

# Urolithiasis – cattle, some small ruminants, management and surgery

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## Abstract

Urolithiasis are commonly encountered in high-energy ration fed animals. Prompt diagnosis and treatment restoring a urine outflow is essential to salvage the animal. Perineal urethrostomy is the most economical option in fattening steers, but challenges arise for intended for breeding animals as well as for small ruminants kept as farm companion animals.

**Key words:** Urolithiasis, Tube cystotomy, perineal urethrostomy, cattle, small ruminants

Urolithiasis in the adult bovid is relatively rare, they occur mainly in show animals or in feedlot steers when the diet is imbalanced with too much grain and/or an inadequate Ca/P ratio. Abrupt decrease in water consumption can also precipitate the formation of the urolith. Clinical signs are variable and may remain unnoticed for few days in case of partial obstruction. Severe abdominal pain with constant straining that can be misinterpreted as a gastrointestinal obstruction, is present as the obstruction of the urinary tract is complete. Unless treated in a timely manner, abdominal distension will occur, whether by the rupture of the bladder and the formation of a uro-abdomen, or by the rupture of the urethra and the collection of urine in the subcutaneous tissue. Appearance of the prepuce and scrotum is usually sufficient to differentiate the two conditions, and can be confirmed by performing an ultrasonographic evaluation of the abdomen.

## Medical support

Hyperkalemia represents a major electrolyte imbalance, and renal value (blood urea nitrogen and creatinine) are largely elevated secondary to the post-renal renal failure. Medical support with isotonic IV fluid is required to restore the hydration status and electrolytes. Surgery is the only option to establish a urine egress route (Byers 2015).

## Managing urinary tract obstruction in intact males

Integrity of the urethra is extremely important for all intact males intended to be used as breeders and suffering from a urinary tract obstruction. If the glans penis and urethra appear intact on physical examination, a tube cystotomy needs to be performed to offer immediate relief of the urinary obstruction and to reduce the urethral spasm. Combined with anti-inflammatory medication, the aim is to dislodge the obstructive stones, minimizing urethral mucosal damages.

For adult bulls, the surgery is performed standing via a left caudal paralumbar fossa laparotomy. If the bladder is already ruptured, repair should be attempted, however, it will be done blindly as it would not be possible to exteriorize it. If the defect is located on the dorsal aspect of the bladder, it could be left to heal by second intention in some cases. A 22 to 24 Fr French Foley catheter is then introduced in the bladder via a stab

incision and secure to it by inflating the balloon and installing a pure string suture around it. The Foley catheter is then exteriorized through a second independent incision in the flank determined to minimize the tension on the bladder. Apposition of the bladder to the body wall is not always achievable and the Foley catheter should be secured to the skin to avoid back and forth movement.

The tube is left patent and protected by making a one-way valve to avoid air ingress in the bladder. Instillation of acidifying solution such as Renacidin or Walpole can be started after few days with temporarily challenge of the urethra provided that the urinary stones or crystals have been identified as magnesium ammonium phosphate. Hour-long challenge is started around day 8 to 10.

In case of unsuccessful alleviation of the urethral obstruction, an ischial urethrotomy can be attempted to allow more time for the urethra to heal after completion of retrograde and normograde urohydropropulsion, understanding the risk of increasing the existing traumatic urethritis. Ischial urethrotomy is performed in a standing position under epidural anesthesia and pudendal regional anesthesia. A 10-15 cm long incision is created starting just proximal to the ischium. The retractor penis muscles are identified and bluntly separated to reveal the bulbospongiosus muscle. The urethra is invaded by longitudinally incising the bulbospongiosus muscle in the median groove. Providing that the obstruction is resolved, a long sterile polyethylene tube is inserted into the bladder first and then in a normograde way down the urethra as a stent over the surgical incision and along the entire urethral mucosa.

If the obstruction is not resolved, this procedure can be turned into an ischial urethrostomy with the introduction of a Foley catheter into the bladder and the breeding soundness prognosis be lowered to guarded.

## Managing urinary tract obstruction in steers

For steers in their final fattening stage and bulls no longer intended to breed, penectomy is a cost-effective salvage procedure. With the steer restrained in a chute and anesthetized locally with a sacro-coccygeal epidural injection of lidocaine 2%, a median 10-15 cm incision is made ventral to the ischial arch and extended through the subcutaneous tissues to the level of the retractor penis muscles that are separated and retract laterally. Blunt dissection is used to identify the penile body, which is freed from the surrounding tissue. The penile body is pulled caudally and dorsally and transected at the ventral aspect of the surgical wound. The proximal portion of the penile body is pulled further caudally and dorsally, exteriorized through the wound and oriented ventro-caudally. It is secured to the skin using large monofilament suture with horizontal mattress pattern. The urethra and corpus spongiosum are incised longitudinally and sutured together on each side with 2 simple continuous patterns to limit hemorrhage and spatulate the distal opening (Turner 1989).

In case of subcutaneous accumulation of urine, ventral skin incisions should be performed to allow the drainage of the urine.

## Managing urolithiasis in small ruminants

The type of stones in small ruminants may be more variable depending on the geographical location of the practice and knowing the preponderance of urolith types is crucial. In regions where calcium carbonate stones are frequent, the addition of radiographs in the evaluation of the patient provides relevant information of the stones' locations (Van Metre 2017).

The initial evaluation may include a chemistry panel to identify the kaliemia prior to anesthesia/heavy sedation, an ultrasonographic evaluation of the abdomen to confirm the obstruction of the bladder determined by its diameter and circular shape (Videla 2016). The penis is then exteriorized to evaluate the urethral process and eventually amputated if it fills with an accumulation of crystals.

Establishing an egress route for urine can be performed either by placing a temporary percutaneous tube in the bladder for a surgery at a later time (Chigerwe 2016), or by directly bringing the animal to surgery and performing a surgical tube cystostomy (Rakestraw 1995). Surgical cystostomy and placement of indwelling Foley catheter is the only way to fully lavage the bladder and clear all uroliths from the bladder. In case of calcium carbonate obstruction, it may be interesting to identify the site of obstruction by retrograde urethral catheterization and performing a urethrotomy to dislodge the urolith as this type of stone will not dissolve in acidic solution.

Urethrostomies can be performed as an initial surgery for the treatment of urolithiasis. Complications of both antepubic and perineal urethrostomy are common with contracture and recurrence of obstruction being the most frequent. Both surgical procedures temporarily relieve urethral obstruction and should be considered as a salvage procedures. A narrow vertical elliptical skin incision on both side of the PU can be performed in order to maintain the opening of the mucocutaneous sutures and eventually prevent contracture. Recently, Tobias and van Amstel reported on a modified perineal urethrostomy procedure to improve longer-term outcomes (Tobias 2013). This modification of the standard perineal urethrostomy technique includes transecting the ischiocavernosus muscles at their attachment to the pelvis. This modification improves the mobilization of the penis and reduces the tension on the muco-cutaneous wound. In a report of 11 cases, 10 survived to discharge and 9 were still alive after 12 months.

Perineal urethrostomies do not allow complete lavage of the bladder or removal of the remaining stones. Surgical tube cystostomy remains the preferred surgical procedure to allow complete removal of the bladder stones as well as attempting the relief of the urethral obstruction while preserving the integrity of the anatomy. With the patient anesthetized and positioned in dorsal recumbency, a caudal paramedian approach to the abdomen is created to expose the urinary bladder. After adequate protection of the abdomen and positioning of stay suture on the bladder, an apex cystostomy is performed to remove the remaining uroliths. A 12 F to 24 Fr Foley catheter is then passed through the body wall via a separate stab incision, inserted into the bladder and secured to it with a purse string suture after inflation of the cuff. Abdominal closure is routine and then the Foley catheter is secured to the body wall using a butterfly

retainer technique or finger trap pattern. When compare to a percutaneous tube cystostomy, a surgical tube cystostomy was associated with a reduce chance of requiring a second intervention (Fortier 2004).

## Long term management of permanent urinary tractobstruction

When all procedures have failed to restore patency within the distal urinary tract, owners should decide whether they want to pursue alternative procedures for permanent deviation of urine outflow. Options would be long-term management of the tube cystostomy, bladder marsupialization (May 1998), or vesicopreputial anastomosis (Cypher 2017).

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