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MANAGEMENT OF URINARY OBSTRUCTION/ UROABDOMEN

Cystolithiasis, neoplasia, and rupture are the most common abnormalities of the urinary bladder in small animals. Urinary obstruction may occur if calculi become lodged in the urethra, or if a tumor obstructs the proximal urethra or trigone. Obstruction to urinary flow may cause a distended urinary bladder, postrenal azotemia, and hyperkalemia. Bladder rupture primarily occurs after motor vehicular trauma but may also be caused by necrotic bladder (e.g., following damage to its blood supply or prolonged urethral obstruction) or as a complication of bladder surgery. Urinary leakage into the abdominal cavity eventually causes uremia, dehydration, hypovolemia, hyperkalemia, and death if undiagnosed or untreated. Urinary obstruction and uroperitoneum are medical emergencies, not surgical emergencies. Hyperkalemia associated with these conditions makes the animal prone to cardiac arrhythmias; therefore, fluid and electrolyte abnormalities should be corrected before anesthesia.

Hyperkalemia from uroabdomen responds well to abdominal drainage plus intravenous fluid therapy. Hyperkalemia caused by urethral obstruction responds well to intravenous fluids plus elimination of the obstruction (e.g., urethral catheterization or decompressive cystocentesis). Although seldom required, life-threatening hyperkalemia may be treated with IV sodium bicarbonate. Bicarbonate therapy drives potassium into cells in exchange for hydrogen ions. Patients with life-threatening hyperkalemia are often moribund and poorly responsive. Sometimes these patients may have respiratory acidosis associated with poor ventilation, in which case they can be intubated and hyperventilated to correct respiratory acidosis. Similar to administering bicar¬bonate, hyperventilating the patient raises pH and drives potassium intracellularly. Alternatively, life-threatening hyperkalemia can be treated with insulin and dextrose administration. Insulin facilitates cellular uptake of potassium, whereas dextrose prevents hypoglycemia following insulin administration. If the hyperkalemia appears immediately life threatening, 10% calcium gluconate can be given slowly intravenously while watching the ECG; this may protect the heart until other therapy lowers the plasma potassium concentration.

Preventing reabsorption of electrolytes and waste products by abdominal drainage, urinary catheterization, and IV fluid therapy is the best way to treat hyperkalemia and azotemia in animals with uroperitoneum. Closed systems (e.g., 14-g over-the-needle catheter) are preferred for abdominal drainage because they can be attached to an empty fluid bag, allowing for a closed system and quantification of abdominal fluid loss to gauge the amount of IV fluid replacement. The goal of abdominal drainage in these patients is to normalize serum electrolytes and decrease azotemia, making the animal a better candidate for general anesthesia. Fluid therapy, urethral catheterization, and abdominal drainage for 6 to 12 hours are often adequate for this purpose. Peritoneal dialysis or hemodialysis may be useful when treating patients with concurrent renal dysfunction.

Urethral trauma (e.g., gunshot or bite wounds, rupture caused by vehicular trauma, obstruction with stones) or neoplasia may result in urinary obstruction. If the prostatic or penile urethra is torn, subcutaneous urine leakage may occur. Spontaneous rupture of the urethra is uncommon but may occur in dogs. Initial signs of subcutaneous urine leakage are bruising and/or swelling, especially of the inguinal tissue of male dogs. The skin and subcutaneous tissue can eventually become necrotic if left untreated. Preoperative management of patients with urethral rupture may necessitate placement of an indwelling urinary catheter and/or cutaneous urinary diversion (tube cystostomy.

Anesthesia

Electrolyte (i.e., hyperkalemia) abnormalities and acidosis in patients with urinary obstruction or leakage should be corrected before anesthetic induction. IV fluids are given intravenously to restore hydration and combat postobstructive diuresis; relief of obstruction without appropriate parenteral fluids can result in hypovolemia and possibly death. An electrocar¬diogram should be monitored before, during, and after surgery for cardiac arrhythmias. If the animal is hyperkalemic (potassium >7 mEq/L), 0.9% saline should be used for fluid therapy. If serum potassium is normal, a balanced electrolyte solution should be administered.

Cystotomy

Cystotomy may be performed for removal of cystic and urethral calculi, identification and biopsy of masses, repair of ectopic ureters, or evaluation of urinary tract infection resistant to treatment. The longitudinal incision generally is made on the ventral or dorsal surface of the body of the bladder, away from the urethra; however, ventral exposure is preferred owing to ease of access and should be performed if identification or catheterization of ureteral openings is necessary. The goal of cystotomy closure is to obtain a watertight seal that will not promote formation of calculi. This has traditionally been accomplished using a single- or double-layer appositional pattern, or by inverting suture patterns using absorbable suture material. A single-layer appositional closure is sufficient if the bladder wall is thick. Even in normal bladders, a single-layer appositional suture pattern (simple continuous [preferred] or simple interrupted) is adequate. A retrospective study found no difference in complication rates between urinary bladders closed with a double-layer inverting pattern versus a single-layer appositional pattern. Luminal penetration is common in thin-walled bladders, but this is not believed to be associated with formation of calculus if absorbable monofilament suture is used. If hemorrhage is expected to be severe, suturing the bladder mucosa as a separate layer (in a simple continuous suture pattern) may be considered to decrease postoperative bleeding.

Isolate the bladder from the rest of the abdominal cavity by placing moistened laparotomy pads beneath it. Place stay sutures on the bladder apex and trigone to facilitate manipulation. Make a longitudinal incision in the ventral aspect of the bladder, away from the ureters and urethra, and between major blood vessels. Remove urine by suction or perform intraoperative cystocentesis before cystotomy if suction is not available. Excise a small section of the bladder mucosa adjacent to the incision to submit for aerobic culture. Check the bladder apex for a diverticulum, and excise it if necessary. Examine the mucosa for defects or lesions, and pass a catheter down the urethra to check for patency. Close the bladder in a single layer using a continuous suture pattern with absorbable suture material. For a two-layer closure, suture the seromuscular layers with two continuous inverting suture lines (e.g., Cushing, followed by Lembert. If the dog has severe bleeding tendencies, consider suturing the mucosa as a separate layer with a simple continuous suture pattern.