Surgery for the Acute Abdomen

Septic Peritonitis

Dogs

- ~60% gastrointestinal origin
  - Foreign body (linear FB is the most common ~40% of cases)
  - Post-op dehiscence
- Genitourinary tract ~23%
- Hepatobiliary ~15%
- Others
  - LN abscesses
  - Penetrating trauma
  - Migrating grass awn
- Reported mortality 20-46%

Cats

- ~47% gastrointestinal (50% are due to perforated neoplastic lesions)
- ~15% due to trauma
- ~14% No obvious cause
- Others
  - Urinary
  - Pancreatic
  - Hepatobiliary
- Cats may present without abdominal pain (~60%) and bradycardia (~16%)
- Mortality rate 30%

Clinical signs

- Non-specific (lethargy, anorexia, pyrexia, abdominal pain)

Diagnostics

- May stop with imaging if the problem is already identified
  - pneumoperitoneum, GI obstruction, intussusception, trauma
- Abdominocentesis
  - Detection of intracellular bacteria (Gold Standard)
  - Look for neutrophil degeneration which is dependent on the amount and virulence of toxins in exudate
- Plasma vs effusion glucose
  - If effusion glucose is >2.1 mmol/L lower than plasma it is suggestive of septic peritonitis

- If glucose is very low in the effusion septic peritonitis is more likely

Surgical therapy

- Treat underlying cause – Source control!
- Take samples for biopsy
- Take swabs for aerobic and anaerobic culture and sensitivity
- Lavage generously with large volume warm balanced electrolyte solution
  - At least 100mL/kg
  - No intra-peritoneal antibiotics
    - The efficacy is no better than systemic and it is irritating to the organs
  - Aspirate/suction as much fluid as possible
- Consider the need for ongoing drainage
  - When to place a drain?
    - Have you achieved definitive source control?
    - Do you anticipate much ongoing effusion?
    - Do you expect uncomplicated healing?
  - Active draining – closed suction
    - Jackson-Pratt or Blake drains
    - Advantages: Closed system, relatively cheap, fluid samples for cytology
    - Disadvantages: No opportunity to re-debride
  - Open abdominal drainage
    - Abdominal incision left partially open to allow for fluid drainage for 2-5 days
    - Advantages: improved drainage, ability to re-explore, discourages anaerobic growth
    - Disadvantages: cost, monitoring, hypoproteinemia, nosocomial infections, pain
- Consider post-operative feeding tube

Antimicrobial Use

- Always perform a culture and sensitivity
- MDR nosocomial isolates are common
- Resistant isolates
  - 71% to ampicillin, 43% to ciprofloxacin, 39% to cefazolin
  - Fluoroquinolones high rate of resistance development
- Higher mortality in cases with inappropriate antimicrobial selection and polymicrobial infections

Hemoperitoneum

- Traumatic – often nonsurgical

    - Blunt (HBC)
    - Penetrating
- Non-traumatic (spontaneous) – usually surgical
    - Neoplasia
        - Dogs = 80%
            - Spleen
        - Cats = 46%
            - Liver (benign and malignant)
        - Other organs = kidneys and adrenal glands
        - Most common neoplasia: Hemangiosarcoma
            - Dogs 88% of spleen malignancies
            - Cats 60%
    - Splenic hematoma
    - Coagulopathy
    - Migrating FB
    - Ruptured abscess
    - Liver lobe torsion
    - Splenic torsion
    - GDV

Splenic Hemoperitoneum

- Small dog size (<20kg) was associated with lower incidence of splenic hemorrhage compared to large dogs
- Hemangiosarcoma was found in 67.5% of large dogs and 50% of small dogs
- Benign lesions 15% in small and large dogs
- Ventricular arrhythmias are more common in hemoperitoneum cases and are associated with an increased risk of mortality

Fluid analysis for a Hemoperitoneum

- Abdominocentesis or diagnostic peritoneallavage
- Blood that has been in contact with the peritoneum for 45 minutes does not clot since it is free of platelets
- Evaluate PCV/TS of fluid
    - Abdominal fluid vs Peripheral PCV is usually similar or sometimes higher
    - Often some hemolysis in plasma

Treatment

- Stabilize
    - IVF – shock rates

    - Blood products
    - Consider abdominal wrap/compressive bandage
- Surgery
    - Difference between traumatic and spontaneous hemoperitoneum

Splenectomy

- Ligation of Splenic and Short Gastric Arteries
    - Pros
        - Fewer ligatures
        - Possibly faster
    - Cons
        - Risks damaging pancreatic blood supply
        - Reduced blood supply to stomach
- Hilar splenectomy
    - Transect vessels directly at the hilus
        - Suture, hemoclips, vessel sealing device
        - Excise omental adhesions (can have tumor nodules)
    - Pros
        - Preserves collateral blood supply to nearby tissues
        - Smaller diameter vessels – less risk of significant hemorrhage
    - Cons
        - Slower if using sutures for ligation
        - Potentially closer to neoplastic tissue in the spleen

Splenic torsion

- Presentation
    - Malaise to acute collapse
    - Splenomegaly palpable in most cases
    - Occlusion of splenic vein first results in continued enlargement and sequestration of blood
    - Abdominal radiographs reduced abdominal detail +/- splenomegaly
    - Abdominal ultrasound: hypoechoic spleen with decreased blood flow in splenic vessels
- Treatment
    - Splenectomy
    - DO NOT de-rotate the spleen > reprofusion injury
        - Caution with the pancreas and blood supply to the left limb of the pancreas

Mesenteric torsion

- Presentation
    - Acute cardiovascular collapse
    - Majority of portal blood flow is reduced
    - Severe abdominal pain/collapse/recumbency
    - +/- abdominal distention
    - Radiographs show a diffuse dilation of bowel
- Treatment
    - De-rotate and resect the necrotic portions
        - Often entire intestines are ischemic
        - Reperfusion injury is still of concern
    - Acute emergency with a grave prognosis

Uroabdomen

- Medical not a surgical emergency
- *Usually* non-septic but possible
- Peritonitis is not as severe compared to septic cases
- Significant metabolic consequences

Pathophysiology

- Urine is typically hyper-osmolar to ECF
    - Fluid shifts into the abdominal cavity
- Small solutes (urea) and electrolytes (K^+) rapidly shift down their concentration gradient into the ECF
- Large molecules (creatinine) persist and provide an osmotic gradient
- Dehydration
    - Third spacing of fluid
    - Vomiting and lack of intake
- Azotemia is commonly seen
- Hyperkalemia in 31% of dogs and 54% of cats
- Chemical peritonitis occurs worsening 3rd spacing and may lead to ileus and pain
- Leakage is typically from the bladder 56%
    - 26% urethra
    - 5% kidney
    - 2% bladder and kidney
    - 2% from ureter
    - 9% undetermined

Clinical signs

- Hematuria, stranguria
- Anuria (many can still urinate)
- Vomiting
- Abdominal distension
- Swollen, cellulitis
- Dehydration
- Lethargy, mental depression
- Trauma patients without uroperitoneum have similar signs
- Diagnosis can be delayed without diligent work-up

Etiology

- Trauma in 85% of cases
    - Dogs
        - Blunt trauma
        - Pelvic fractures
    - Cats
        - Blunt trauma (56%)
        - Urethral catheterization (32%)
        - Bladder expression (9%)
    - Much less common in cats
        - Post-cystotomy, nephrotomy
        - Rupture secondary to obstruction, neoplasia
        - Iatrogenic (inadvertent ureter trauma)

Diagnosis

- Measure effusion and peripheral blood K^+ and creatinine
    - Ratios above 2:1 for creatinine
    - Ratios above 1.4:1 in dogs and 1.9:1 in cats for potassium
        - Dogs with uroabdomen usually have even higher values in effusion >4:1
- Radiography
    - Pain radiography
        - Loss of serosal detail
        - Ability to see a full bladder does not always confirm the urinary tract is completely intact
    - Pelvic fractures
        - More likely to have urinary tract trauma
- Contrast imaging
    - Positive contrast retrograde cystourethrogram
        - Contrast study of choice for Lower UT

- Fluoroscopic retrograde positive contrast study
    - Easier to catch dynamic leaks
- IV excretory urogram
    - Upper UT trauma
- Antergrade pyelogram
    - Upper UT trauma
- Ultrasound +/- contrast cystography (microbubble)
- Computed tomography
    - Usually rads are enough, CT is pricy
    - Harder to catch dynamic leaks like with radiographs/fluoroscopy

Surgical Treatment

- Repair of bladder wall/urethral defects
- Urethral anastomosis
- Radical cystectomy
    - Complications: Pollakiuria, dysuria
- Urethral reimplantation