Urinary Tract Emergencies – Stabilizing the Lower Urinary Tract Emergency

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Objectives:

- Identifying the uroabdomen case and/or lower urinary tract obstruction patient
- Tips for securing a diagnosis of uroabdomen and/or obstruction
- Keys to stabilization prior to surgery

Urinary tract emergencies make up a fair number of emergency cases that a veterinarian may see. It is very important that the clinician is able to make a timely diagnosis as this can, in many cases, determine whether the patient will thrive or not. Urinary tract emergencies not only affect the urinary tract (obstruction or uroabdomen), they also can incorporate other organ systems that can pose life-threatening scenarios.

The urinary tract is generally divided into the upper and lower urinary tract. The upper urinary tract is typically defined as the kidneys and ureters and the lower urinary tract as the urinary bladder and the urethra. This lecture will focus on the lower urinary tract and associated pathology. This lecture is designed to give the clinician the skills to make a quick diagnosis and guidance with stabilization of these cases. Too many times, patients who are deemed unstable are prematurely anesthetized for definitive surgery with a less than ideal outcome. While we cannot always avoid an intra-operative mortality, we can drastically improve patient safety and case success with proper, aggressive stabilization and quick procedures that can give us the time to stabilize appropriately.

Acute Uroabdomen

Uroabdomen is diagnosed when there is urinary leakage outside of the urinary tract and inside the abdomen. This can be associated with the lower urinary tract, as well as the upper urinary tract. Focus will be placed on the lower urinary tract. The condition of uroabdomen is not an uncommon occurrence and can be caused by multiple etiologies. The most common cause in veterinary medicine would be due to blunt force and pelvic trauma. In 15-20% of cases that have pelvic fractures due to vehicular trauma, uroabdomen and/or significant lower urinary injury will be diagnosed. It is very important to evaluate and confirm an intact bladder in these cases. Other causes of uroabdomen outside of trauma would be iatrogenic (recent urinary tract surgery, cystocentesis, etc.), increased pressure due to distal urinary tract obstruction, and neoplastic (with subsequent leakage).

Clinical Signs/Presentation

The presentation can vary in patients with uroabdomen from being stable to severely decompensated. In patients that have undergone trauma, some of the clinical signs (pain, hypotension, tachycardia, etc.) will overlap and the challenge will be in deciphering what is actually occurring with the patient. It is paramount that the presence of uroabdomen is evaluated for in these patients. Pain and abdominal distention are generally present due to chemical peritonitis that develops from urine being present in the abdomen. In patients that have had vehicular trauma, it can take 48-72 hours for the patient to start to display signs of uropertitoneum if we are not actively searching. These signs include (not limited to) pain on abdominal palpation, vomiting/nausea, hypovolemia (hypotension/tachycardia), decreased urinary output, abdominal distention, lethargy (ranging from mild to moribund), and cardiac arrhythmias (and arrest). If the patient has had a traumatic event or recent surgery on the urinary tract – suspicion must be given to the presence of uroabdomen.
Diagnostic Tests

Once the patient is initially assessed and there is suspicion of uroabdomen, some baseline tests should be performed to either confirm or deny the diagnosis. Abdominal radiographs can help lead to a presumptive diagnosis. The major finding would be decreased serosal detail indicating abdominal effusion. Other factors to evaluate would be cystic (or urethral) calculi and/or pelvic fractures. The presence of a urinary bladder silhouette would decrease our suspicion of a ruptured bladder; however, this cannot definitively rule out a uroabdomen. Similarly, the lack of identification of a urinary bladder on radiographs cannot prove that there is a bladder rupture. Abdominal radiographs, while a useful tool cannot entirely diagnosis this issue. Contrast studies of the lower urinary tract can be very beneficial in not only diagnosing a bladder or urethral tear, but they can also give the clinician an idea of where the damage is located and can be of prognostic value.

Another imaging modality that is helpful would be ultrasonography. A full abdominal (diagnostic) ultrasound is recommended or a point of care (A.F.A.S.T.) ultrasound should be performed. The most notable feature would be the identification of abdominal effusion. It should be noted that small amounts of fluid might not be visualize with either imaging modalities, especially if the patient is hypovolemic. Beginning supportive care to correct hypovolemia is necessary with serial imaging.

Contrast radiography is a very helpful tool to assess for urethral or bladder ruptures and to look for uroliths. Generally, stabilization of the patient is performed prior to the contrast study, as a urethral catheter is needed. In male dogs, this can be an easy task, however female dogs and male cats usually require some amount of sedation. It is always prudent to get survey radiographs of the abdomen prior to injection of contrast. An iodinated contrast solution is typically used. With urinary bladder rupture the clinician will observe increased opacity to the abdominal effusion and may see an area where the bladder is actively leaking. Many times, with urethral tears, there is an increase in opacity around the pelvic region and the laceration site can be identified.

A non-imaging method of confirming uroabdomen is the comparison of creatinine and potassium values of the abdominal effusion to the peripheral blood. The rule of thumb is if the ration is ≥ 2:1 (effusion to blood) then that is confirmation of uroabdomen. This is a test that can be performed on initial evaluation and has a very high sensitivity and specificity and should be part of the clinician’s diagnostic tools.

Complete blood work including the following should be performed as well: complete blood count (CBC), chemistry profile, and electrolytes. While these may not confirm a diagnosis of uroabdomen, these values will help the clinician establish whether a patient is stable or suffering from other related changes. Renal values are assessed and can help determine whether a patient is stable for anesthesia or not. Most patients will be suffering from post-renal azotemia; this can be combined with pre-renal and renal azotemia in many patients. A urine specific gravity can help decipher in these cases.

In addition to renal values, the electrolyte values are extremely important, in particular potassium (K+). Potassium values can vary and can have profound effects on the patient. Elevation of potassium can be associated with depression, weakness, lethargy, cardiac arrhythmias, and the development of fatal arrhythmias. These are typically seen when the K+ value is greater than 7 mEq/L, with cardiotoxic effects being seen in cases between 8-11 mEq/L. It is common for these patients to have a metabolic acidosis if blood gases are measured. The presence of hyperkalemia greatly increases the mortality of these patients when anesthetized. The rest of the blood work should also be interpreted to assess function of other body systems; one can certainly see other types of system failure – multiple organ dysfunction syndrome.
(MODS), systemic inflammatory response syndrome (SIRS), and disseminated intravascular coagulopathy (DIC).

The uroabdomen patient should also have electrocardiogram (ECG) monitoring. Bradyarrhythmias are more common in the hyperkalemic patient. Hyperkalemia is generally seen by suppression of P wave amplitude or the loss of the P wave, widening of the QRS complex, and the narrowing of the T wave duration with tenting of the T wave. These ECG effects can be exacerbated by hyponatremia, acidemia, and hypocalcemia.

Another point of care assessment that should be made is blood pressure. In early-detected cases of uroabdomen it is conceivable that hypertension may be present due to pain, however most patients will present with hypotension. In many cases this can be present due to hypovolemia and shock. Most of these patients are hypovolemic at presentation and many have other injuries that can contribute to hypotension. More severe, refractory hypotension can be seen with severe hyperkalemia.

Treatment

While surgery is often seen as the hallmark of treatment, uroabdomen is NOT considered a surgical emergency. While surgery is inevitable for most patients with uroabdomen caused by lower urinary tract trauma/injury, to take the unstable patient and place them under a prolonged anesthetic period would greatly increase their risk of becoming a mortality statistic.

It is important to recognize when a patient is stable for surgery. In cases with relatively mild changes to blood work, normotensive and patients that are volume resuscitated, an anesthetic protocol can be drafted and surgery performed. Even cases with mild azotemia (assuming post renal) can have a relatively safe anesthetic period. In patients with moderate to severe azotemia and/or severe elevations in potassium (>7 mEq/L) further stabilization is necessary. While diuresis and fluid resuscitation are needed, one must assess the patient’s cardiac status (underlying cardiac disease) in order to know how aggressive fluid delivery can take place. Also, outflow must be established to allow for adequate stabilization. Placement of an indwelling urinary catheter (Foley) is recommended. It must be realized that depending on where the leakage has occurred this may not actively remove the majority of urine that is produced, however this can assist urine removal. What the author has found to be very helpful is the placement of an abdominal drain. In most patients (given they are severely compromised) this can be placed at the level of the umbilicus through the linea alba and secured in place with suture. The type of drain is called a Jackson Pratt and is a closed suction drain (please refer to lecture). This can typically be placed utilizing a local injection of lidocaine and an opioid bolus. The benefit of this type of drain is that it not only removes the urine in the abdomen at the time of placement, but also can remain in the abdomen to continually remove urine as it is produced. Almost single handedly, this technique has turned this once thought of surgical emergency into a controlled surgical procedure.

It is important to remember to focus attention on correction of hypovolemia and hyperkalemia if present. In cases of mild hyperkalemia fluid management may be all that is needed. The fluid of choice in these patients is typically 0.9% sodium chloride. In patients that have more severe hyperkalemia, it is more common to recommend administration of sodium bicarbonate and/or glucose and insulin. In patients experiencing metabolic acidosis sodium bicarbonate would be indicated. The thought process in using insulin/glucose combination is that insulin will mediate the movement of glucose into cells which is via a K+ channel, which will mobilize K+ into the intracellular space (from the extracellular space).

Once the patient is adequately volume resuscitated and fully stabilized, then surgery can be recommended for definitive treatment. These cases can be rewarding when accurately and swiftly diagnosed. Again, stabilization is key to a successful outcome. Surgical techniques will be explored in the accompanying lecture.
Post-Renal Obstruction

Lower urinary tract obstruction is a very common emergency presentation seen. Like an uroabdomen, urinary obstruction cases can present with a varying degree of severity. It is important to know that the obstructed patient can become unstable in a relatively short period of time. It is most common to develop in the male canine and feline.

In the canine patients, the most common cause of a urinary obstruction would be urolithiiasis. Other causes would be prostatic enlargement in the male dog (abscess, cyst, or neoplasia), urinary bladder/urethral neoplasia, or urethral stenosis (multiple reasons that this can occur). Female patients can also develop a urethral obstruction due to urolithiasis or neoplasia. Females are less likely to form an obstruction due to the wider diameter of the urethral in comparison to males.

Feline patient can also succumb to uroliths, however in the male cat we see a higher incidence of obstruction due to feline lower urinary tract disease (FLUTD) which is an umbrella term for multiple conditions such as idiopathic cystitis, uroliths (about 15% of cases), urethral spasms, proteinaceous plug development, etc. A full discuss of FLUTD in the male cat is beyond the scope of this lecture. We can see uroliths and neoplasia in both male and female cats.

Presentation of a urinary obstructed patient is similar to the presentation for uroabdomen case, without the potential traumatic injury. Patients can range from stable (acute obstruction) with stranguria to lateral recumbency. Initial triage of supportive care similar to what was mentioned previously for uroabdomen.

Diagnostic Tests

In the obstructed patient sometimes, the physical examination will lead one directly to the diagnosis. In male cats with a urethral obstruction a pathognomonic feel to the urinary bladder on palpation is seen. The bladder is typically a moderate size, yet very firm and uncomfortable. In patients with uroliths, the bladder can range in size. Occasionally cystic calculi can be noted on palpation of the urinary bladder if they are numerous and large enough.

The standard diagnostic tool would include radiographs. Most (not all) stones are radio-opaque and can be visualized on radiographs. Be sure to include the urethra when taking a radiograph. There is value to perform a contrast urethro-cystogram and/or double contrast if the stones are not very radio-opaque. With the availability of ultrasound, these tests are performed less frequently. An abdominal ultrasound would be much more sensitive for seeing urethral or cystic calculi and is the diagnostic of choice.

The other diagnostic tests as mentioned above are very important with urinary obstruction as well. Care must be taken to assess for electrolyte changes and azotemia. Like the case of uroabdomen where removal of the abdominal urine is recommended, removing or moving the obstruction and restoration of urethral patency is of utmost importance in achieving stability.

In most cases of urethral obstruction caused by uroliths (>95%), sedated retropulsion can be performed and a urinary catheter placed in order to properly stabilize the patient. In the case of the stable patient, retropulsion can be performed under anesthesia prior to surgical removal via cystotomy. A technique that the author finds helpful is lavaging the urethra using a 1:1 mixture of sterile lubrication jelly and sterile saline. This can be mixed using 2 60ml syringes filled halfway and both attached to a 3-way stopcock. Once the solution is made then this can be flushed through an appropriately sized red rubber catheter. Another tip to assist the passage of uroliths back into the bladder is to provide an increased pressure within the urethra by having another individual digitally occlude the pelvic urethra rectally. The ultimate therapy is surgical removal of
the stones, however proper stabilizing must be performed. The same protocol can be followed in both male and female dogs.

When there is urethral obstruction due to neoplasia, there are different considerations and conversations that must had with the owner. In most cases of transitional cell carcinoma of the urethra and neoplasia of the prostate, the goal is for palliative therapy and catheterization is not curative. The owner must consider the potential treatments of urethral stenting, radiation, tube cystostomy, or a combination of these. The overall prognosis in these cases is poor and dependent on the disease process.

Approximately 15% of male cats will obstruct due to uroliths, but the majority are not stone related. Nonetheless, the patient needs to be unobstructed in order to adequately stabilize. The authors preference is to still use a mixture of sterile saline and sterile lubrication jelly and attempt to pass a tom cat catheter to mobilize the obstruction. Once passage into the urinary bladder is achieved, the bladder can be lavaged and samples obtained. A softer indwelling catheter should be placed, either a 3.5 French red rubber or small silicon catheter placed and secured to the prepuce. By passage of a catheter, the patient can be adequately stabilized and there are times when catheterization can work to releave the obstruction. As a surgeon, if a male cat has an obstruction two or more times, the conversation of performing a perineal urethrostomy (PU) is started and the procedure recommended. It is important to stress that a PU does not remove the disease process; it does however alleviate signs and life-threatening events by anatomically increasing the size of the urethral orifice.

As mentioned above, the lower urinary tract emergency patient can be a very intimidating case. Care must be taken to identify the problem and the complex systemic changes that occur with these patients. Most uroabdomen and urinary obstruction cases are NOT surgical emergencies and can be appropriately stabilized. These techniques should be utilized to increase patient mortality and provide a more positive outcome.

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