

EVALUATION OF SUB-ISCHIAL URETHROTOMY FOR THE TREATMENT OF OBSTRUCTIVE UROLITHIASIS IN MALE BUFFALO CALVES

SAURABH*, R.S. BISLA, RISHI TAYAL and ANITA GANGULY

Department of Veterinary Surgery and Radiology, College of Veterinary Sciences
Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar-125 004, India

Received: 16.06.2016; Accepted: 15.12.2016

ABSTRACT

The study was conducted on ten male buffalo calves suffering from urinary obstruction and presented to Regional Centre, TVCC, LUVAS, Uchani, Karnal for treatment. All calves were operated from sub-ischial region for urethral catheterization under sedation with xylazine hydrochloride @ 0.01mg/kg I/V and local administration of lignocaine 10ml at surgical site. Post-operatively all cases were medicated with ceftriaxone @ 20mg/Kg. b.wt. I/M, meloxicam @ 0.24mg/Kg b.wt. im, along with ammonium chloride @ 15gm orally and herbal litholytic agent (cystone tab.) @ 2 bid orally for 7 days. The procedural observations including duration of surgery, pre and post-operative complications and recovery rate were recorded for upto two months post-operatively where as haematological and biochemical observations were recorded pre-operatively and immediately after surgery and 72 h after surgery. A significant ($p < 0.05$) decrease was observed in the level of BUN and creatinine post-operatively after 72 h in comparison to pre-operative values. Dribbling of urine started at 5 days (average) post surgery and catheter was removed at 10 days (average) post surgery and/or after the animal started urinating normally through the natural orifice. Sub-ischial urethrotomy procedure was found successful with less post-operative complications in terms of early recovery of bladder and urethra. The technique was found to be highly useful in early stage of obstructive urolithiasis having intact urinary bladder.

Key words: Calf, sub-ischial urethrotomy, obstructive urolithiasis

Obstructive urolithiasis is a painful condition in calves, if not treated may lead to loss of valuable genetic material along with refusal of let down of milk by dam causing severe economic loss to dairy farmers. Factors such as diet, age, sex, breed, genetic makeup, season, soil, water, hormone, mineral, and urinary tract infections play an important role in the genesis of urolithiasis (Udall and Chow, 1969). Young goats and calves are frequently affected with this condition (Amarpal *et al.*, 2005). After formation of calculi in urinary tract, these may lodge anywhere within the urinary tract, causing urine retention. Surgery is the primary treatment of obstructive urolithiasis (Larson, 1996) and surgical procedures like urethrostomy, tube cystostomy (Williams and White, 1991), bladder marsupialization (May *et al.*, 1998), penile catheterization and amputation have been tried but with little success. Tube cystostomy together with medical dissolution of calculi is considered as an effective technique for resolution of obstructive urolithiasis in small ruminants (Ewoldt *et al.*, 2006). Animals with prolonged obstruction have high morbidity due to subsequent uraemia. Surgical management of such patients should be done very cautiously. In this study incidence of obstructive urolithiasis in male buffalo calves and its surgical management by sub-ischial urethrotomy catheterization is reported.

*Corresponding author: saurabhsingroha@gmail.com

MATERIALS AND METHODS

The present study was conducted on male buffalo calves having urinary obstruction and that were presented to the LUVAS Regional Station, TVCC, Uchani, Karnal, for treatment. Out of all affected calves, ten calves after clinical examination were selected for this study and these calves were having urinary obstruction with intact urinary bladder. Clinical, haematological and biochemical parameters were recorded before surgical intervention. All calves were operated from sub-ischial region for urethral catheterization under sedation with xylazine hydrochloride @ 0.02mg/Kg I/V and local administration of lignocaine 10ml at the surgical site. Post-operatively all cases were medicated with ceftriaxone @ 20mg/Kg. b.wt. I/M, meloxicam @ 0.24mg/Kg b.wt. I/M, along with ammonium chloride @ 15gm orally, and herbal litholytic agent (cystone tab.) @ 2 bid orally for 7 days. The procedural observations including duration of surgery, pre and post-operative complications, and recovery rate were recorded upto two months post-operatively where as haematological and biochemical observations were recorded pre-operatively, immediately after surgery and then at 72 h post-operatively.

Blood samples were collected (pre-operative and post-operative at 0 h and 72 h) in vials with or without

anticoagulant (ethylene diamine tetra acetic acid). Blood collected in anticoagulant vials was used for hematological examination using Veterinary Cell counter (MS4Se). The coagulated blood samples were centrifuged at 5000 rpm for 15 min and the supernatant (serum) was collected for biochemical estimations using fully automated Biochemistry analyzer EM Destiny 180, Erba.). Electrolytes viz. Sodium, Potassium and Chloride were analysed using an Electrolyte analyzer (HD Lyte, India)

Sub-ischial Urethrotomy: The procedure was standardised as follows. The penis was grasped and pulled outwardly by straightening the sigmoid flexure with 12" artery forceps through external prepuccial opening and a long steel stellate was inserted through external urethral orifice and pushed forward toward ischial region breaking the sandy calculi. The urethrotomy was performed from sub-ischial region and steel stellate loaded PVC catheter of no 10 FG was inserted into the urethra and pushed into the bladder by avoiding entrapments into the blind end of urethral recess. The urethra was closed with 2-0 vicryl suture keeping another end of catheter outside the urethra and skin. The skin wound was closed as routine anchoring the PVC catheter open end with stay suture outside of the skin (Figs 1-4).

Postoperative Management: Owners were advised to give antibiotic ceftriaxone @ 20mg/kg b.wt and anti-inflammatory drug e.g. Meloxicam @0.24mg/kg body weight I/M for 7 days. Herbal litholytic drug i.e., tab. Cystone (2 tablets; Herbal Remedies, Bangalore India Ltd.) was given twice a day orally for 7 days. Ammonium chloride @ 15 gm/animal was given orally for 15 days for acidification of urine.

Statistical Analysis: The data were analyzed using One-Way analysis of variance (ANOVA) to compare the values among different subgroups at corresponding intervals and independent 't' test for comparison of different values with base values in different subgroups (Snedecor and Cochran, 1994). The data for the occurrence was analysed to find the percentage. The differences were considered significant at level of $P < 0.05$.

RESULTS AND DISCUSSION

The occurrence of obstructive urolithiasis in buffalo calves varied considerably with seasons and the maximum incidence (64.54%) was recorded from November 2015 to March 2016 with a peak in December (20.29 %) at LUVAS Regional Station, TVCC, Uchani, Karnal. Out of 10 buffalo calves selected for comprehensive study,

calves of 2-4 months of age had the highest (60%) occurrence of obstructive urolithiasis followed by the buffalo calves of 4-6 months of age (30%) and 1.5-2 months of age (10%). Maximum number (60%) of cases presented to the clinic was after 3-4 days, followed by 1-2 days (40%) of illness. Complete urethral obstruction was observed in 70% buffalo calves presented whereas partial urethral obstruction was seen in 30% cases. The animals were treated with Frusemide (Lasix) in combination with cystone, ammonium chloride and sodium bicarbonate as the primary treatment by the field veterinarian (as per history taken).

Clinical Examination: The clinical signs in animals with intact urinary bladder included anuria, inappetance to anorexia, respiratory distress, prolonged recumbency, normal alertness to depressed and dull appearance, sunken eyes, rough to moist muzzle, inward and outward movement of the flank during straining, breath holding, engorged urethra and sphincter movement, twitching of the penis, straining for urination, maintaining urinary posture for prolonged periods, tail lifting, adherence of sandy material at the prepuccial hairs and prepuccial mucosa, restlessness, frequent attempt to urinate and prolapse of rectum due to straining.

Clinical Parameters: Mean \pm SE heart rate (per min) in the affected animals was 71.05 ± 1.33 (50-90) and was higher than the normal reference value (66.00 ± 2.91). Similarly respiratory rate (breaths/min) in all the affected animals was 24.42 ± 1.28 (14-52) and was higher than the normal reference value (22.06 ± 1.56). The rectal temperature ($^{\circ}\text{C}$) in the affected buffalo calves was 37.88 ± 0.158 (34.50-40.30).

The values of different haematological parameters in the buffalo calves suffering from obstructive urolithiasis at different post operative days have been shown in Table 1. Values of packed cell volume (PCV) and haemoglobin (Hb) were recorded higher on the day of admission that might have occurred due to dehydration (Sharma *et al.*, 1982; Sockett *et al.*, 1986; Radostits *et al.*, 2000) as the elevated levels of these parameters are the indicators of dehydration (Meyer *et al.*, 1992). A non-significant reduction in Hb and PCV level was recorded after 72 h of surgery. Decrease in postoperative values towards normalcy could be attributed to the onset of rehydration due to fluid therapy and normal intake of food and water following correction of the obstruction.

Post-operative alterations in biochemical parameters are presented in Table 2. As depicted in this table, the levels of BUN and creatinine on the day of reporting were significantly ($p < 0.05$) higher than the values at 72

Table 1**Haematological parameters in obstructive urolithiasis affected buffalo calves at different intervals**

Parameters	Before surgery	Post-operatively at 0 h	Post-operatively at 72 h
Hb (g %)	11.55±0.16 ^a	11.05±0.41 ^a	10.64±0.36 ^a
PCV (%)	38.70±2.19 ^b	35.80±0.95 ^{ab}	33.2±0.94 ^a
TEC (×106/cu.mm)	9.24±0.42 ^a	8.87±0.59 ^a	8.15±0.26 ^a
TLC (×103/cu.mm)	14.8±1.68 ^a	15.81±1.62 ^a	16.21±1.58 ^a
Neutrophil (%)	56±3.24 ^a	54.50±3.81 ^a	47.50±4.51 ^a
Lymphocyte (%)	41.30±3.33 ^a	43.30±4.36 ^a	50±4.26 ^a
Monocyte (%)	0.80±0.02 ^a	0.80±0.35 ^a	0.40±0.22 ^a
Eosinophil (%)	2.30±0.15 ^a	2.40±0.40 ^a	2.18±0.19 ^a

Mean with different superscript within a row for a parameter vary significantly (P<0.05)

h of the surgery. The elevated values of BUN and creatinine could be due to the onset of acute renal failure manifested by decreased glomerular filtration rate as a result of back pressure on the kidneys and absorption of these substances from the urine present in the bladder in the intact urinary bladder cases, or from peritoneal cavity in the ruptured urinary bladder cases of complete obstructive urolithiasis (Sharma *et al.*, 2006). In this study, changes in BUN and creatinine levels were similar and both could be monitored to ascertain the efficacy of treatment. Total serum protein, albumin, sodium, calcium, ALT (alanine transaminase) and AST (aspartate transaminase) levels were non-significantly lower at the 0 h while the same were non-significantly higher at the 72 h of surgery. Opposite trend was observed for glucose, potassium and chloride levels. The lower and higher values of calcium and phosphorous, respectively could be due to feeding the calves with wheat bran and other concentrate diets which are rich in phosphorous and low in calcium content (Brobst *et al.*, 1978; Donecker and Bellamy, 1982; Sockett *et al.*, 1986; Singh *et al.*, 1987).

Additionally in the state of metabolic alkalosis, which was a common finding in most of the animals of this study, there is a further reduction in the proportion of ionized calcium, thus decreasing calcium levels. The post-operative improvement in the calcium values and decrease in phosphorous values might be due to the return of appetite, restoration of a normal acid-base balance, feeding calves with a balanced diet as the owners were advised and the inverse effect of the elevated calcium level in the blood. Pre-operative values of serum glucose were significantly increased at 0 h while the same were non-significantly decreased at 72 h of surgery. Tsuchiya and Sato (1990) have recorded high glucose value in goats with experimentally induced uraemia probably due to stress. Thakur (2006) has also recorded hyperglycemia in goats suffering from urethral obstruction. Post-operatively serum glucose level

decreased but was higher than the normal reference range. This could be due to variation in state of uraemia, different level of stress and appetite.

High levels of AST have also been recorded by Joshi *et al.* (1989) in sheep and by Singh (1987) in goat suffering from obstructive urolithiasis. Doxey (1983), Carlson (1990) and Kerr (2002) reported that AST is a non-specific indicator of the tissue damage and is normally present in tissues like skeletal muscle, cardiac muscle, liver, RBC's and kidneys. Therefore, the elevated level of AST could be due to cellular damage in various organs due to uraemia and dehydration.



Figs. 1-4. Passing of stellate through external urethral orifice in retrograde manner. 2. Stellate loaded PVC catheter inserted into the urethra in retrograde manner. 3. Fixation of catheter in urinary bladder. 4. Urethral recess preventing the entry of catheter into urinary bladder

Table 2

Biochemical parameters in obstructive urolithiasis affected buffalo calves at different intervals

Parameters	Before surgery	Post-operatively at 0 h	Post-operatively at 72 h
BUN (mg/dl)	38.60±7.54 ^b	38.10±7.35 ^b	13±2.34 ^a
Creatinine (mg/dl)	5.05±0.75 ^b	5.05±0.75 ^b	1.41±0.29 ^a
Sodium ion (mmol/L)	133.45±3.34 ^a	130.58±1.89 ^a	139.79±8.4 ^a
Potassium ion (mmol/L)	4.97±0.66 ^a	5.25±0.58 ^a	4.61±0.51 ^a
Chloride ion (mmol/L)	86.93±2.87 ^a	90.11±2.00 ^a	89.31±2.85 ^a
Calcium ion (mg/dl)	8.78±0.44 ^a	8.27±0.29 ^a	8.86±0.13 ^a
Phosphorus ion (mg/dl)	7.98±0.59 ^a	7.65±0.55 ^a	7.65±0.55 ^a
Total Protein (g /dl)	6.18±0.14 ^a	5.98±0.14 ^a	6.30±0.19 ^a
Albumin (g /dl)	2.72±0.55 ^a	2.56±0.52 ^a	2.69±0.12 ^a
ALT (IU/L)	38.54±6.13 ^a	42.74±4.96 ^a	43.51±4.37 ^a
AST (IU/L)	187.21±1.65 ^a	176.39±1.38 ^a	185.38±2.32 ^a
Glucose (mg/dl)	104.2±5.57 ^a	135.58±1.62 ^b	90.1±3.2 ^a

Mean with different superscript within a row for a parameter vary significantly (P<0.05)

Post-operative Observations and Complications:

The median time of initiation of dribbling of urine normally through urethra in the cases of sub-ischial urethrotomy with follow up was 5 days (2-9 days). However, the median time of free flow of urine from the urethral orifice was 8 days (5-11 days). Free flow of urine through the external urethral orifice could be due to the interplay of many factors. Reduction in infection and urethral spasm could be due to administration of anti-inflammatory drugs, drying up of calculi by diversion of urine through catheter, dissolution of urethral calculi by acidic urine caused by oral administration of ammonium chloride, pulverization of calculi by the litholytic effect of Cystone tablets, and breaking of sandy calculi with help of steel stellate. The median time of removal of PVC catheter in all the buffalo calves was 10 days (8-15 days).

Different post-operative complications recorded included catheter dislodgement (1), catheter blockade (1) and urine leakage at urethrotomy site (1). In one case, second surgical intervention was undertaken. Eight calves recovered without any complications while one calf recovered after complications. None of the calves died during or after surgery.

Sub-ischial urethrotomy procedure was found successful in terms of early recovery of bladder and urethra with less post operative complications. The procedure was found effective in sandy urethral calculi. The complications like stenosis of urethral lumen, leakage of urine and sloughing of muscle and skin were not observed. The procedure is for application only in young calves because the penile urethra from sub-ischial region is not approachable in heavy bulls. Observed changes in hematological and biochemical values are useful indicators for monitoring the health status of the animals under surgery, their prognosis and corrective measures for supportive therapy.

REFERENCES

Amarpal, Kinjavdekar, P., Aithal, H.P., Singh, T., Singh, M., Kushwaha, R.B., Thakur, K., Pathak, R., Pawde, A.M., Pratap, K. and Singh, G.R. (2005). Evaluation of tube cystostomy for the management of obstructive urolithiasis in buffalo calves. *Indian J. Vet. Surg.* **26**(2): 134.

Brobst, D. F., Parish, S.M., Torbeck, R.L., Frost, D.L. and Bracken, F. (1978). Azotaemia in cattle. *J. Am. Vet. Med. Assoc.* **173**: 454-456.

Carlson, G.P. (1990). Clinical Chemistry Tests. In: Large Animal Internal Medicine. Smith, B.P. (ed.). The C.V. Mosby Co.

Donecker, J.M. and Bellamy, J.E.C. (1982). Blood chemical abnormalities in cattle with ruptured bladder and ruptured urethra. *Can. Vet. J.* **23**: 355-357.

Doxey, D. L. (1983). Clinical Pathology and Diagnostic Procedures. Bailliere Tindal Ltd. Iowa.

Ewoldt, J.M., Anderson, D.E., Miesner, M.D. and Saville, W.J. (2006). Short-and long-term outcome and factors predicting survival after surgical tube cystostomy for treatment of obstructive urolithiasis in small ruminants. *Vet. Surg.* **35**: 417-422.

Joshi, H.C., Zangana, I.K. and Saleem, A.N. (1989). Haemato-biochemical and electrocardiographic changes in uremia in sheep. *Indian J. Vet. Med.*: **9**: 95-99.

Kerr, M.G. (2002). Veterinary Laboratory Medicine : Clinical Biochemistry and Haematology. Blackwell Science Ltd.

Kulkarni, B.B., Chandna, I.S., Peshin, P.K., Singh, J. and Singh, A.P. (1985). Experimental evaluation of treatment of uraemia due to ruptured urinary bladder in calves-II. Correction of acid-base and electrolyte imbalance and water deficit. *Indian J. Vet. Surg.* **6**: 25-30.

Larson, B.L. (1996). Identifying, treating, and preventing bovine urolithiasis. *Vet. Med.* 366-367.

May, K., Moll, A.H.D., Wallace, L.M., Pleasant, R.S. and Howard, R.D. (1998). Urinary bladder marsupialization for treatment of obstructive urolithiasis in male goats. *Vet. Surg.* **27**: 583-588.

Meyer, D.J., Coles, E.H. and Rich, E.J. (1992). Veterinary Laboratory Medicine - Interpretation and Diagnosis. W.B. Saunders Co, Philadelphia.

- Pandey, N.N. and Singh, G.R. (1989). Clinico-diagnostic profile in experimental uraemia of post renal origin in goats. *Indian J. Vet. Med.* **9**: 100-103.
- Radostits, O.M., Blood, D.C., Gay, C.C. and Hinchcliff, K.W. (2000). *Veterinary Medicine: A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses*. (9th edn.). Bailliere Tindall, London.
- Sharma, P.D., Singh, K., Singh, J. and Kumar, A. (2006). Bacteriological, biochemical and histopathological studies in uroperitoneum in buffalo calves (*Bubalus bubalis*). *Indian J. Anim. Sci.* **76**: 124-126.
- Sharma, S.N., Prasad, B., Kohli, R.N. and Singh, J. (1982). Pathophysiology of bovine uraemia. *Indian J. Anim. Sci.* **52**: 643-649.
- Singh, J., Singh, A.P., Peshin, P.K., Singh, M. and Gahlawat, J.S. (1987). Studies on the effects of bilateral ureter obstruction in calves. *Indian Vet. J.* **64**: 127-131.
- Snedecor, G.W. and Cochran, W.G. (1994). *Statistical Methods*. (8th edn.). Iowa State University Press, Ames, IA.
- Sockett, D.C., Knight, A.P., Fettman, M.J., Kichl, A.R., Smith, J.A. and Arnold, S.M. (1986). Metabolic changes due to experimentally induced rupture of the bovine urinary bladder. *Cornell Vet.* **76**: 198-212.
- Thakur, K. (2006). Tube cystostomy with medical dissolution for the management of urethral calculi in goats. M.V.Sc. thesis, Deemed University, IVRI, Izatnagar (UP), India.
- Tsuchiya, R. and Sato, M. (1990). Uraemic changes induced by experimental urinary retention in goats. *Japanese J. Vet. Sci.* **52**: 113-119.
- Udall, R.H. and Chow, F.H. (1969). The etiology and control of urolithiasis. *Adv. Vet. Sci. Comp. Med.* **13**: 29-57.
- Van Metre, D. (2004): Urolithiasis. *Farm Animal Surgery*. Fubini, S.L. and Ducharme, G.N. (eds.). W.B. Saunders, New York.
- Williams, J. M. and White, R.A.S. (1991). Tube cystotomy in dog and cat. *J. Small Anim. Pract.* **32**: 598-602.