Introducing the Medical or Surgical Abdomen

André Desrochers dmv, MS, Dipl ACVS, Dipl ECBHM.
Faculty of Veterinary Medicine, Université de Montréal, Saint-Hyacinthe, Québec, Canada

Introduction

A cow is presented to you for colic. At the rectal examination, you palpate tension bands. It’s midnight, the cow is nervous and she wants to lie down constantly. She is 7 month old pregnant. What do you do? Treat her with laxative, a subQ calcium and ketoprofen? Or you open her up on the right side standing to find that she has a volvulus and the bowel are falling out of the abdomen while she decides to lie down on the right side. Déjà vu? What should you consider before going in surgery or rather treat her medically. ‘A chance to cut is a chance to cure’ does not apply to all animals. We will discuss the criteria that may influence your decision process to decide if it’s a surgical abdomen or not.

Surgical Abdomen or Not

Some of those pathologies are surgical and other medical. Before taking the decision to favour a surgical or medical approach, you need to gather information and approach the case in a logical manner? (1) Review the possible causes of abdominal pain relevant to the particular case, (2) Recognize the indications for immediate surgery, (3) Is surgery an option (economics, facilities, surgical abilities) (4) Establish medical treatment prior to or during surgery, (5) If surgery is postponed, determine in advance a precise time and list criteria to be monitored help decision making, (6) Establish and present to the client a most realistic prognosis and cost estimate. A systematic approach based on adequate signalment and history, complete physical examination and judicious choice of ancillary tests represents the tools available to the clinicians.

Abdominal Pain in Ruminants

Abdominal pain may be a consequence of excess distension of a hollow viscus, spasm of intestinal smooth muscle, stretching of the mesenteric supporting structure, intestinal ischemia, or chemical irritation of the visceral or parietal peritoneum. Abdominal pain may be classified into visceral pain (hollow viscus and solid organs) and parietal pain (parietal peritoneum, abdominal muscles, rib cage). Visceral and parietal pain can be differentiated using history and clinical observation of the animal; however this task is often difficult. Pain sensation from the parietal peritoneum travel through the peripheral spinal nerves and usually localizes over the affected area. Since parietal pain is exacerbated by pressure and tension modification, the patient is reluctant to move and have a tonic reflex contraction of the abdominal muscles. In most cases, no active clinical sign of colic are recognize. Some pain fiber endings are located in the submucosa and muscle layers of hollow viscous (intestines, bladder), and in the capsule of solid organs (kidney, liver). Consequently, distention, forceful contraction or traction will produce pain in a hollow viscous. Capsule stretching will create pain in a solid organ. Visceral pain is associated with active manifestation of colic: kicking at the abdomen, treading with the rear feet, lying down or standing and stretching out. Visceral pain is transmitted via sensory fibers in the autonomic nerves and is often diffuse and difficult to localize.

Differential diagnosis for abdominal pain in ruminants may be first categorized into abdominal or extra-abdominal origin. Extra-abdominal causes include thoracic pain, laminitis, hypokalemia and myopathy. The abdominal causes can then be sub-categorized into digestive or non digestive origin. The non digestive causes include pyelonephritis, urolithiasis and uterine torsion.
while the abdominal digestive causes include volvulus, intussusception, enteritis, incarceration, reticuloperitonitis, gastric ulcer and ileus.

**Immediate Surgery?**

If surgery is the only possible treatment offering a complete recovery and a long term positive outcome, there is no reason to delay the intervention. A good example is a case of abomasal volvulus where the definitive diagnosis is clinically achievable in some situations and where the rate of recovery using medical treatment alone is 0%. Unfortunately, in most acute abdomen, the certainty of the clinical diagnosis is not as great as in cases of abomasal volvulus and medical treatment could appear promising at first. This is why in all species, clinical and clinico-pathological criteria have been studied in hope to define an evidence-based approach. So far, there are no clinical studies establishing objective criteria for decision making if immediate surgery is needed. The following criteria are frequently used in our clinics: rapidity of the evolution since the first clinical sign, severity of colic and its response to therapy if attempted prior to referral, the severity of the abdominal distension, the heart rate and abdominal examination per rectum. When available, the serum chloride, potassium and calcium are of great interest.

**Physical Examination**

As stated earlier, there is no definitive criteria that will help you decide if you must do a surgery or not. Very distended abdomen needs assistance rapidly. A stomach tube should be passed to decompress the rumen. If no free gas is coming out of the tube, it’s maybe a frothy bloat or intestinal volvulus. Abnormal findings at rectal palpation would be presence of fresh blood, absence of feces, tension band, distended small bowel, distended cecum, a mass in the middle of small bowels. Ileus and peracute enteritis can be easily confused with jejunal obstruction. Usually the small bowel will distend primarily with fluids and easily palpable per rectum. Tension bands maybe palpated as well. In volvulus, intestines are severely distended with gas occupying the pelvic cavity. Intussusception is difficult to identify precisely but usually we suspect it if we feel a hard mass in the middle of distended small bowell. Animals with enteritis may run a fever and show other clinical signs or lab results compatible with it. Finally, the heart rate is a good indicator of the severity of the condition but should be correlated with other findings. A cow with mildly distended small bowel and a heart rate of 80 does not need immediate assistance. However, a cow with distended organ and heart rate of 100 and dehydrated needs immediate assistance.

**Establishing Medical Treatment**

At this point, your goal is to treat the patient medically or anyhow to improve his general condition before a surgery. While the animal is treated or stabilized, diagnostic procedures can be performed to rule out some conditions by doing specific examination, blood work and ultrasound. The goal of supportive therapy is to correct hemodynamic and metabolic imbalances, to control pain and to prevent or treat infection if suspected. Fluid therapy, non-steroidal anti-inflammatory drugs and antimicrobial drugs are commonly used.

**Fluid Therapy**

Crystalloid solutions (0.9% NaCl, Ringer’s solution) are indicated initially to replenish fluid loss and improve the circulating blood volume. In our clinics, we often use a volume of 20 L of isotonic saline in adult cows (20 L IV in 60-90 minutes). Intravenous administration of hypertonic saline provides a rapid resuscitation in dehydrated or endotoxemic ruminants. A rate of 4-5 mL/kg of hypertonic solution should be administered IV through the jugular vein over 4-5 minutes. In our
clinics, unless the animal is unable to stand or showing clinical signs of acute blood loss, hypertonic solutions are not used routinely in case of acute abdomen. Ideally, correction of electrolytes imbalance should be based on laboratory results. Most patients with acute abdomen suffer of metabolic alkalosis associated with hypochloremia and hypokalemia. Hypocalcemia is common in ruminants with gastrointestinal diseases. Calcium ions are of particular importance in gastrointestinal motility. In our clinics, the intravenous solution used for the medical treatment of an acute abdomen is most often an isotonic saline to which calcium borogluconate is added. The Ringer’s solution containing 8.6 g/l NaCl, 0.3 g/L KCl, and 0.3 g/L CaCl₂ is the commercial available solution of choice.

Pain

Pain is a primary cause of gastrointestinal hypomotility. Gastrointestinal pain increases sympathetic tone causing general inhibition of the gastrointestinal tract. Peritoneal inflammation or irritation and associated pain is an initiatory factor of ileus in several species. Consequently, analgesic and anti-inflammatory drugs are often considered in the management of the bovine acute abdomen. These drugs must be used with the complete knowledge of their side-effects. Non steroidal anti-inflammatory drugs (NSAIDs) may induce abomasal ulcers particularly in an anorexic patient. Analgesics may also alter clinical signs (pain, fever) used to decision making in a particular case. NSAIDs are commonly used. There is no information comparing the efficacy of the different NSAIDs available in food animal medicine related to their use in the management of acute abdomen. Anderson and Muir report that based on clinical observation flunixin provides an excellent visceral analgesia. In our clinical experience, flunixin and ketoprofen are both adequate to control visceral pain in cattle. Sedatives and analgesics such as xylazine, detomidine and medetomidine could also be used to relieve pain in cases of acute abdomen. In a cow with large intestinal obstruction, signs of abdominal discomfort disappear immediately after the administration of a single dose of xylazine (0.05 mg/kg, IV) for at least 1 hour. Xylazine is reported to have significant effects on the gastrointestinal tract in cattle, altering reticuloruminal and intestinal motility. Because of the associated hemodynamic changes, these drugs must be used with caution in patients in arterial hypotension or/and in shock. Moreover, you should go light on the xylazine if you plan to do the surgery standing. In our clinics, one treatment of ketoprofen is administered to virtually all cases of acute abdomen very shortly after initial assessment. In several cases, it is administered prior to referral.

Antimicrobial

Bacterial translocation from the intestines may occur in cases of mechanical or functional ileus secondary to bacterial overgrowth, inflammation and impairment of barrier function of the intestinal wall. In human medicine, prolonged broad spectrum antibiotic therapy in case of surgical acute abdomen does not appear beneficial. In human medicine, the current recommendation is a single prophylactic antibiotic administration when there is no or minimal evidence of contamination and a 5 to 7 days regimen when infection is identified during the procedure (localized or diffused).

Laxatives

The use of laxatives in cases of suspected gastrointestinal obstruction or ileus is at the least controversial since the intestines are already filled with gas and fluid. In human medicine, laxatives are frequently used for the treatment of postoperative ileus, however there is no study that could demonstrate their true benefit. Braun et al. reported that the use of laxatives in the treatment of cecal disorders delay the time to first defecation. Magnesium hydroxide may induce metabolic alkalosis and hypermagnesemia, increased ruminal pH and decreased rumen microbial activity.
**Prokinetic Drugs**
Motility-modifying agents may be used in the management of gastro-intestinal disorders. Steiner reviewed the different prokinetics that can be used in ruminant medicine and their clinical implication. In our clinics, we do not tend to use prokinetic in acute abdomen patients.

**Diagnostic Procedures**
Ancillary diagnostic tests mainly serve three purposes: assessment of the patient’s immediate requirements, attainment of an etiological diagnosis and helping determining prognosis. The following procedures are the ones we find most useful in the management of an acute abdomen patient.

**Hematology**
Hematologic profiles are useful for assessing hydration and for indicating the presence of inflammation. Of particular interest is the relationship between plasma protein concentration and PCV. An increased PCV combined to a normal to decreased plasma protein concentration often indicate an active secretion of protein-rich fluid into the peritoneal cavity.

**Biochemistry Profile**
Most gastrointestinal impairment leads to sequestration of the high-chloride abomasal contents into the upper gastrointestinal system. Some degree of systemic hypochloremic hypokalemic metabolic alkalosis eventually develops. The diagnostic value of this finding is limited since it does not bring precise information on the possible etiology and has controversial value as a prognostic indicator. Moreover, it is so common that one may assume it is occurring if the physical examination reveals a gastrointestinal stasis. We have seen severe depletion of chloride (<70 meq/L) in duodenal obstruction. In some cases, the obstruction was real and localized at the sigmoid flexure. In other animals, no real obstruction was found in surgery and IV administration of NaCl corrected the situation. Serum calcium concentration is of great interest since it is commonly low in anorexic periparturient dairy cattle. It is so important in gut motility that we feel we cannot ignore even a marginal diminution. Elevated BUN with normal creatinine is a sign of GI bleeding. Melena may be observed at the same time. Animal with gastric ulcers or jejunal hemorrhagic syndrome will have high BUN compared to slightly elevated creatinine level (dehydration). Severe hypokalemia will provoke myositis and ileus. Cows with potassium as low as 2 meq/L have been referred to our clinic for colic and possible GI obstruction (general discomfort and tension band at the rectal palpation). Although other electrolytes and acid base imbalance were associated with it, those cases were managed medically.

**Abdominocentesis and Peritoneal Fluid Evaluation**
Abdominocentesis is a simple practical tool to manage acute abdomen. However, absence of peritoneal fluid does not rule out the possibility of peritonitis. A large volume of peritoneal fluid is abnormal. Normal bovine peritoneal fluid should be clear, with a specific density less than 1.016. Protein content should be less than 3 g/dl, although some authors have reported normal values up to 6.3 g/dl (the major part being albumin). Nucleated cells count should be less than 10 000 cells per µl, with a majority of macrophages. Lymphocytes, eosinophils and desquamated mesothelial cells may also be present. Neutrophils are rare. Periparturient cattle have significantly more peritoneal fluid with a lower protein concentration. Cytological examination of the peritoneal fluid is a useful aid in making a definitive diagnosis of peritonitis. Very little is known on the most common bacteria isolated from acute or chronic peritonitis, however since *Arcanobacter pyogenes* is commonly isolated from abscess in the bovine, one could assume that it may be of importance in chronic abcedative cases.
**Ultrasound Examination**

Ultrasound is used to image soft tissues of the abdominal cavity. The potential of this tool is enormous. The size and anatomic relationship of lesions may be delineated. Knowledge of the underlying anatomy is important to avoid misinterpretation of images. Abscesses, tumors, large amount of free fluid and intussusceptions have been identified in our clinic using ultrasound. We look for distended bowel or the presence of distended and empty bowels at the same time, compatible with an obstruction. With experience, perforated ulcers can be distinguished by ultrasound avoiding an unnecessary stressful surgery to the animal. Reticuloperitonitis can be easily identified by looking at the movement of the reticulum and the presence of fluids and fibrin surrounding it.

**Cranial Abdominal Radiography**

Radiology of the cranial abdomen is a useful diagnostic aid. It is however limited to reference centers with high quality equipment due to the difficulty to penetrate the depth and density of tissues involved. Radiography of the diaphragm and reticulum is feasible with large units. Reticular radiography is of particular interest in the diagnosis of traumatic reticuloperitonitis.

**Fecal Occult Blood**

Bleeding into the gastrointestinal system commonly occurs with abomasal ulceration, severe gastroenteritis / enteritis, parasitism, structural lesions (eg. neoplasia), and local vascular engorgement or obstruction (eg. intussusception, abomasal volvulus). One useful diagnostic test to detect abomasal ulcer is the fecal occult blood test. This test is inexpensive and can be performed during the physical examination.

**Open It, See it!**

Exploratory laparotomy or laparoscopy is a valuable ancillary diagnostic procedure in ruminants. Information obtained from the physical examination and laboratory data is often indicative of a diagnosis but does not provide a specific cause. Cattle are particularly amenable to exploratory surgery as the procedure is performed standing and with care towards asepsis is associated with little complications. The approach for exploratory celiotomy is determined by the suspected location of the problem. Traumatic reticuloperitonitis and primary rumen disorders are usually approached from the left side, so that if indicated a rumenotomy may be performed. Abomasal disorders may be approached from either the left, right or paramedian incisions. Small and large bowel disorders are approached from the right side. Standing flank procedures are the least compromising to the patient. A squeeze chute with or without sedation, and a regional anesthesia (eg. paravertebral) is usually required for beef cattle. Dairy cattle often only require a set of stocks and local analgesia. As with the physical examination and rectal examination a systematic approach is important.

**References**