Acute abdomen is defined as a condition characterised by the acute onset of abdominal pain. Such a condition requires a rapid diagnosis and appropriate therapy, be it medical or surgical, or a combination of both. Affected patients will present with variable severity of clinical disease. Those that are severely affected may require emergency therapy prior to the collection of a complete history and performance of a complete physical examination. In patients with severe disease there is the potential for systemic complications of disease such as sepsis, a systemic inflammatory response syndrome (SIRS), disseminated intravascular coagulopathy (DIC) and multiple organ dysfunction syndrome (MODS).

Acute onset abdominal pain can be the result of intra-abdominal or extra-abdominal disease. Intra-abdominal causes can include distension or traction of the gastrointestinal tract or gall bladder (or even ureters or the bladder), stretching or traction of the capsule of an organ, inflammation of an organ or the peritoneum, or potentially ischaemia. Gastrointestinal ulceration can sometimes be a cause for abdominal pain. Extra-abdominal causes of abdominal pain can include spinal pain (intervertebral disc disease, trauma, inflammation), myositis or perhaps steatitis.

**Emergency Evaluation**
A very basic examination could include evaluation of the temperature, heart rate and rhythm, pulse strength, respiratory rate and effort, mucous membrane colour and capillary refill time, and an assessment of the level of consciousness. If there is tachycardia, weakness, weak pulses, pale membranes and cool extremities there is a likelihood of shock, and fluid resuscitation is required. If there is fever, injected mucous membranes with rapid capillary refill, and bounding pulses it is suggestive of the hyperdynamic phase of shock, and there is the potential for sepsis, and fluid therapy is also required. Blood should be drawn, and an intravenous catheter placed to allow fluid resuscitation. Oxygen should be provided if there is concern of hypoxaemia. Analgesics should also be provided in the acute situation. Pure mu agonists are typically preferred, so methadone, morphine, and fentanyl are alternatives.

**Signalment**
The signalment will not always provide significant information, but may help narrow the list of potential causes of disease. An overweight middle aged Cocker Spaniel may be more likely to have pancreatitis, whereas a young dog is more likely to have a gastrointestinal foreign body, whereas a large, deep chested dog may be more likely to have a GDV.

**History**
A general history should be obtained, but specific questions should be asked about prior illnesses (gastrointestinal, neoplastic for example), medications (especially NSAIDs or glucocorticoids), potential ingestion of toxins, spoiled food, garbage, table scraps, or foreign bodies. Previous gastrointestinal signs or melena may point to a primary
gastrointestinal disease. Dysuria, stranguria, pollakiuria or haematuria could suggest a urinary tract focus for the disease.

**Physical Examination**
A thorough examination should be performed in addition to the initial examination described previously. A careful abdominal examination should include auscultation, palpation for masses, a distended gastrointestinal tract, organomegaly, ballotment for signs of abdominal effusion. Abdominal percussion can be useful in the diagnosis of a gastric dilation +/- volvulus. A rectal examination is warranted to check the prostate in male dogs, palpate the urethra, attempt to palpate the medial iliac lymph nodes, and to check the nature of the faeces. In cases of trauma or dog fights it is indicated to clip the abdomen and look for any potentially penetrating wounds or haemorrhages.

**Diagnostics**
There are some basic clinicopathological tests that should be performed as soon as possible after patient presentation. These include a PCV/TP, blood glucose, and a blood urea. The electrolytes should also be checked, and if possible a blood gas analysis performed. If there are in house testing capabilities an albumin should also be evaluated, as it can sometimes be quite low.

Further testing may then be indicated. A complete blood count should be performed. The red cell parameters are variable. Thrombocytosis may be a response to inflammation, but thrombocytopenia can be the result of platelet consumption or destruction. The leucogram can vary, from neutropaenia secondary to consumption through to a neutrophilia and left shift as a result of inflammation. A biochemical profile is indicated to check for signs of organ dysfunction. A urinalysis is also required to help interpret the biochemical profile and to check for bacteriuria. If there are signs of abdominal effusion or a coagulopathy a blind cystocentesis may not be indicated. Coagulation testing (prothrombin time, activated partial thromboplastin time) is also indicated and may provide indications of DIC. In patients with diarrhoea faecal parasitology may be indicated, and perhaps testing for infectious agents.

Abdominal imaging is indicated in cases of an acute abdomen. Radiography can be useful in cases of gastrointestinal obstruction, foreign bodies, gastric dilation volvulus, bladder distension, and can be used to determine the presence of organomegaly. In cases with potential intestinal obstruction where the radiographic findings are equivocal, radiographs could be repeated in a few hours to assess progression or resolution. Free abdominal gas raises concern of gastrointestinal tract rupture, penetrating injuries, or sometimes infection. Gas within the hepatic parenchyma raises concern of serious infection. Abdominal ultrasonography can provide more detailed information on the GI tract, and abnormalities in abdominal organs, including the prostate and uterus. It can also help confirm the presence of abdominal effusion, and can aid in the sampling of small volume effusions, or can guide fine needle aspiration of lesions detected.

Abdominal effusion analysis is essential in the diagnosis of underlying disease, and also provides guidance on whether surgical intervention is required in an individual patient. A basic analysis can be performed in-house with a total protein measurement, a PCV if the fluid appears blood stained, and a smear review. The presence of an elevated protein level, increased neutrophil numbers, and intracellular bacteria suggest septic peritonitis, and provide an indication for surgical intervention. A full fluid evaluation should be performed at a diagnostic laboratory, including cell counts. If bacteria are detected, or
there is a suspicion of sepsis aerobic and anaerobic cultures are indicated. In some cases a biochemical evaluation of the fluid will be of value. If the abdominal fluid glucose is > 1 mmol/L less than the blood glucose septic peritonitis is likely. A bilirubin concentration in fluid greater than the serum concentration is suggestive of biliary rupture. Potassium levels higher in abdominal fluid can suggest urinary tract rupture. Urea or creatinine levels may be higher in abdominal fluid acutely after bladder rupture, but they will equilibrate over time.

If an abdominocentesis is negative, a diagnostic peritoneal lavage becomes an option. This can be achieved using a commercial catheter that has preplaced holes, or using an intravenous catheter with side holes cut into it, that can be from 18 g to 14 g depending on the size of the patient. The bladder should be emptied first. The ventral midline should be clipped and surgically prepared. The animal should be in left lateral recumbency. A small amount of local anaesthetic is infused just caudal to the umbilicus on the midline of just lateral. A small stab incision is made into the skin. The catheter is gently inserted into the abdomen. A syringe can be placed and gentle aspiration performed, because if fluid is collected there is no need for a lavage. If no fluid is obtained 22ml/kg of warm 0.9% saline is infused. The animal is gently rolled, and then a syringe is used to gently aspirate a fluid sample. A suture or staple can be used to close the skin incision.

**Aetiology of Septic Peritonitis**

Gastrointestinal leakage is a most commonly implicated in cases of septic peritonitis. This can be the result of gastrointestinal accidents such as foreign bodies, GDV, intussusception, penetrating trauma etc. There can be leakage through neoplastic lesions, inflammatory lesions, or gastrointestinal ulcers. There can also be gastrointestinal leakage post intestinal surgery or biopsy. Risk factors for septic peritonitis post surgery include low pre-operative serum albumin and protein concentrations, and intraoperative hypotension. Obviously medications such as NSAIDs or glucocorticoids can cause ulcers (even at appropriate dosages), but they may also be a consequence of systemic disease such as neoplasia (mast cell tumours, gastrinoma), metabolic disease etc. The bacterial load in the GI tract increases as it progresses distally, so upper GI leakage may be associated with less severe signs. Gastrointestinal contamination results in mixed organisms, with anaerobes typically involved.

The genitourinary tract can also be a source of contamination of the abdomen. Uroperitoneum can be septic if there was a urinary tract infection present prior to leakage. There can be contamination of the peritoneal cavity with pyometra, uterine or vaginal rupture during parturition or diagnostic procedures, or leakage from a prostatic abscess (perhaps as a result of diagnostic procedures).

The liver can also be a source of contamination. Hepatic abscesses can potentially leak, or there can be rupture of the biliary system, which may occur with trauma, biliary mucocoeles, or as a result of severe cholecystitis or occasionally gall bladder infarction.

**Therapy**

Initial therapy of a patient with acute abdomen is typically based on fluid therapy and analgesics. Balanced electrolyte solutions can be used, and rates may need to approach shock rates for patients with trauma, severe hypovolaemia or hypotension. In cases with hypoalbuminaemia or refractory hypotension, colloid solutions may be of benefit, either
synthetic or natural. If a patient has signs of a coagulopathy fresh frozen plasma will likely be of benefit.

Antimicrobial therapy will be indicated in cases with septic peritonitis. If there is gastrointestinal leakage broad spectrum, four-quadrant antimicrobial therapy is indicated, and should be administered intravenously. For other causes of septic peritonitis the antimicrobial choice should be based on the source of contamination whilst awaiting culture results, but bile peritonitis should likely have broad-spectrum therapy.

Gastric protectant therapy will be indicated if there are signs of gastrointestinal ulceration. Antiemetic therapy may be indicated as necessary, and drugs such as metoclopramide (as a continuous rate infusion), maropitant, or ondansetron are suitable choices. In patients with ongoing anappetence enteral feeding may be indicated to maintain enterocyte nutrition, and help support the immune system.

The decision of whether surgery is indicated is simple in some cases, such as a GDV, intestinal obstruction, pyometra, traumatic abdominal injuries, or septic peritonitis. In other cases it is less straightforward. In many cases if there is doubt it may be more prudent to consider surgery, as long as the patient is stable enough and the surgical intervention itself will not increase morbidity and mortality.

If surgery is performed, ideally the underlying disease can be treated, such as removal of a foreign body, resection of diseased intestine, correction of a gastric dilation volvulus, excision of a neoplastic disease, drainage and omentisation of a prostatic abscess, excision of a pancreatic abscess, removal of a pyometra, resection of a hepatic mass/abscess, or removal of a torsed spleen. There would be copious lavage of the abdomen at the time of surgery. The question then remains of whether post-operative drainage is indicated or not. Indications could include an inability to control the source of contamination, generalised peritonitis where significant ongoing fluid production is anticipated, or severe localised peritonitis. Large volume effusions inhibit peritoneal defence mechanisms, limit localisation of contamination, and can speed the absorption of bacteria and endotoxins. In some cases such as a prostatic abscess omentisation is indicated, as the immunological and angiogenic properties of the omentum can help in local infection control and wound healing.

Open peritoneal drainage has been utilised in severe cases of generalised peritonitis. It may be best utilised where a second surgery would be anticipated, and also anaerobic infections. The falciform fat is excised, and the linea alba closed with a gap left open, and the subcutaneous tissue and skin are not closed. Sterile dressings are placed over the wound, and can be secured by having large loops of suture adjacent the wound, and using umbilical tape to hold the dressing down, and it should be changed at least daily. An indwelling urinary catheter and closed collection system helps reduce wound contamination. The wound is closed when the underlying disease process and peritonitis are controlled. Hypoproteinaemia, nosocomial infection and extended hospital stays are potential complications.

In the past attempts to place abdominal drains had the challenge of the drains being rapidly encased by the omentum and viscera. However there are now other techniques to promote ongoing drainage in a closed abdomen. A vacuum-assisted closure device has been described, but more commonly utilised are closed suction drainage techniques. These utilise a fenestrated silicone drain attached to an external reservoir via a non-
fenestrated tube, such as seen with Jackson Pratt drains. The drain is typically placed near the liver in the most dependant part of the abdominal cavity, but sometimes more caudally if indicated. The tubing exits the abdomen via a small paramedian incision, and it is secured with a purse string and finger trap suture. The contents of the drain are emptied on an as needed basis. Periodic cytological evaluation of fluid may be helpful.

Suggested Reading/References


