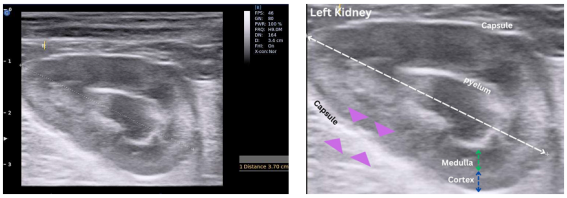


Figure 11. Sonogram of the spleen. The spleen capsul is hyperechoic, and the spleen size is within the normal range.



Figures 12. Sonogram of the left kidney. The size of the left kidney is 3.7 cm (double-sided white arrow). The size of the cortex and medulla is relatively similar.

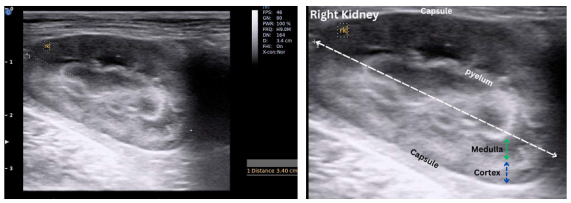


Figure 13. Sonogram of the right kidney. A thin, hyperechoic layer of capsule with a flat surface. The cortex texture was hypoechoic and non-homogeneous. The medulla was anechoic into a hypoechoic homogenous texture. The boundary between the cortex and medulla of the right kidney was clear, with no abnormalities. The long dimension of the right kidney was normal (double-sided white arrow)

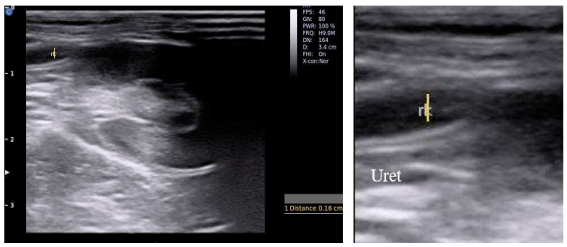


Figure 14. Sonogram of the ureter (Uret) of the right kidney. The diameter (white double-sided arrow) is within the normal range.

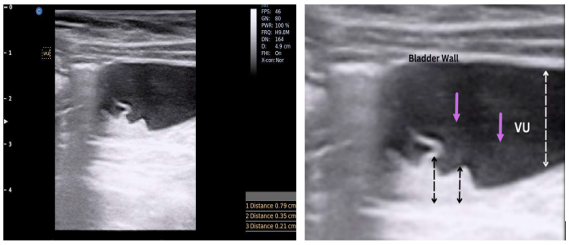


Figure 15. Sonogram of the urinary bladder (VU) shows an irregular shape of the urinary bladder. The presence of urinary bladder wall thickening (double-sided black arrows) and hypoechoic masses (purple arrows) in the urinary bladder lumen (double-sided yellow arrow) were observed.

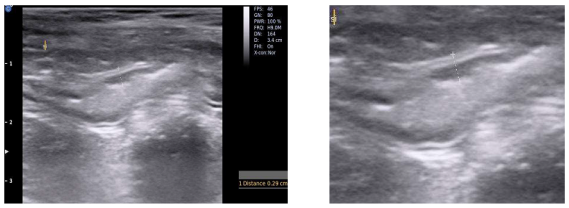


Figure 16. Sonogram of the small intestine. The thickness of the small intestine wall was 2.9 mm (slightly increased compared to normal) (black double-sided arrow on the inset).

Figure 17. The patient was pooped with normal consistency voluntarily (red arrows) one day after the enema procedure.

A standard saline infusion was used to rehydrate the cat patient from bleeding and dehydration. Melovem® is a medicine that contains meloxicam as an active substance. Meloxicam is one of the non-steroidal anti-inflammatory drugs (NSAIDs) of the oxicam class that inhibits prostaglandin synthesis, exerting anti-exudative, anti-inflammatory, antipyretic, and analgesic properties. The United States of America Food and Drug Administration (FDA) approved the use of meloxicam and robenacoxib for cats (FDA, 2022). In cats with feline urinary syndrome, NSAIDs appear helpful in alleviating bladder pain and lowering the intensity of clinical symptoms (He *et al.*, 2022). Meloxicam is an example of an NSAID recommended for treating cholecystitis and cholelithiasis co-occurring in this case report (Otte *et al*., 2017). NSAIDs have an anti-inflammatory and analgesic impact by reducing the activity of cyclooxygenases and decreasing prostaglandin production. Meloxicam reduces clinical signs of disease because prostaglandins trigger inflammation, pain, exudation (fluid that leaks out of blood vessels during inflammation), and fever. However, precaution should be considered as meloxicam can limit blood flow to the kidneys and cause acute renal damage in cats, particularly those with decreased water intake and probably dehydration (He *et al.*, 2022). Thus, the recommended dose for cats in pain was 0.3 mg/kg (or less) with a subcutaneous route once only (Plumb, 2008). The patient was given Renate® once a day per oral after meal for eight days. Renate® is a complementary feed for cats designed to help maintain normal renal function in cats. The cat patient was supplemented with Samylin®. Samylin® contains S-adenosyl L-methionine (SAMe), Silybin, and vitamin E. SAMe, a glutathione precursor, is the active form and is integral to correct hepatic function. Silybin is conjugated with phosphatidylcholine, which increases its bioavailability, facilitating its actions as a free radical scavenger in the liver. Vitamin E can support the function of hepatocytes from within the lipid-soluble environment of the cell membranes.

Cats with extrahepatic bile duct obstruction (EHBDO) were commonly treated with Samylin® (Otte *et al.*, 2017). The cat patient in this study was given glycosaminoglycans (GAG) supplementation (Cystaid®). Cystaid® contains N-acetyl-glucosamine, L-theanine, and quercetin. GAG supplementation is recommended because cats with cystitis tend to decrease the protective GAG layer in the bladder (Gunn-Moore & Shenoy, 2004; He *et al.*, 2022; Mazda *et al.*, 2023; Seawright *et al.*, 2008). Phytomenadione is a vitamin K1 injection. Phytomenadione is an aqueous colloidal solution of Vitamin K1 for parenteral injection. It possesses the same type and degree of activity as natural Vitamin K. Vitamin K increases the liver's creation of active prothrombin from a precursor protein. The mechanism by which vitamin K stimulates prothrombin production at the molecular level is unknown. Phytomenadione with a dose of 1 mg/kg body weight was commonly used to treat bleeding in the urinary tract of cats (Thahir & Saputri, 2023). Claneksi® syrup contains amoxicillin and clavulanic acid; every 5 mL of Claneksi® includes 125 mg of amoxicillin and 31.25 mg of clavulanic acid. The recommended dose for cats with urinary tract infections was 62.5 mg/cat per oral every 12 hours for ten days (Plumb, 2008). Amoxicillin/clavulanic acid was also used for cholecystitis and cholelithiasis that co-occurred in this patient (Otte *et al*., 2017). Amoxicillin/clavulanic acid oral suspension preparations are permitted in dogs and cats to treat susceptible organism-caused urinary tract, skin, and soft tissue infections. It is also suggested for canine periodontal disease caused by susceptible bacterial strains (Plumb, 2008).

Hematuria is when there are abnormally elevated levels of red blood cells in the urine. In the current study, the cat patient's condition is macroscopic hematuria as there is enough red blood in the urine to be seen with the naked eye, as seen in Figure 1 during the patient's hospitalization. Urine that is turbid and often brownish to crimson indicates macroscopical hematuria. The current study confirmed hematuria with microscopy with more than five red blood cells (RBCs) in a high-power (40 x 10) field in fresh, centrifuged urine. It is crucial to use microscopy to confirm the presence of RBCs while evaluating gross hematuria. The discovery of crimson urinary sediment following centrifugation of the urine and a positive hemoglobin strip test indicate hematuria (Popa *et al.*, 2017). Lew-Kojrys *et al.* (2017) reported macroscopic hematuria in 50% of patients in veterinary clinics at the University of Warmia and Mazury (Poland). This case report supported a previous study that reported that most female dogs' and cats' hematuria had micro lithiasis, cystitis, feline urinary syndrome, and glomerulonephritis (Popa *et al.*, 2017). However, other possible causes of hematuria are renal biopsy procedures, penetrating wounds, and blunt force (Vaden, 2005). This study confirmed the hematuria urinary bladder contusion using ultrasonography. The current confirmation of urinary bladder cystitis agreed with other studies reported that detailed examination of the urinary bladder to diagnose cystitis using abdominal ultrasonography and or negative/positive double-contrast radiography through measuring the thickness of the urinary bladder wall, bladder rupture, neoplasia, diverticulum, blood clots, and/or the occurrence of small and/or radiolucent calculi. Any condition that affects the urogenital tract's mucosal surfaces or vasculature may cause leakage of red blood cells into the urine area and consequent hematuria. The main possible reason for hematuria in the current study was trauma, as the owner reported that the patient was hit by a car three days before the hospital visit. However, other possible causes of hematuria in cats are penetrating injuries, bite wounds, pelvic fractures, iatrogenic injury, urolithiasis, and urinary tract infections (Addison *et al.*, 2014; Anderson *et al.*, 2006; Halfacree *et al.*, 2011; Litster *et al.*, 2011; Manzini *et al.*, 2020; Meige *et al.*, 2008; Weisse *et al.*, 2002). Hematuria can be brought on by various pathologic conditions, such as inflammation, neoplasia, trauma, vascular disease, and coagulopathies (Forrester, 2004). Small animal veterinarians often encounter problems or disorders of the urinary system in cats in Indonesia (Jordan *et al.*, 2022). However, urinary bladder cystitis due to hit-by-car has rarely been documented in animals. In the veterinary literature, few studies have described the presence of a foreign body in the urinary bladder or other urinary tracts. A study demonstrated that a sterile lead implant (air-gun pellet) in a feline bladder could cause chronic cystitis (Sunghan *et al.*, 2020).

CONCLUSION

The best supporting diagnostics for the current case are hematology, blood chemistry, urinalysis, imaging, and ultrasonography. The patient recovered clinically after three days of hospitalization through the treatment given, namely intra-rectal flushing with warm physiologic saline and other medications such as antibiotics, anti-hemorrhagic agents, anti-inflammatory agents, and kidney, liver, and urinary bladder supplements. Medication without surgery in this study is an effective treatment with a good prognosis. Moreover, early diagnosis and continuous antibiotic prophylaxis also increase the chance of survival. Most specific information regarding lower urinary tract injuries in small animals exists as isolated case reports or small case series, so the actual incidence rates, absolute treatment recommendations, prognoses of urinary bladder contusions, and the duration of treatment until full recovery are not available in the literature.

SUGGESTION

A contrast radiograph of the urinary bladder should be carried out to double confirm the diagnosis of bladder contusion. Follow-up of treatment and reexamination were needed to ensure the recovery of cat multi-trauma diseases.

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