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Tube cystostomy for surgical management of obstructive urolithiasis in goats: A report of 5 cases

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Abstract

Obstructive urolithiasis means the formation of calculi in the urinary tract with a urinary blockage. It is an emergency condition that affects small ruminants. This study evaluates the efficacy of tube cystostomy as a surgical intervention for managing urolithiasis. The animals were presented with the history of anuria, abdominal pain and straining. Survey radiograph of abdomen shows distended bladder. Based on the history, clinical signs, physical, hemato-biochemical examination and radiography, condition was diagnosed as obstructive urolithiasis. Animals were subjected to tube cystostomy. Tube cystostomy was performed under general anaesthesia, local infiltration at the surgical site and epidural anaesthesia. Postoperatively, the animals were treated with antibiotic Inj. Enrofloxacin @ 5mg/kg I/M, analgesic Inj. Meloxicam 0.2 mg/kg I/M for 5 days along with Acidifier ammonium chloride were given. Dribbling of urine from the urethra was observed between 7th to 10th postoperative days. On 15th post-operative day the normal urine outflow was noticed and the tube cystostomy tube was removed on the same day. Animal had an uneventful recovery.

Keywords: Urolithiasis, male goats, tube cystostomy

Introduction

Obstructive urolithiasis in goats is defined as the blockage of urine flow due to the formation and lodgement of urinary calculi (uroliths) anywhere along the urinary tract leading to partial or complete obstruction of the urethra. Obstructive urolithiasis is a commonly encountered emergency condition of small ruminants (Mejia, 2022) [8]. Urolithiasis was identified as the most prevalent lower urinary tract condition in goats, accounting for 50% of the recorded cases, followed by bacterial cystitis (25%), bacterial urinary tract infection (23.21%) and patent urachus (1.79%) (Kumar *et al.*, 2024) [5]. Predisposing factors for the occurrence of obstructive urolithiasis, including biological factors (such as breed, age, sex, genetic makeup, hormone levels, castration status, and urine pH), physical factors (such as climate, season, environment, soil, and water), as well as husbandry and feeding practices (Schregel *et al.*, 2022) [11].

Males are more prone to urinary calculi than female goats primarily due to the narrow and tortuous route of the urinary tract (Sutradhar *et al.*, 2018) [12]. Uroliths can form in the upper or lower urinary tract. Urinary calculi cause obstructions in both bucks and wethers, more often because of the length, diameter, and course (shape) of their urethra. Early castration has been postulated to decrease the diameter of the urethra. The urethra at the areas of the urethral process and sigmoid flexure are most often becomes obstructed (Wolf, 2006) [17]. The clinical signs of obstructive urolithiasis differed depending on whether the urinary bladder was intact or ruptured. In animals with an intact bladder, the signs included anuria, frequent straining to urinate, restlessness, colic, anorexia, sunken eyes, dull and depressed appearance, reluctance to walk, tail lifting, engorged urethra, licking of the prepuce, twitching of the penis, pain on palpation of the penis or urethra, hematuria, respiratory distress, and rectal prolapse due to continuous straining. In cases with a ruptured urinary bladder, anuria and bilateral abdominal distension were commonly observed (Khan *et al.*, 2021) [3].

Diagnostic imagining techniques such as radiograph and ultrasound, urinalysis and hematobiochemical analysis were most reliable for confirmation of urolithiasis. In goats, calculi were usually composed of phosphate salts, predominantly apatite (calcium phosphate)

or, more commonly, struvite (magnesium ammonium phosphate hexahydrate). Survey radiography provides essential information for clinical decision-making by identifying the location, number, and size of radiopaque uroliths. In small ruminants with an intact urinary bladder, ultrasonography typically reveals bladder distension with a hyperechoic bladder wall. Multiple hyperechoic foci, representing sludge on the bladder floor with observable fluctuations, can be detected by gently tapping and moving the transducer (Prakash *et al.*, 2024) ^[9]. Examination of the urethra using a high-frequency ultrasound probe allows visualization of the urethral wall and lumen, facilitating identification of the site and cause of urethral obstruction (Al-Lugami *et al.*, 2017) ^[11]. Ultrasonography of the urinary tract is also valuable for assessing the urinary bladder and urethra to confirm urolithiasis and to determine the presence of an intact or ruptured bladder, a perforated urethra, or uroperitoneum.

Treatment options for obstructive urolithiasis in goats include medical management, surgical intervention, or a combination of both. However, medical management alone is generally considered ineffective (Mavangira *et al.*, 2010) ^[7], hence surgical management is the best option for treating intermittent or complete urinary obstructions. Surgical treatment options for urinary obstruction include various procedures such as urethral process amputation, cystocentesis, bladder irrigation with acidic solutions and tube cystostomy (performed via percutaneous, laparoscopic, or laparotomy approaches). Other surgical options include bladder marsupialization, urethrostomy (prepubic, perineal, or pre-scrotal), urethroscopy with laser lithotripsy, vesiculopreputial anastomosis and penile amputation (Videla and van Amstel, 2016) ^[15].

However, Surgical tube cystostomy is regarded as the gold standard technique for treating urinary obstruction, as it provides direct access to the urinary bladder and effectively restores urethral patency (Venkatesh *et al.*, 2024) ^[14]. In this present study we describe the presentation, diagnosis and treatment of obstructive urolithiasis in three male goats.

Materials and Methods

The five male goats (Table. 1) were presented to Large Animal Unit of teaching Veterinary Clinical Complex, Madras Veterinary College. The animals were presented with symptoms of abdominal pain, straining, tenesmus, shifting weight, tail twitching, and dribbling urine. On abdominal palpation bladder was distended. On radiographic examination no radio opaque calculi were noticed in the bladder and urethral passage. Ultrasonography of abdomen revealed distended bladder and sludge on the bladder floor. Based on the symptoms and diagnostic tools condition was diagnosed as obstructive urolithiasis. In all the patients mild elevation in creatinine and BUN values was observed. To manage uremia and dehydration, the animals were stabilized with fluid and supportive therapy pre-operatively. After stabilization, the animal was prepared for a tube cystotomy on the same day.

Table 1: Details of animals in present report

Case no	Animal details
1	Caprine/ND/1.5yrs/Intact male
2	Caprine/Kanni Adu/1yr/Castrated male
3	Caprine/ND/2yrs/Intact male
4	Caprine/ND/1.8yrs/Intact male
5	Caprine/ND/1.2yrs/Castrated male

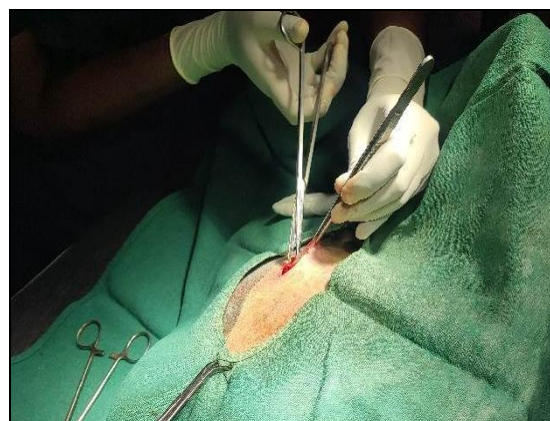


Fig 1: A linear incision anterior to rudimentary test



Fig 2: Bladder sutured and subcut tunnel created



Fig 3: Catheter inserted and inflated with normal saline

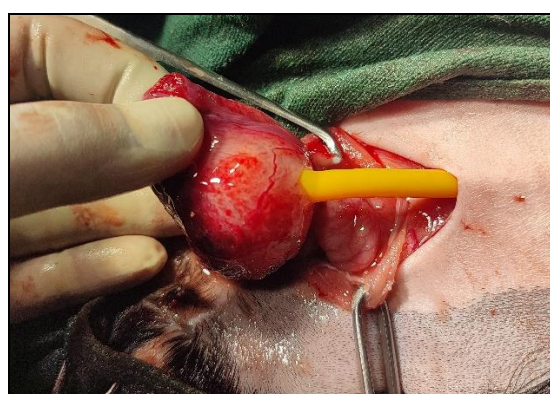


Fig 4: Muscle closure

All the animals were sedated with xylazine @ 0.05 mg/kg administered intramuscularly, followed by epidural anesthesia and local infiltration at the surgical site to provide effective

sedation, analgesia, and muscle relaxation throughout the procedure. All the animals were placed in left lateral recumbency and the surgical site was aseptically prepared. A linear skin incision was made anterior to the rudimentary teat (Fig. 1). After carefully separating the subcutaneous tissues and muscle layers, the bladder was located. The urinary bladder integrity was assessed by manual palpation. In case 4, a bladder rupture was identified (fig. 2) by bladder collapse and the presence of free urine within the peritoneal cavity, indicative of uroabdomen. The rupture site was surgically repaired using a double-layered suture technique. To prevent peritoneal contamination and secondary peritonitis, the abdominal cavity was thoroughly lavaged with metronidazole solution. Following repair, a Foley's catheter was inserted via a separate stab incision away from the rupture site to minimize further trauma. In cases with intact bladders, a subcutaneous tunnel was created by passing artery forceps parallel to the prepuce. The Foley catheter was introduced externally and guided into the peritoneal cavity with its tip stabilized using a stylet. The stylet facilitated precise puncture of the bladder wall at the dorsal or craniodorsal aspect, ensuring accurate catheter placement through the bladder wall while minimizing iatrogenic trauma. Once correctly positioned, the catheter balloon was inflated with 10 ml of sterile saline (Madhu, 2023) ^[6] to secure the catheter in situ and prevent its displacement. Following balloon inflation, a urine sample was aseptically collected via the catheter for diagnostic evaluation (Fig. 3). Following this procedure, the muscle and subcutaneous tissues were closed using 2-0 Polyglycolic acid no 2-0 sutures (Fig. 4). The skin was then sutured with 2-0 polyamide sutures in a cross-mattress pattern. The Foley's catheter was fixed externally to the skin at multiple sites for secure placement (Fig. 5). Postoperatively, the owners were instructed to administer Inj. Enrofloxacin, an antibiotic, at a dose of 5 mg/kg body weight intramuscularly for six days and Inj. Meloxicam, an analgesic, at a dose of 0.2 mg/kg for three days. In addition, Pow. Ammonium chloride an alkalizer was prescribed at 200 mg/kg body weight (Prakash *et al.*, 2024) ^[9], orally twice a day for one month. Urine sample was centrifuged and sediments examined under microscope. Colourless to white crystals that appeared as fine, needle-like (amorphous), granular, or rosette-shaped structures under the microscope were identified as calcium phosphate crystals (Fig. 6).



Fig 5: Securing catheter with skin



Fig 6: Calcium phosphate crystals

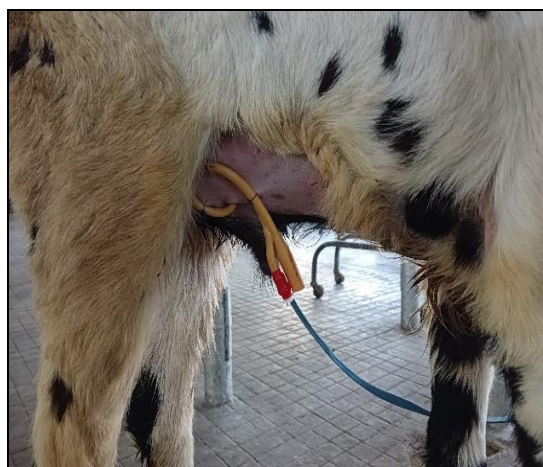


Fig 7: 7th postoperative day

Results and discussion

The owners were recommended to provide ad-lib clean drinking water, feeding less than one-fourth of grain and advised to regularly block the Foley catheter for at least half an hour daily to check urethral patency at the normal site (Prakash *et al.*, 2024) ^[9] (Fig. 7). Dribbling of urine from the urethra was observed between 7th to 10th postoperative days and the obstruction was completely relieved by the 15th postoperative day. As a result, the Foley's catheter was removed. No recurrence was observed during the subsequent period. Regular flushing of Foleys catheter to avoid blocking might have prevented the complications and made uneventful recovery (Kumar *et al.*, 2023) ^[4] in all the presented cases.

Tube cystostomy (Williams and White., 1991) ^[16] provides an alternative surgical technique for the management of obstructive urolithiasis. The free flow of urine through the external urethral orifice can be attributed to several factors. The administration of anti-inflammatory drugs helped relieve urethral spasm and inflammation. Ammonium chloride and sodium chloride, combined with increased water intake, lowered the pH of the urine, promoting the dissolution of calculi. Bypassing urine through the Foley's catheter may have contributed to reducing the size of the calculi. Additionally, frequent occlusion of the catheter with a clamp helped maintain urethral patency by flushing out debris and calculus material from the urethra (Ewoldt *et al.*, 2006) ^[1].

Tube cystostomy is an effective technique for the resolution

of obstructive urolithiasis, which is consistent with earlier findings (Sangeetha *et al.*, 2015) ^[10]. This technique provides a reliable method for managing urinary obstructions caused by uroliths, offering relief and promoting recovery.

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Author's Contribution

Not available.

Conflict of Interest

Not available.

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