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## Evaluation of surgico-therapeutic management in obstructive urolithiasis with cystorrhesis in male cattle calves

**Rakesh Pooniya, Suresh Kumar Jhirwal, Rajesh Saini, Suresh Kumar Palsania, Anil Kumar and Praveen Bishnoi**

### Abstract

The study was conducted on twenty-three (n=23) clinical cases of obstructive urolithiasis in male cattle calves with ruptured urinary bladder presented to the Department of Veterinary Surgery & Radiology, RAJUVAS, Bikaner. The diagnosis was made on the basis of history and clinical signs (anorexia, depression, bilateral abdominal distension and concretions at urethral orifice). All the animals needed surgical intervention for the repair of ruptured bladder and passive routes for passage of urine till bladder healing occurred and urine continued to pass through normal urethral orifice. The animals were divided into three groups depending on the surgical intervention adopted viz., Tube cystostomy (n=11), Cystorrhaphy with urethrostomy (n=6) and Intraperitoneal tube siphoning of urine (n=6). Haemoglobin was found to be below; BUN and serum creatinine above the normal reference values in majority of the cases. Obstructive urolithiasis occurred more frequently under specific managemental condition like heavy concentrate feeding along with higher mineral concentration ground water intake. The overall survival rate was higher in animals treated by tube cystostomy. Rate of recovery without post-operative complications was higher in the animals that were treated by cystorrhaphy with urethrostomy as compared to other technique. Urinary acidifiers like ammonium chloride and sodium chloride were effective in dissolution of urinary calculi.

**Keywords:** Urolithiasis, abdominal distension, tube cystostomy, intraperitoneal tube siphoning, urinary acidifiers

### 1. Introduction

India has largest livestock population in the world. It has about 190.9 million cattle, which is 37.28 per cent of total livestock population in India (NDDB, 2017) [14]. India ranks first in milk production. This data indicates the importance of cattle and buffalo in Indian economy. Male calves are usually weaned at an early age as compared to female calves. Also, male calves are offered concentrate, particularly oilseed cake instead of a calf starter or weaning ration. Thus, a high protein diet with no milk and very low water intake leads to formation of urinary calculi (Bhatt *et al.*, 1973) [5].

Obstructive urolithiasis is a condition of the urinary tract in which insoluble mineral and salt concretions develop and aggregate around a nidus of protein aceous material within the urinary bladder or urethra. Nidus formation mostly occurs when mucoprotein in the urine coalesce and precipitate with crystals in supersaturated urine (Belknap and Pugh, 2002) [4]. However, if the stones become too numerous or too large, they may cause obstruction of the urethra or the neck of the urinary bladder, particularly in castrated male ruminants (Pinsent and Cottom, 1987) [15]. This condition termed as obstructive urolithiasis can cause complication of rupture of urinary bladder or urethra, uremic crisis and death (Baxendell, 1984) [3]. Male ruminants are more likely to be affected because of an extremely long and narrow urethra, in contrast to females having a shorter and wider urethra (Matthews, 1999) [11]. Steers are most commonly affected by obstructive form of disease because of the anatomical conformation of urinary tract (Larson, 1996; Radostits *et al.*, 2000) [10, 16]. Urinary calculi formation usually results from a combination of nutritional, physiological and managemental factors. It is mainly attributed to imbalanced or excessive intake of minerals (McIntosh, 1978; Radostits *et al.*, 2000) [16]. A calcium phosphorous imbalance results in high urinary phosphate excretion which is an important factor in formation of phosphate calculi. Less frequent types of uroliths include those composed of silica, oxalates or carbonates (Larson, 1996) [10].

Retention of the urine is one of the important surgical disorders resulting due to formation of urinary calculi in kidney, ureter, urinary bladder and urethra associated with considerable morbidity and mortality. Urine retention is frequently observed in young cattle calves even at the age of 1-3 months resulting in uraemia and death. Urolithiasis frequently occurs between the age of 2-6 months in bovine calves (Fazili and Ansari, 2007) [6]. Obstructive urolithiasis in ruminants, especially in cattle, is of considerable economic importance as losses inflicted by this malady are considered very high (Singh and Singh, 1990) [18].

## 2. Materials and Methods

The present study was conducted on 23 clinical cases of retention of urine in cattle calves of less than one year of age presented to the Clinics of Department of Veterinary Surgery and Radiology, Bikaner (Rajasthan). History of cases regarding age and sex of the animal, duration of illness, feeding pattern, managemental practices, early signs of disease, previous treatment etc. were obtained from the owner. The diagnosis was confirmed on the basis of history, clinical examination, abdominal palpation and abdomino-centesis as per case status. Venous blood samples were collected for estimation of different haematological and biochemical parameters. Abdominal palpation or ballottement was performed to record the fluid thrill in cases having uroperitoneum, following rupture of the bladder. Abdominocentesis was done at slightly dorsal and caudal to the umbilicus with the help of a 16 or 18 G hypodermic needle and variable amount of blood tinged fluid was drained out. Fluid therapy (normal saline), broad spectrum antibiotics and supportive therapy (anti-inflammatory and analgesic drugs) were given to the animal with severe dehydration or uraemia as per the requirement of the case.

### 2.1 Surgical management of obstructive urolithiasis

Animals were subjected to tube cystostomy, cystorrhaphy with urethrostomy and intraperitoneal tube siphoning of urine. Preoperatively, fluid and supportive therapy were given to animals suffering from severe dehydration or uraemia as per the requirement of the clinical cases. All the animals were operated under epidural anaesthesia and local infiltration of left paramedian area starting from the rudimentary teats. Cystorrhaphy was performed in ruptured urinary bladder after necessary debridement of the wound, irrigation and removal of calculi from cystic lumen and neck.

### 2.2 Tube cystostomy

This surgery was performed in dorsal recumbency. Animals were shaved at an area lateral to the penis on the left side of the abdomen near the rudimentary teat. After proper scrubbing of surgical area, incision was given anterior to the rudimentary teat. After incising the skin, subcutaneous tissue, fascia, muscles and peritoneum, urinary bladder was located. After locating the urinary bladder, a direct deep nick incision was given by Baird Parker blade No. 20 parallel to the surgical incision line through which the Foley's catheter was passed with pointed end towards the incision. Cystorrhaphy was done using catgut no.1 after placement of catheter inside the urinary bladder. The catheter was inserted and the bulb of the catheter was inflated with about 30 ml the normal saline solution to fix the catheter in the urinary bladder and anchored to the skin near prepuce. After successful lodging of the catheter into the urinary bladder, the peritoneum, muscles and

skin were closed in routine manner.

### 2.3 Cystorrhaphy with urethrostomy

This type of surgery was performed in clinical cases of ruptured urinary bladder under local infiltration anaesthesia for cystorrhaphy with urethrostomy. The urine present in the abdomen was siphoned out as much as possible slowly to prevent the animal from shock. The tear in the urinary bladder was located and urinary bladder was examined for the presence of any urolith, concretions or blood clots. Flushing of urinary bladder was done with normal saline. A clutch wire was inserted through the PVC catheter to increase its rigidity and act as a stilet. A moderate force was applied to pass the PVC catheter through the urinary bladder neck into the urethra. The site of resistance i.e., the site of urethral obstruction was infiltrated with local anaesthetic and the urethra was exposed by standard procedures. Urethra was incised, obstructing calculi removed, the end of the catheter pulled out from the proximal end of the urethral nick incision. PVC catheterisation was done in animals from urinary bladder to the urethrostomy stump. The newly created penile stump was transfixed at lower commissure of incision with stay suture. The skin incision was closed with simple interrupted suture with silk. A retrograde hydropulsion was done with 50-100 ml of normal saline in order to ensure restoration of urine outflow. The repair of the urinary bladder was done by two layer continuous inversion sutures using catgut No. 1-0. The abdominal cavity was flushed with normal saline solution containing broad spectrum antibiotic (strepto-penicillin). The muscles and skin incision were sutured in the routine manner.

### 2.4 Intraperitoneal tube siphoning of urine

This technique was performed in the animals which were presented with ruptured urinary bladder to provide immediate relief to the patient. This was performed under dorsal recumbency. Area around left ventro-lateral aspect to urethral orifice was prepared for aseptic procedure; nick incision was given on skin about 5 cm left lateral side of urethral orifice. The Foley's catheter was introduced in peritoneal cavity through the blunt incision made on abdominal muscle with the help of artery forceps. The bulb of the Foley's catheter was inflated with approximate 30 ml of NSS to fix the tube in the peritoneal cavity. Immediately after fixing Foley's catheter urine flow started through catheter.

### 2.5 Postoperative management

Post-operative treatment included antibiotics (streptomycin and penicillin combination) @ 1.25 gm total dose i/m in cattle calves for five days, non-steroidal anti-inflammatory drug (meloxicam @ 0.5 mg/kg body weight i/m for three days) and ammonium chloride @ 100 mg/kg body weight, b.i.d. orally for twenty days. Fluid therapy (normal saline) was continued intravenously for 1-3 days as per requirement of the case. Cystone (Himalaya Drug Company, India) tablets (2-4 tablets twice a day for fifteen days) were given orally to prevent reoccurrence of the condition. Owners were advised to add sodium chloride to the drinking water @ 3-4 per cent to enhance frequent water intake and aid in acidification of urine. Local antiseptic dressing with five per cent povidone iodine (betadine) was advised daily for a week. The blocked catheters were cleaned by flushing with normal saline solution.

### 2.6 Haemato-biochemical Parameters

For the estimation of haemato-biochemical studies, 10 ml blood was collected in each animal from jugular vein using sterile syringe and stored in sterile vial containing EDTA. 5 ml fresh blood sample as used for the study of haematological parameters and rest of the sample (5 ml) was centrifuged immediately to separate out the serum, which was preserved for further analysis. The haematological parameters such as haemoglobin (Hb) by Sahli's haemoglobinometer, total leucocytic count (TLC) by Haemocytometer and differential leucocytic count (DLC) by using Giemsa's staining were estimated from the fresh blood sample as per standard technique. Blood urea nitrogen (BUN) in mg/dl and serum creatinine (Sr.Cr.) in mg/dl were also estimated by using IDEXX auto analyzer at TVCC, RAJUVAS, Bikaner.

### 3. Results and Discussion

The clinical signs exhibited by the cases with ruptured urinary bladder included anorexia (82.60%), bilateral abdominal distension (60.87%), fluid thrill at abdominal ballotement (56.52%), depression (52.17%), and restlessness & mild bloat (30.43%).

The age of the calves varied from 1-12 months (mean age 4 months).

#### 3.1 Tube cystostomy

This surgical procedure was done in eleven cases. The time of completion of surgical procedure was around 30-40 minutes. Dribbling of urine from the external urethral orifice in the treated animals started after 7-8 postoperative days and free flow of urine started after 8-9 postoperative days. Foley's catheter dislodgement and loss was observed in one animal.

Postoperative follow up of tube cystostomy up to three months revealed that nine cases were survived and were voiding normal urine flow from urethral orifice. In two cases, complications were recorded in which flushing with normal saline solution was done after that they recovered successfully.



Fig 1: Ruptured Urinary Bladder

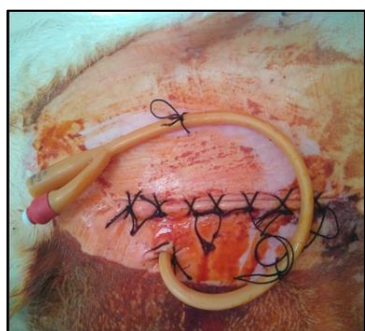


Fig 2: Placement of Foley's catheter

This type surgical technique was performed in six cases. Indwelling PVC catheter was removed after sixteen days and skin sutures after ten days of surgery. Success rate of cystorrhaphy with urethrostomy showed five animals recovered uneventfully whereas one animal died on 10<sup>th</sup> postoperative days.



Fig 3: Exteriorisation of UB for cystorrhaphy



Fig 4: Incision Sites for Cystorrhaphy with urethrostomy

#### 3.3 Intraperitoneal tube siphoning of urine

This surgical technique was performed in six animals having ruptured urinary bladder. Out of six cases that were treated by this technique, five survived. Out of these five, four showed uneventful recovery whereas in one animal, surgical intervention was required due to status quo. One case did not respond telephonically that is why no post-operative results were obtained.



Fig 4: Placement of IP tube

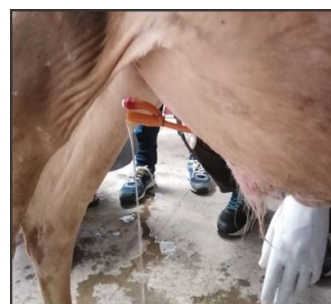


Fig 5: Urine coming out of IP tube on standing

### 3.4 Evaluation of surgical procedure

All the cases that were included in this study were treated by three surgical procedures viz. tube cystostomy, cystorrhaphy with urethrostomy and intraperitoneal tube siphoning of urine. The evaluation of these surgical procedures were done on the basis of postoperative complications like catheter loss, catheter dislodgement, catheter blockade, free flow of urine, healing of surgical wound, requirement of second surgical intervention and survival rate.

### 3.5 Catheter blockade

The problem of blockage of catheter were reported one each in cases treated by tube cystostomy and cystorrhaphy with urethrostomy while two catheter blockages in cases treated by intraperitoneal tube siphoning of urine. The blockade of catheters in these cases was corrected by flushing with normal saline solution postoperatively as and when required.

### 3.6 Catheter loss and dislodgement

Foley's catheter was lost in one animal that was treated by tube cystostomy technique on 5<sup>th</sup> postoperative day respectively.

### 3.7 Requirement of second surgical intervention:

Three cases which were treated by tube cystostomy, 1 which was treated by intraperitoneal tube siphoning of urine required second surgical intervention.

### 3.8 Time for removal of catheter in tube cystostomy and urethral catheter

The mean time for removal of catheter in tube cystostomy, cystorrhaphy with urethrostomy and intraperitoneal tube siphoning of urine was 12.88, 14 and 7.4 days respectively.

### 3.9 Recovery/ success rate

In present study, overall success rate was 82.60 per cent (19/23). The cases which were treated by cystorrhaphy with urethrostomy recorded success rate of 83.33 per cent, in the cases which were treated by tube cystostomy the success rate was 81.82 per cent while in cases which were treated by intraperitoneal tube siphoning of urine the success rate was 83.33 per cent. The percentage of recovered animal without any complication was 77.77 per cent (7/9) in cases which were treated by tube cystostomy, eighty per cent (4/5) in cases which were treated by cystorrhaphy with urethrostomy and sixty per cent (3/5) in cases which were treated by intraperitoneal tube siphoning of urine.

### 3.10 Hematobiochemical Parameters

Values of haemoglobin ranged from 5.40-11.80 gm/dl. Average haemoglobin was found to be  $8.77 \pm 0.29$  gm/dl. In most of the animals, haemoglobin values were found below normal range (ref.  $11.12 \pm 1.21$ ). Total leucocyte counts in ranged from 3.20-15.25 thousand/mm<sup>3</sup>. Mean total leucocyte found to be  $6.69 \pm 0.47$  thousand/mm<sup>3</sup>. In most of cases of total leucocyte count was within normal range (4.5-13.8 thousand/mm<sup>3</sup>). In two cases TLC values were found to be above 13.8 thousand/mm<sup>3</sup>, which was above than normal reference value. In five cases, TLC values were found to be below 4.5 thousand/mm<sup>3</sup>, which was below than normal reference value. Blood urea nitrogen value in serum of affected cattle calves ranged from 17-94 mg/dl. Mean BUN was found to be  $50.51 \pm 3.13$  mg/dl. These values were found to be above the normal range (6-27 mg/dl). The elevated base

values of BUN recorded in twenty clinical cases. Serum creatinine values ranged from 0.98-6.40 mg/dl. Mean value of serum of the serum creatinine was found to be  $2.47 \pm 0.23$  mg/dl. Most of the clinical cases were reported with the higher values of serum creatinine (normal range: 1-2 mg/dl). The elevated base values of serum creatinine in thirteen clinical cases.

Monocytes ranged from 1-12%. The mean value of monocytes was found to be  $4.74 \pm 0.38$  %. These were found to be 1-3% and 4-12% in eight and fifteen animals, respectively. The values were found close to the reference value ( $5.10 \pm 0.99$ %) in most of clinical cases of present study. Eosinophils ranged from 0-6%. The mean value of eosinophils was found to be  $1.74 \pm 0.27$  %. However, the values were found to be 1-3% and 4-6% in twenty and three animals. The mean values were found below to reference value ( $3.82 \pm 0.71$ %) in most of clinical cases present study. Neutrophils ranged from 18-81%. The mean value of neutrophils was found to be  $40.22 \pm 1.83$ % (reference value:  $28.91 \pm 1.21$ %). Base values of DLC showed slight neutrophilia in twenty-one clinical cases. This indicates activation of defence system of the body in response to the condition like uroperitoneum due to urinary bladder rupture. Lymphocyte value ranged from 15-69%. The mean value of lymphocyte was found to be  $51.94 \pm 2.27$ %. Base values of DLC showed slight lymphocytopenia in twenty-one clinical cases. The mean values were found to be lower than reference value ( $62.23 \pm 3.10$ %) of lymphocytes. Basophils were found zero percentage in all clinical cases.

## 4. Discussion

In the present study, history taken from owners revealed that most of the clinical cases were maintained on concentrate ration like cotton seed cake, groundnut cake and grains. Wang *et al.* (1997) [20] reported more incidence of obstructive urolithiasis in animals fed high grain diet with Ca: P ratio as low as 1:1. In this study, most of the cattle calves brought for treatment belonged to rural areas and were also maintained on high grain diet as a milk replacer because availability of green fodder was less in these area. From the findings of present study, it is evident that the feeding habits have a profound predisposing effect on the development of particular uroliths. The incidence of obstructive urolithiasis was mostly found in early winter to end of winter under temperate conditions, pointing towards the inadequate water intake and lack of green fodder as another predisposing factor for the development of uroliths. Kopper (1967) [9] and Muhee (2006) [12] also recorded highest number of cases of urolithiasis in calves during winter season. In the present study calves of age group between 1-3 months had the highest (42.85%) occurrence of obstructive urolithiasis, followed by the calves of 4-6 months (28.57%), 7-9 months (20%) and 10-12 months (8.57%). Amarpal *et al.* (2004) [2] also recorded a high incidence of obstructive urolithiasis in buffaloes and caprines below 6 months of age. Muhee (2006) [12] also recorded highest incidence (27.27%) of obstructive urolithiasis in the calves of 3-4 months age followed by 4-5 months age group (19.32%) and lowest (10.23%) in 1-2 months age group. Delayed detection of disease, delayed presentation of cases, due to transportation problems and common practice of administration of diuretic, by local quacks and para-veterinarians resulting in increased formation of urine might be responsible for increased chances of rupture of urinary bladder. Adam (1995) [1] also reported the high occurrence of

ruptured urinary bladder due to delayed presentation of the animal to the hospital, administration of diuretics to increase the urine output. The elevated base values of BUN recorded in twenty cases of present study. These findings were in agreement with those of Villar *et al.* (2003) [19]. Sharma *et al.* (2006) [17] also reported an elevated values of BUN in obstructive urolithiasis due to the onset of acute renal failure manifested by a decreased glomerular filtration rate as a result of back pressure on the kidneys and absorption of these substances from the urine present in the urinary bladder in the intact urinary bladder cases, or from peritoneal cavity in the ruptured urinary bladder cases of complete obstructive urolithiasis. The findings of elevated Serum creatinine in present study were in consonance with the findings of Gera and Nigam (1981) [7] and Villar *et al.* (2003) [19]. Kerr (2002) [8] also reported that serum creatinine levels elevated more quickly than urea levels at the start of the disease, and also decreased more quickly when an improvement takes place, thus this could be used for early diagnosis and recovery from the disease.

### 5. Conclusions

Obstructive urolithiasis occurred more frequently under specific managerial condition like heavy concentrate feeding with higher mineral concentration in ground water. In the present study, comparison of different surgical techniques revealed that intraperitoneal tube siphoning of urine was a less time consuming procedure than tube cystostomy or cystorrhaphy with urethrostomy. The overall survival rate was higher in animals treated by tube cystostomy in present study. Rate of recovery without post-operative complications was higher in the animals that were treated by cystorrhaphy with urethrostomy as compared to other technique. Urinary acidifiers like ammonium chloride and sodium chloride, and herbal litholytic agents like Cystone® tablet were effective in dissolution of urinary calculi.

The disease can be prevented to a large extent by modifying the prevailing managerial practices i.e. feeding of concentrate and roughage in proper ratio, encouragement of more water intake and advised to add sodium chloride to the drinking water @ 3-4 per cent to enhance frequent water intake.

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