

Traumatic uterine rupture in three felids

Rebecca Davies, DVM; Elizabeth Rozanski, DVM, DACVIM, DACVECC; Florina Tseng, DVM; Samuel Jennings, DVM, DACVS and April Paul, DVM, DACVECC

Abstract

Objective – To describe 3 near-full-term, young-adult felids (2 domestic shorthair cats, and 1 bobcat [*Lynx rufus*]) that experienced uterine rupture following trauma.

Series Summary – Two of the animals had motor vehicular trauma and 1 had abdominal bite wounds. The 2 domestic cats that were treated with surgical exploration and ovariohysterectomy recovered uneventfully. The bobcat died during hospitalization prior to surgical intervention, and necropsy identified uterine rupture and associated peritonitis.

Unique Information Provided – Traumatic uterine rupture should be considered in known or suspected pregnant animals that experience blunt or penetrating trauma, particularly if they are in late-term pregnancy.

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Introduction

Blunt and penetrating abdominal trauma is common in small animals following motor vehicular trauma or bite wounds.^{1,2} Common internal abdominal injuries include damage to the liver or spleen resulting in hemoperitoneum, or rupture of the bladder or diaphragm.^{1,2} Intestinal injury is less common, presumably attributable to increased mobility of the intestines within the abdominal cavity.³ The uterus may potentially be injured subsequent to trauma but it is small in nonpregnant animals. However, in pregnancy, particularly late-term pregnancy, the uterus is enlarged, and may also be at risk of traumatic injury.

Uterine rupture in small animals is infrequently documented, with the majority of cases involving uterine wall compromise secondary to endometritis, pyometra, intra-uterine fetal death, or uterine torsion or prolapse.^{4–6} In addition, manual *per vaginam* manipulation of the fetuses during dystocia, and oxytocin administration to animals with obstructive dystocia, may have resulted in uterine rupture.⁴ Uterine rupture during pregnancy

and labor or delivery in women primarily occurs at previous hysterotomy incision sites, while external trauma including vehicular accidents, falls, or domestic abuse are less frequent causes of rupture.^{7–11} A single case report describes uterine rupture in a cat following vehicular trauma.¹² This case series provides detailed descriptions of the diagnosis, treatment, and outcome for 3 gravid felids with uterine rupture following trauma.

Case 1

An approximately 1-year-old domestic shorthair cat weighing 4.8 kg was presented to the emergency room immediately after being attacked by 2 dogs. The previously healthy cat had been adopted 1 month earlier, and was known to be pregnant. Physical examination documented shock, characterized by mental dullness, hypothermia (35.8°C [96.4°F]) and tachycardia (210 beats/min). The cat had multiple superficial lacerations over the hindquarters and full-thickness puncture wounds to the perineum. Point-of-care laboratory testing^a identified acidemia (pH 7.23; reference interval [RI], 7.27–7.42), hyperglycemia (12.65 mmol/L [228 mg/dL]; RI, 3.99–7.33 mmol/L [72–132 mg/dL]), hyperlactatemia (7.5 mmol/L [67.57 mg/dL]; RI, <1.8 mmol/L [<16.2 mg/dL]), increased blood urea nitrogen (BUN) concentration (23.56 mmol/L [66 mg/dL]; RI, 7.85–11.78 mmol/L [22–33 mg/dL]), and increased plasma creatinine concentration (221.0 mmol/L [2.5 mg/dL]; RI, 61.88–167.96 mmol/L [0.7–1.9 mg/dL]). The cat had a packed cell volume (PCV) of 32% (RI, 28–40%)

From the Departments of Clinical Sciences (Davies, Rozanski, Paul), Environmental and Population Health (Tseng), and Biomedical Sciences (Jennings), Cummings School of Veterinary Medicine, Tufts University, North Grafton, MA 01536.

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Address correspondence and reprint requests to Dr. Elizabeth Rozanski, Department of Clinical Sciences, Cummings School of Veterinary Medicine, Tufts University, 200 Westboro Road, North Grafton, MA 01536.

Email: Elizabeth.rozanski@tufts.edu

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and was hypotensive with blood pressure of 90 mm Hg as measured by a Doppler ultrasonic flow detector.

Radiography did not reveal evidence of thoracic trauma or long-bone fractures. Six mineralized fetal skeletons were identified in the abdomen, and there was normal abdominal serosal detail. Ultrasonography performed shortly after presentation revealed a fetal heart beat in only 1 fetus and no peritoneal effusion. Fetal heart beats were not auscultated through the body wall and no fetal heart beats could be detected by ultrasonography performed 2 hours after presentation. Fluid resuscitation was initiated using isotonic crystalloid^b administered as a 20 mL/kg IV bolus and 6% hydroxyethyl starch 130/0.4^c administered as a 3 mL/kg IV bolus, with improvement in heart rate and blood pressure. The cat was also administered oxymorphone^d (0.1 mg/kg, IV, q 4 h) and ampicillin sodium/sulbactam sodium^e (50 mg/kg, IV, q 8 h). Soon after that, the cat's cardiovascular stability declined, and a venous blood-gas analysis revealed progressive acidemia (pH 7.105), anemia (PCV 22%), hypoglycemia (3.38 mmol/L [61 mg/dL]), hyperlactatemia (9.9 mmol/L [89.2 mg/dL]), and azotemia (BUN of 26.42 mmol/L [74 mg/dL]) and total protein 5.4 gm/dL, suggesting inadequate hemodynamic stabilization with possible blood loss. Antibiotic coverage was broadened to include enrofloxacin^f (5 mg/kg IV, q 24 h), and a type-specific packed red blood cell transfusion was administered (4 mL/kg, IV). In addition, 50% dextrose (3 mL diluted 1:2 with 0.9% NaCl) was administered IV. Emergency surgery was elected to explore the abdominal and perineal wounds, given the cat's declining clinical status and suspicion for the presence of sepsis. She was premedicated with oxymorphone (0.1 mg/kg, IV) and midazolam^g (0.2 mg/kg, IV), and anesthesia was induced using propofol^h (2.5 mg/kg, IV). The cat was endotracheally intubated, and anesthesia was maintained using isoflurane in oxygen. Exploratory laparotomy was performed through a ventral midline incision, and revealed a single-site rupture of the right uterine horn and an intra-abdominal fetus contained within the amniotic sac. There was no gross evidence of local peritonitis or serosal adhesions. Multiple puncture wounds to the mesometrium and mesovarium were identified bilaterally. Ovariohysterectomy was performed and all fetuses were deceased. Surgical exploration of the perineal wounds and a subsequent contrast urethrogram confirmed a urethral tear with subcutaneous urine pooling. An indwelling urinary catheter^{i,j} was placed, and was maintained for 5 days following surgery. Her cardiovascular stability improved immediately following surgery, with a normalization of vital signs. She remained weak and anorexic over the next 36 hours, while she was receiving supportive care including Lactated Ringer's



Figure 1: Photograph taken at necropsy depicting single intra-abdominal fetus and hemorrhagic effusion in Case 2.

solution (3 mL/kg/day), oxymorphone (for 48 h post operatively), and ampicillin sodium/sulbactam sodium and enrofloxacin. She was hospitalized for a total of 5 days. She received no additional blood transfusions or further surgical intervention and was discharged to her owner for ongoing supportive care. The remainder of her recovery was unremarkable.

Case 2

An adult female bobcat (*Lynx rufus*) weighing 8.4 kg was presented to the Wildlife Clinic (WC) following presumptive vehicular trauma. She was found near the side of the road and was mentally appropriate and fully ambulatory on presentation, although there was evidence of facial trauma and epistaxis. She was anesthetized with telazol^k (12 mg/kg, IM) for complete evaluation. The bobcat was not intubated, but supplemental oxygen provided. Vital signs at that time were within normal limits, and the bobcat had a normal appearing body condition. Abdominal palpation revealed a gravid uterus and palpable fetuses. Thoracic radiographs appeared normal, and abdominal radiographs confirmed the presence of 3 mineralized fetuses. She was administered isotonic crystalloid fluids (30 mL/kg, SC) and buprenorphine hydrochloride^l (0.01 mg/kg, SC), prior to anesthetic recovery. No directed therapy was provided for the next 48 hours, but the bobcat would eat, and appeared more mentally alert. On the third day of hospitalization, she began to vocalize, stopped eating, and later was found dead in her enclosure. Necropsy was performed and documented a single site of rupture in the left uterine horn with the presence of an intra-abdominal fetus, severe generalized fibrinous peritonitis, and a moderate volume of serosanguineous fluid (Figure 1). Pubic and ischial fractures and marked retroperitoneal hemorrhage

were also identified. Microscopic examination of the lungs identified foci of pulmonary necrosis, hemorrhage, and arterial thrombi, likely secondary to septicemia. Bacterial placentitis and endometritis were the presumed source of the fibrinosuppurative peritonitis. The cause of death was presumed to be septicemia with blood loss from uterine and pelvic hemorrhage. Gastrointestinal and pulmonary nematodes were also identified.

Case 3

A 4-year-old domestic short hair cat weighing 4.0 kg was presented immediately after sustaining vehicular trauma. The cat had no known preexisting medical history. On evaluation, facial abrasions, bilateral corneal ulceration, scleral hemorrhage, and unilateral epistaxis were identified. Other major injuries included a non-weight-bearing lameness of the right hind limb because of an open femoral fracture. The cat's neurologic function appeared normal. Abdominal palpation did not elicit pain, and a gravid uterus was identified. Abdominal palpation was not consistent with peritoneal effusion. Initial abnormalities from a plasma biochemistry analysis included increased BUN (13.57 mmol/L [38 mg/dL]) with normal creatinine (88.4 mmol/L [1.0 mg/dL]) concentration. PCV and total plasma protein (TPP) were 20% and 40 g/L (4.4 g/dL; RI, 55–78 g/L [5.5–7.8 g/dL]), respectively, considered to be a result of blood loss and the relative anemia of pregnancy. She was hospitalized and treated with hydromorphone hydrochloride^m (0.1 mg/kg IV, q 4 h) for analgesia and isotonic crystalloid fluids (lactated Ringer's solution 4 mL/kg/h). Both eyes were treated with 0.3% tobramycin ophthalmic solution (1/4" strip, OU, q 8 h).ⁿ Radiography of the extremities and the abdomen confirmed a comminuted mid-diaphyseal femoral fracture and 6 faintly mineralized fetal skeletons. There was no obvious intrathoracic trauma based on evaluation of thoracic radiographs.

The following day, the cat underwent amputation of the right hind limb because of the severity of the fracture and owner financial limitations. Ovariohysterectomy under the same course of anesthesia was recommended but declined due to the additional cost. The cat received a type-specific packed red blood cell transfusion perioperatively and a transdermal fentanyl patch^o (12 µg/h) was placed for postoperative analgesia. She was discharged with amoxicillin/clavulanic acid^p (14 mg/kg, PO, q 12 h).

Two days after discharge, the cat was re-presented for elective ovariohysterectomy. A single rupture of the right proximal uterine horn was identified, and a fetus was protruding through the defect (Figure 2). All fetuses were deceased at the time of surgery. There was no gross evidence of peritonitis or omental adhesions. Ovariohys-

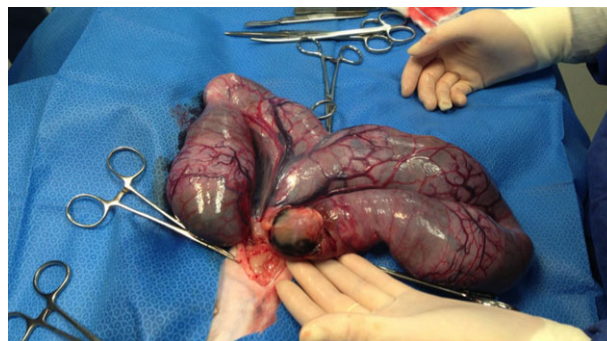


Figure 2: Photograph depicting a single transverse uterine rupture at the proximal aspect of the right uterine horn, identified at time of ovariohysterectomy in Case 3.

terectomy was performed and the cat recovered without incident. The cat was discharged to continue oral and topical antimicrobial therapy at home. Both incision sites were healed and the cat was doing well 10 days later.

Discussion

Uterine rupture of any etiology in small animals is uncommonly reported in the veterinary literature. Among domestic large animals such as horses, uterine rupture as result of complications with labor and delivery are well documented.^{13,14} Uterine rupture in the cat may be less commonly identified for numerous reasons, including that most pet cats are spayed and those intact animals that are free-roaming and more likely to be pregnant are less commonly presented to the hospital. Additionally, cats with planned pregnancy are more commonly kept indoors and may be less likely to be the victims of trauma.

Uterine rupture in other species, including dogs, horses, cows, and humans, is often associated with underlying uterine wall compromise that lends to structural weakness. In reported episodes of uterine rupture in dogs, manual manipulation of fetuses during dystocia, the pyometra-endometritis complex, obstructive dystocia, fetal death, uterine torsion or prolapse, and external trauma have all been described as underlying risk factors.^{4–6} In women, although uterine rupture has been reported as a result of uterine wall defects and trauma, the majority of reports describe rupture during parturition at previous hysterotomy sites.^{8–11,15} In horses, uterine rupture is more commonly identified postpartum, and has been associated with prolonged or excessive fetal manipulation, fetotomy, or fetal malposition; however, rupture following uncomplicated parturition has also been reported.^{13,16}

Uterine rupture, regardless of underlying etiology, is a catastrophic complication of pregnancy. In women and

horses, there is an increased risk of significant hemorrhage caused by increased vascularity of the endothelio-chorial placental attachment in these species. In horses, fibrinous or septic peritonitis is a more common manifestation of postpartum uterine rupture, occurring in 40 of 49 cases in 1 retrospective study.¹³ In the same equine study, uterine rupture was recognized as the third most common cause of postpartum death in horses, following uterine artery tear and gastrointestinal tract rupture.¹³ While dogs and cats may have a lower risk for hemorrhage because of the epitheliochorial attachment of placental sites, the risk of peritonitis appears to be similar, based on this case series.

The potential for complications following uterine rupture is well recognized and is associated with increased maternal and fetal mortality rates in humans and large animals.^{10,13} The overall maternal survival rate for horses with uterine tears is between 75% and 80%, whether managed medically or surgically.^{13,14} There are no studies that describe maternal mortality rate in cats and dogs with uterine rupture; however, fetal death is likely due to placental disruption or direct trauma. In the current case series, fetal mortality was 100%.

Among domestic animals and in the absence of previous hysterotomy incisional scarring, uterine rupture most often results in a single uterine horn defect.^{12,13,16} Horses appear to have increased frequency of right horn rupture (72% vs 28%).¹³ The reason is unknown.¹³ The increased propensity for uterine horn rupture over uterine body rupture is corroborated by the current report, as all 3 felids suffered similar defects affecting a uterine horn, adjacent to the ovary. The horns of a gravid feline uterus are much longer than the uterine body, and are more mobile in the abdomen. Two of the cats in this report had a right uterine horn rupture while the other had a left horn rupture, although case number is too small to state a predilection.

The limited published information on uterine rupture in queens precludes speculation regarding the actual incidence and survivability of uterine rupture. Of particular interest is the variable clinical course and outcome in cats with uterine rupture. Lucas et al¹² described a case of traumatic uterine rupture in a cat following vehicular trauma 72 hours prior to presentation, with subsequent uncomplicated but incomplete delivery of offspring 2 days later. The cat in this account lacked peritonitis or omental adhesions to the ruptured right uterine horn. In the current report, case 3 was routinely spayed in a delayed, elective procedure nearly 96 hours following the initial trauma. These cases suggest that uterine rupture may be tolerated for a number of days in the queen but that fetal survival is low. Regardless of maternal stability, the absence of fetal viability may prompt the clinician

to have a heightened suspicion for uterine compromise following blunt trauma in pregnant cats.

The cases in this report describe a variable degree of maternal clinical illness within the 96-hour period following trauma, and highlight that illness and outcome appear to be related to the presence or absence of peritonitis and concurrent injury. As there is no literature describing the outcome in a large population cats having sustained traumatic uterine rupture, it is impossible to determine if nonsurgical treatment options are reasonable and what degree of maternal and fetal risk they carry. Medical management of uterine rupture with and without peritonitis was equivalent to surgical exploration in the horse; however, these episodes were result of rupture at parturition and not external trauma so may not be extrapolated to external trauma, or animals with multiple fetuses.¹³ Given the available evidence, surgery to achieve source control should continue to be the recommendation for cats with suspicion for uterine rupture and peritonitis. Uterine rupture should be suspected in any late term pregnant queen with abdominal blunt or penetrating trauma, particularly with documented loss of fetal viability. Diagnostic confirmation of uterine rupture continues to be a challenge in all species. The identification of peritoneal effusion or pneumoperitoneum may indicate uterine or other abdominal organ rupture warranting exploratory surgery. Thorough evaluation of the reproductive tract intra-operatively may offer the only confirmation for diagnosis, although ultrasonography may allow preoperative identification of an extra-uterine fetus.

Trauma in the domestic cat occurs frequently, and investigation for pregnancy and estimation of gestational stage should be encouraged to ensure traumatic uterine rupture is not overlooked in intact female cats. In cats confirmed to be approaching full term, a thorough search for uterine rupture should be conducted, and may include abdominal imaging, ideally with ultrasonography. It is important to consider that clinical course may be highly variable and may range from mild clinical illness to rapid clinical deterioration and death. Based on the cases presented here, clinical signs may be confounded by other injuries, analgesics used in management, or time lapse between trauma and presentation, and thus may not be a reliable indication of disease severity. Given the potential life-threatening complications of uterine rupture, a clinical suspicion of rupture should drive a recommendation for surgical exploration.

Footnotes

- ^a Nova Stat Profile pHOX Ultra, Nova Biomedical, Waltham, MA.
- ^b Lactated Ringer's Injection USP, Baxter Healthcare Corp, Deerfield, IL.
- ^c Vetstarch, Abbott Laboratories, North Chicago, IL.
- ^d Opana, Endo Pharmaceuticals, Inc, Chadds Ford, PA.

- ^e Unasyn, Pfizer Injectables, New York, NY.
^f Baytril, Bayer Healthcare LLC Animal Health Division, Shawnee Mission, KS.
^g Midazolam, CARACO Pharmaceutical Laboratories, Detroit, MI.
^h Propofol, Abbott Animal Health, Abbott Park, IL.
ⁱ Bard medical silicone elastomer latex foley catheter, 5fr, 2-way, Covington, GA.
^j Telazol, Fort Dodge, IA.
^k Telazol.
^l Buprenorphine, Reckitt Benckiser Pharmaceuticals, Inc., Richmond, VA.
^m Hydromorphone, Hospira Inc., Lake Forest, IL.
ⁿ Tobramycin (0.3%) ophthalmic solution, USP, Akorn, Inc., Lake Forest, IL.
^o Fentanyl transdermal system, Janssen Pharmaceuticals, Raritan, NJ.
^p Clavamox, Pfizer Animal Health, New York, NY.

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