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Comparative evaluation of ultrasound guided tube Cystostomy and conventional tube Cystostomy for treatment of obstructive Urolithiasis in male buffalo calves

Amit Kumar, Sandeep Saharan, Deepak Kumar Tiwari, Maneesh Sharma and Parveen Kumar Gahlot

Abstract

The present study was conducted in 12 male buffalo calves to evaluate the efficacy of ultrasound guided tube cystostomy (group I; 6 calves) and conventional tube cystostomy (group II; 6 calves) for the treatment of obstructive urolithiasis. Diagnosis was carried out on the basis of history of anuria, clinical signs and ultrasonographic examination. For group I, the median time required for completion of surgery was 4.5 minutes (4-5 minutes) and 22.5 minutes (20-25 minutes) for group II. The median time of free flow of urine from urethral orifice was 13 day (10-17 days) in group I and 21 days (20-22 days) in group II. From the present study, it may be concluded that ultrasound guided tube cystostomy is more efficient for the treatment of obstructive urolithiasis in male buffalo calves.

Keywords: Ultrasound guided tube cystostomy, obstructive urolithiasis, ammonium chloride

Introduction

Urolithiasis is a diseased condition which occurs due to formation of uroliths as a consequence of pathophysiological processes which may be congenital and/or acquired, that result in increased concentration of less soluble crystalloids in urine (Osborne and Kruger, 1984) [12]. It affects both male and female but more occurrence is seen in males (Makhdoomi and Gazi, 2013) [9] due to long and narrow urethra in male ruminants. Most common site of obstruction in bovines is distal part of sigmoid flexure and glans penis (Gera and Nigam, 1979; Sharma and Singh, 2001) [5, 18]. Early aged castrated males are more prone to urolithiasis (Williams, 1955; Kopper, 1967; Bhatt *et al.*, 1973; Smith and Sherman, 1994) [22, 6, 1, 19] because castration causes narrowing of urethral diameter and thus predisposed the animal for calculus obstruction (Larson, 1996) [7]. Testosterone hormone is necessary for normal development of urethra and also for secretion of protective colloids in urine of male animals (Williams, 1955) [22]. Urethral obstruction due to uroliths/calculi or concretions results in retention of urine in bladder and causes its overdistention. If treatment is not provided at an early stage then rupture of either urinary bladder or urethra may occur, which will rapidly deteriorate the overall condition of animal. Floeck (2009) [3] suggested that ultrasonography is a non-invasive, safe, economical and dynamic imaging modality that aids in diagnosis of several urinary tract abnormalities, supplementing the clinical examination and clinicopathological analysis by providing additional information on urinary tract diseases. It is quite accurate in diagnosing urethral calculi, concretions, distended and ruptured urinary bladder, urethritis, hydronephrosis and nephrolithiasis (Saharan *et al.*, 2013) [16]. The purpose of present study is to determine efficacy of both methods for the treatment of obstructive urolithiasis in male buffalo calves.

Materials and Methods

The present clinical study was conducted on 12 male buffalo calves suffering from obstructive urolithiasis which were brought to Veterinary Clinical Complex, Lala Lajpat Rai University of Veterinary and Animals Sciences, Hisar, Haryana and were managed by ultrasound guided tube cystostomy (group I) and conventional tube cystostomy (group II). Clinical signs observed were anuria, inappetence to anorexia, reluctance to walk, respiratory distress, prolonged recumbency, normal alert to depressed and dull appearance, sunken eyes, dry to moist muzzle, engorged urethra, twitching of penis, straining for urination, maintaining urinary

posture for prolonged periods, tail lifting, frequent attempt to urinate and pain on palpation of penis/urethra.

Evaluation of status of urinary bladder, wall thickness, and presence of urinary calculi were done preoperatively by ultrasonography using 4 MHz transducer (Siemens Acuson S2000 machine). Intact urinary bladder cases were selected for both the groups.

Surgical Technique

For group I

Bovine calves were sedated using xylazine at the dose rate of @0.01mg/kg body weight intravenously and were restrained in right lateral recumbency with the left hind-limb tied to far side of the table in flexed position to expose the left ventral caudal abdomen for paramedian approach (Fig.1). After preparation of animal for aseptic surgery, 3-4 ml local anaesthetic (2% lignocaine HCl) was injected at the surgical site (Fig. 3) under the guidance of ultrasonogram. A stab incision was given over skin and fascia to puncture abdominal wall under the guidance of ultrasonogram (Fig. 4). Plunger of artificial insemination gun is inserted into Foley's catheter no. 18 up to its eye through urinating port and then Foley's catheter was made to penetrate directly into urinary bladder (Fig. 5). After observing urine outflow and ensuring proper placement of catheter into lumen of bladder, the balloon of catheter was inflated with 25 ml normal saline solution so as to anchor the catheter inside the lumen against the urinary bladder wall (Fig. 6). A simple interrupted skin suture was applied at stab incision site by using non-absorbable silk No. 1 (Fig. 7). The median time required for completion of surgery was 4.5 minutes (4-5 minutes).

For group II

After proper sedation, restraining (Fig. 8) and aseptic preparation (Fig. 9), paramedian skin incision was given in between the supernumerary teats (Fig. 10). Urinary bladder was approached after separating abdominal muscles (Fig. 11). A stab incision was made over intact urinary bladder and then foley's catheter was fixed into urinary bladder by inflation of balloon of catheter (using 25 ml normal saline solution). Routine muscles suturing was done in two layers using absorbable suture material (catgut no.1) (Fig. 12). Skin suturing was performed using non-absorbable suture material (silk no. 1) (Fig. 13). The median time required for completion of surgery was 30 minutes which is co-related with findings of Saurabh *et al.*, (2016)^[17].

Post-operatively, Broad spectrum antibiotic Ceftriaxone @10 mg per kg body weight (Maradiya *et al.*, 2010)^[11] and anti-inflammatory drug meloxicam @ 0.5 mg/kg body weight (Papich, 2011)^[12] were administered intra muscularly for 5 days. Ammonium chloride @ 500 mg/kg body weight (Mangotra *et al.*, 2016)^[10] was given orally in drinking water for the acidification of urine in both groups for 20 to 25 days. Sodium chloride supplementation was recommended in drinking water to enhance frequent water intake and aid in acidification of urine. Owners were advised to flush the catheter with normal saline solution to remove debris from catheter. After 2 days of surgery, owners were advised to block urinating port of catheter for 4-6 hours to facilitate dribbling through urethra and time of blockage was increased as dribbling was observed. Occlusion of Foley's catheter

might have helped in early expulsion of calculi from the urethra (Rakestraw *et al.*, 1995; Van Metre, 2004)^[14, 21].

Results and Discussion

In present study, no complications were encountered during surgery. However, ultrasound guided tube cystostomy was found to be easy, simple, less time consuming technique than conventional tube cystostomy for the treatment of obstructive urolithiasis in bovine calves. No muscles suturing was needed in USG guided technique as only stab incision was given over surgical site but suturing was needed in conventional tube cystostomy, so USG guided technique was found to be more economical than conventional technique. Chances of entry of environmental infection was very less as abdominal cavity is not opened fully but more chances of infection were there in conventional tube cystostomy. No post-operative complications were observed in USG guided technique. However, wound infection at surgical site in two cases and catheter blockage in three cases of conventional tube cystostomy (group II) was recorded, may be due to improper post-operative care by owners. Blockade of Foley's catheter might occur by urinary sludge, blood clot and concretions, which required daily inspection and flushing of the catheter for dislodgement of the obstruction (Rakestraw *et al.*, 1995^[12]; Fortier *et al.*, 2004^[12]; Van Metre, 2004)^[14, 4, 22]. The blockade of Foley's catheter might also depend on the mucosal damage of urinary bladder and flow rate of urine from the Foley's catheter. Blockade of catheter may be suspected in calves when mucosal shreds are present in the urine and flow of urine is low.

For group I, the median time of initiation of dribbling of urine normally through urethra was 7 days (6-14 days). However, the median time of free flow of urine from urethral orifice was 12 day (10-17 days) which is co-related with findings of Ram Niwas *et al.*, (2021)^[15]. For group II, the median time of dribbling of urine was 14 days (10-18days). However, the median time of free flow of urine from urethral orifice was 18 days (17-24 days) in group II. The free flow of urine through the external urethral orifice could be due to the interplay of many factors. Reduction in inflammation and urethral spasm by administration of anti-inflammatory drugs, drying up of urethral concretions by diversion of urine through the tube cystostomy catheter, dissolution of urethral concretions by acidic urine caused by oral administration of ammonium chloride and sodium chloride along with drinking water, and occlusion of tube cystostomy catheter helped in achieving urethral patency by flushing the urethra of all debris and calculus material (Ewoldt *et al.*, 2006; Rakestraw *et al.*, 1995^[2, 14]. Mahajan and co-workers (2017)^[8] concluded that tube cystostomy is found to be a simple, useful technique in the management of obstructive urolithiasis in calves and small ruminants with overall success rate of 73.33%.

Chances of entry of environmental infection was very less as abdominal cavity is not opened fully but more chances of infection were there in conventional tube cystostomy as minimum complications are encountered with small surgical incision. Streeter and co-workers (2002)^[20] pointed that laparoscopic assisted cystostomy with subsequent tube cystostomy can be helpful in male small ruminants suffering from obstructive urolithiasis for removal of uroliths and debris from the urinary bladder.



Fig 1: Showing buffalo calf in right lateral recumbency with flexed left hind limb to expose the left prepubic region.



Fig 4: Ultrasound guided stab incision



Fig 2: Ultrasonography of urinary bladder showing intact urinary bladder.



Fig 5: Placement of Foley's catheter into urinary bladder and inflation of its balloon



Fig 3: Local infiltration with 2% Lignocaine hydrochloride.



Fig 6: Ultrasonographic picture of inflated balloon of Foley's catheter



Fig 7: Post-operative picture of ultrasound guided tube cystostomy

Group II: Conventional tube cystostomy

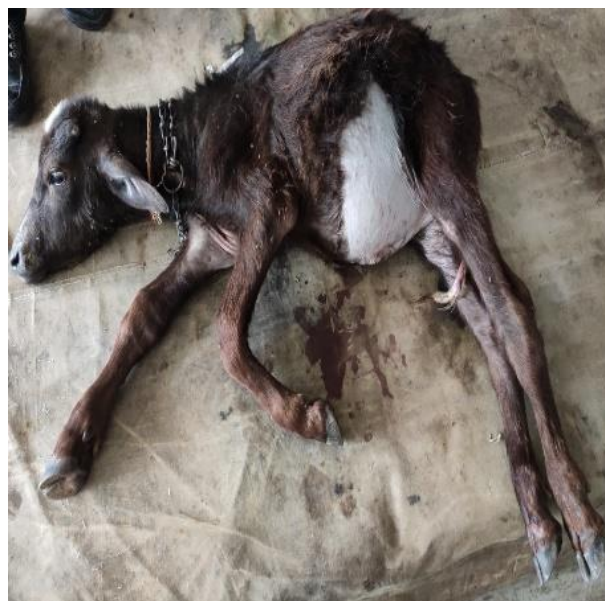


Fig 8: Showing buffalo calf in right lateral recumbency

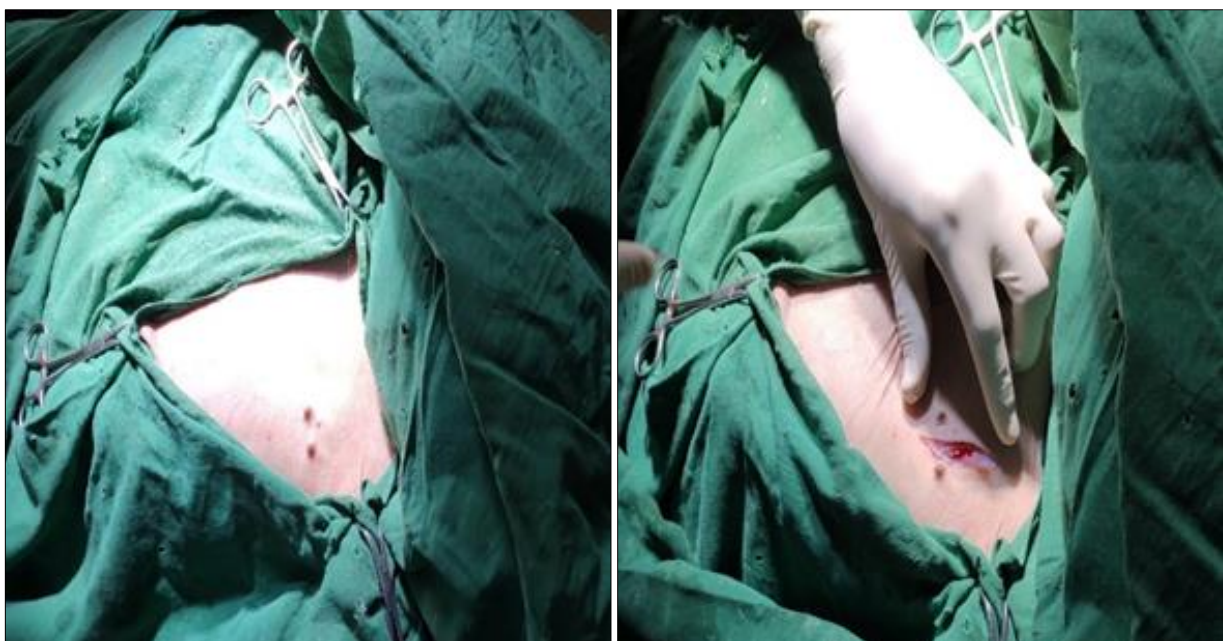


Fig 9, 10: Showing surgical site and skin incision



Fig 11, 12: Showing urinary bladder and muscle suturing using catgut no. 1



Fig 13, 14: Showing skin suturing using silk no. 1 and post-operative picture of conventional tube cystostomy

Conclusions

Ultrasound guided tube cystostomy is easy, simple, less invasive and less time consuming technique for the treatment of obstructive urolithiasis in bovine calves. Post-operative complications (wound infection, suture dehiscence and kinking of catheter etc.) are very less along with less post-operative surgical management as compared to conventional tube cystostomy. It is more cost effective for farmers also. So, it may be recommended as the first choice of treatment for the management of obstructive urolithiasis in buffalo calves with intact urinary bladder.

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