

Treating the Acute Abdomen

Lisa L. Powell, DVM, DACVECC
University of Minnesota Veterinary Medical Center

Introduction

Acute abdomen is defined as the sudden onset of severe abdominal pain. Other clinical signs that accompany abdominal pain include vomiting, diarrhea, lethargy, anorexia, and a bloated abdomen. Signs specific to pain in the abdominal area include a stiff gait, hunched back, or “prayer position”. If cardiovascular shock is present in association with the underlying cause of the abdominal pain, severe weakness and recumbency may be evident. Often, patients presenting with acute abdomen require emergency surgery for definitive treatment. However, cardiovascular stabilization should precede any surgical intervention. Because not all patients presenting with an acute abdomen require abdominal surgery, quick assessment and diagnosis is imperative in these cases.

Abdominal pain originates from either visceral or somatic neurologic pain pathways. Visceral pain is generated from nerve fibers located within abdominal organs. Stimulation of these pathways from organ distension, stretching of an organ capsule, or ischemia often causes a diffuse, dull pain sensation. Somatic pain is generated from the parietal peritoneum. Stimulation of somatic pain pathways occurs due to intraperitoneal inflammation, and the subsequent release of vasoactive substances and tissue proteinases. Somatic pain tends to be sharper and more localized due to specific areas of innervation into the peritoneum.

Abdominal pain may also be referred from other areas. Patients with intervertebral disk disease often have referred abdominal pain. Injuries to surrounding soft tissues may also result in referred abdominal pain.

The acute abdomen syndrome presents a dilemma when deciding when and if abdominal surgery should be performed. Rapid assessment of the underlying disease process and immediate cardiovascular stabilization results in better decision-making, and improved outcome for the patient.

Causes of Acute Abdomen Syndrome

The sources of abdominal pain that should be considered in a patient with acute abdomen syndrome include gastrointestinal, urinary, splenic, hepatobiliary, reproductive, and peritoneal.

Gastrointestinal causes of acute abdomen include severe enteritis, gastric dilatation without volvulus (GD), gastric dilatation with volvulus (GDV), acute pancreatitis, intestinal foreign body (gastric, pyloric, linear, and nonlinear), gastric or intestinal neoplasia, intestinal intussusception, mesenteric volvulus, and hemorrhagic

gastroenteritis. Patients presenting with mesenteric volvulus, acute pancreatitis, GD, or GDV often present recumbent, with associated cardiovascular shock. Because many of these etiologies cause severe fluid and electrolyte loss into the intestinal lumen, patients presenting with gastrointestinal causes of acute abdomen are often dehydrated and hypovolemic. A history of vomiting is commonly associated with gastrointestinal causes of acute abdomen, and may be accompanied by inappetance, lethargy, and diarrhea.

Urinary causes of acute abdomen include pyelonephritis, renal neoplasia, ethylene glycol intoxication resulting in renal distension and pain, blockage or rupture of ureters or urethra, and bladder rupture. Trauma may result in rupture of the ureters or, more commonly, the bladder. Ureteral calculi can cause ureteral obstruction and acute abdominal pain. Cystic calculi can become lodged in the urethra, causing severe urinary bladder distension and pain, and may result in a ruptured bladder.

Acute abdomen caused by splenic disease may be due to splenic torsion or splenic rupture secondary to neoplasia or trauma. Splenic rupture is associated with hemoabdomen, diagnosed by abdominocentesis. Patients presenting with splenic torsion often exhibit signs of cardiovascular shock.

Hepatic disease leading to acute abdomen includes acute hepatitis, hepatic abscess, traumatic hepatic injury, and liver lobe torsion. Biliary disease includes biliary tract rupture from trauma, inflammation, or neoplasia, resulting in bile peritonitis and acute abdomen.

Reproductive causes of acute abdomen include pyometra, ruptured uterus prior to or during parturition, prostatic abscess, and testicular torsion. An open pyometra is associated with purulent vaginal discharge and a less urgent clinical condition. A closed pyometra requires more immediate surgical intervention, following stabilization, because drainage of the infected uterus is not occurring.

Peritonitis is defined as inflammation of the abdominal parietal peritoneum, and is associated with free abdominal fluid. Septic peritonitis may be caused by intestinal rupture (foreign bodies or neoplasia), ruptured hepatic, pancreatic, or prostatic abscess, gastric rupture, penetrating wounds, ruptured urinary bladder with an associated urinary tract infection, or ruptured pyometra. Acute pancreatitis or FIP can cause a sterile peritonitis. Other causes include bile peritonitis, uroabdomen, and hemoabdomen.

Diagnostics

As with any patient workup, history and physical exam findings are an integral part of a full diagnostic plan. Abdominal neoplasia, gastric dilatation, intestinal foreign bodies, and evidence of an abdominal fluid wave may be apparent on abdominal palpation. Rectal exam can reveal prostatomegaly, and is useful in identifying the presence and character of abnormal feces. Full physical examination should be performed to assess cardiovascular stability, adequate respirations, and mentation.

Immediate laboratory tests should include assessment of packed cell volume, total solids, blood glucose, and blood urea nitrogen. Arterial or venous blood gas analysis is helpful in assessing oxygenation, acid/base abnormalities, and serum electrolytes on an emergent basis. A complete blood count, serum chemistry profile, coagulation profile, and urinalysis should be collected prior to aggressive intravenous fluid therapy if possible. Depending on the underlying disease process, patients may show anemia with hypoproteinemia (blood loss), hypoglycemia (sepsis, insulinoma), azotemia (urogenital disease), leukocytosis (inflammation, sepsis), leukopenia (overwhelming sepsis), hyperbilirubinemia (hepatobiliary disease), or coagulopathy (DIC, anticoagulant rodenticide intoxication). A hypochloremic metabolic alkalosis reflects upper gastrointestinal obstruction. Hyperkalemia can be seen secondary to urethral obstruction or rupture of the ureters or bladder. Metabolic acidosis may be present due to lactic acid production from decreased peripheral perfusion (shock state). Critical patients, or those with suspected sepsis, should have urine, blood, and/or abdominal fluid cultures submitted.

Abdominal radiography should be performed when the patient is stable, or during stabilization efforts. Both lateral and ventrodorsal views should be done, if the patient can withstand dorsal recumbency. Right and left laterals can be taken if dorsal recumbency is not tolerated. Radiography can help to discern the presence of abdominal fluid, free abdominal gas, pancreatitis, presence of a GD or GDV, diaphragmatic hernia, renal, ureteral, cystic, or urethral calculi, intestinal obstructive pattern, presence of intra-abdominal neoplasia, investigation of the retroperitoneal space, ileus, mesenteric volvulus, and gastrointestinal foreign bodies. Plain abdominal radiographs may not be diagnostic in some cases, necessitating contrast studies such as barium upper GI, intravenous pyelogram, and cystourethrogram. If intestinal perforation is a concern, water-soluble contrast should be administered for a contrast gastrointestinal study. Care should be taken if the animal is vomiting or is obtunded, as aspiration of contrast material may occur. Patients should be well hydrated prior to performing an intravenous pyelogram due to the high osmolality of the contrast solution.

Abdominal ultrasonography is being used more frequently to assess patients with acute abdominal pain. Small amounts or pocketed abdominal fluid can easily be seen via ultrasonography, and specific aspiration of the fluid guided by the ultrasound probe can be done. Ultrasound is effective in assessing the presence of pancreatitis, intra-abdominal neoplasia, organ abscesses, hepatobiliary pathology, patency of the ureters, renal pathology, and prostatic disease. Fine needle aspiration and needle biopsies of tissue including the liver, spleen, lymph nodes, and gastrointestinal masses may also be performed with ultrasonography, provided no coagulopathy or severe thrombocytopenia exists. Free gas in the abdominal cavity and the presence of barium within the gastrointestinal tract greatly hinders ultrasonographic evaluation, and may not be diagnostic in these cases.

Computed tomography may be helpful in diagnosing the stable patient with abdominal disease to further assess abdominal pathology when other diagnostic modalities have produced equivocal results, or to evaluate the extent of disease.

Abdominocentesis and diagnostic peritoneal lavage (DPL) are indicated in patients with suspected free abdominal fluid based on 1) palpation of a fluid wave; 2) loss of serosal detail on abdominal radiographs; 3) evidence of free fluid base on ultrasound results; 4) abdominal pain and signs of circulatory shock; 5) trauma-induced abdominal pain, and 6) suspected peritonitis from a prior abdominal surgery. An open-needle technique is preferred for abdominocentesis, providing the best chance for retrieval of small amounts of fluid. If possible, the urinary bladder should be emptied prior to abdominocentesis or DPL. The abdomen is divided into four quadrants, with the umbilicus at the center. The animal is placed in lateral recumbency and the area to be aspirated is clipped of hair and prepped with antiseptic soap and alcohol. Four 22 gauge, 1 and ½ inch long needles are placed in the abdomen in the four quadrants: dorsal-cranial to the umbilicus, dorsal-caudal, ventral-cranial, and ventral-caudal. Minimally, two needles should be placed in the ventral positions. The needles should be placed at a 90° angle to the body wall, and the entire needle should be within the abdominal cavity. The needles can be slowly rotated after placement. Fluid should be allowed to drip out into a collection tube (EDTA tube and clot tube). If no fluid is obtained, a 1 cc syringe can be used to gently aspirate through the needles. A relatively large amount of abdominal fluid must be present for retrieval via abdominocentesis (5.2-25 ml/kg). A second method used to obtain abdominal fluid if abdominocentesis is negative is a diagnostic peritoneal lavage. Only 1-4.4 ml/kg of fluid needs to be present for fluid retrieval when performing a DPL. When performing a DPL, an 18 gauge over-the-needle catheter is placed into the caudoventral abdominal wall with the animal in lateral recumbency. One or two extra holes can be placed near the end of the catheter with a scalpel blade. The catheter remains in the abdomen and 20 ml/kg of warm saline is placed into the abdomen through the catheter. The abdomen is gently agitated, and the fluid is removed for analysis. All the fluid placed into the abdomen will not be retrieved, and will be absorbed by the patient.

Evaluation of abdominal fluid includes cytology, chemistry analysis, PCV and total protein in hemorrhagic effusions, and cell counts. The presence of degenerate neutrophils with intracellular bacteria is diagnostic for a septic abdomen, and emergency exploratory laparotomy following quick stabilization is indicated. The presence of vegetable fibers with inflammatory cells is also consistent with intestinal or colonic perforation; however, care must be taken during evaluation to ensure an intestinal loop was not punctured during aspiration, revealing intraluminal contents. Bile pigment may be noted with bile peritonitis. Neoplastic cells may be evident. Chemistry analyses on abdominal effusions include bilirubin, creatinine, potassium, and lipase. Higher levels of these chemistries compared to serum levels indicate bile peritonitis, uroperitoneum (creatinine and potassium), and pancreatitis, respectively. A PCV comparative peripheral PCV indicates hemorrhage. With DPL fluid, a PCV of more than 2 to 5 percent indicates significant hemorrhage.

Treatment

Treatment of acute abdomen depends on the underlying cause of the abdominal pain. Life-threatening cardiovascular shock must be immediately recognized and treated aggressively. Causes of acute abdomen that may result in cardiovascular shock include GDV, GD, mesenteric torsion, systemic sepsis syndrome due to intra-abdominal sepsis or bacterial translocation from denuded intestinal mucosa, and systemic inflammatory response syndrome due to acute pancreatitis or abdominal neoplasia. Ruptured intra-abdominal hemangiosarcoma or hemangioma may result in hemorrhagic shock, requiring resuscitation with blood products and plasma. Traumatic causes of acute abdomen may result in multiple injuries including bone fractures, lung contusions, pneumothorax, and head trauma.

Animals presented with acute abdomen can usually be placed in one of three categories: nonsurgical, urgent, and critical. Nonsurgical acute abdomens are treated medically with supportive care and analgesia. Examples include acute pancreatitis and severe enteritis. Urgent cases include those patients that require abdominal surgery for definitive treatment, but benefit from medical therapy for a period of time (up to 12 hours). Examples include stabilized intra-abdominal hemorrhage, uroabdomen with the placement of a temporary dialysis catheter, and gastric dilatation without volvulus. Critical patients require abdominal surgery as soon as is practical, following a few hours of cardiovascular stabilization. Heart rate, respiratory rate, and blood pressure should be normalized prior to surgical intervention, if possible. Analgesia coupled with resuscitation with crystalloids, colloids, or blood products as indicated prepares the unstable patient for emergency surgery. In these cases, rapid deterioration may occur if surgical intervention is delayed. Examples of critical situations include GDV, mesenteric torsion, acute peritonitis, diaphragmatic hernia with entrapment of stomach or strangulated intestine in the chest, penetrating abdominal trauma, uncontrolled hemorrhage due to trauma or neoplasia, splenic torsion with associated cardiovascular shock, intestinal linear foreign body, complete intestinal blockage.

Absolute indications for surgery as reported by Saxon (see reference number **XXX**) include:

1. Uncontrollable abdominal hemorrhage and inability to stabilize medically
2. Free gas on plain abdominal radiographs (provided previous surgery has not been performed, and gas was not introduced via abdominocentesis)
3. GDV
4. Intracellular bacteria, fecal or vegetable material in abdominal fluid
5. Bilirubin in abdominal fluid higher than peripheral serum levels
6. Complete bowel obstruction or linear foreign body
7. Penetrating abdominal injury
8. Splenic torsion
9. Mesenteric volvulus
10. Gunshot wound to abdomen
11. Evisceration

12. Abdominal impalement

If the diagnosis is not immediately evident, patients should be hospitalized for further treatment and diagnostics. Serial monitoring including heart rate, respiratory rate, mentation, and abdominal palpation should be performed. A DPL may be a rewarding test if abdominocentesis is negative and free abdominal fluid is suspected. Ultrasound, follow-up abdominal radiographs, contrast studies, and computed tomography are other diagnostics that may help to diagnose the underlying cause of acute abdominal pain.

Analgesia is an important element in the treatment of patients with acute abdomen. Activation of pain receptors results in release of stress hormones, including epinephrine and norepinephrine. Release of these hormones can result in hypertension, peripheral vasoconstriction, tachycardia, and heart arrhythmias. Patients experiencing pain are also less likely to eat, increasing morbidity by causing a negative nitrogen balance. Some analgesics result in hypotension and respiratory depression, and patients should be monitored for significant side effects. Pure agonist opioids such as morphine, hydromorphone, and fentanyl are preferred. Routes of administration include intermittent injections, continuous rate infusions, epidural injection or catheters, intraperitoneal bupivacaine infusions, and transdermal patches. It is the opinion of this author that scheduled doses of analgesics should be administered rather than depending on subjective assessment and “PRN” dosing.

Prognosis

Prognosis for patients presenting with acute abdomen depends on the underlying disease process, presence of cardiovascular shock, and response to treatment. Those diseases carrying a grave prognosis include mesenteric torsion, severe septic peritonitis, and malignant abdominal neoplasia. Many diseases are readily treatable with aggressive intervention, including fluid resuscitation, pain control, and often, exploratory laparotomy.