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## Combination of Urethrotomy, Urinary Bladder Repair, Tubecystostomy in Clinical Cases of Urethral Obstruction in Bullocks

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**Abstract:** Combination of a urethrotomy, bladder repair, and tube cystostomy was done in 48 clinical cases of bullocks suffering from urethral obstruction. Tube Cystostomy performed using either Foley's or PVC catheter along with urethrotomy and bladder repair for adult bullocks was performed for both intact bladders and ruptured bladders with high success rate of 70.83%. Surgical tube cystostomy in addition to urethrotomy and bladder repair was found to be superior to percutaneous tube cystostomy and urethrotomy. Tube Cystostomy with Foley's catheter was found to be superior to PVC catheter.

**Keywords:** Urethrotomy, Tube Cystostomy, Urethral obstruction, Bullocks.

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### INTRODUCTION

Urolithiasis has defined as the formation of stones anywhere in the urinary system (Emerick, 1988; Paynae, 1989 and Radostits, et al., 2000). Urolithiasis in India presents an important economic factor where cattle - based agriculture is strongly linked with the livelihood of an important segment of the population. In India, deaths due to urolithiasis in bullocks were contributing to the severe economic loss. Urethrotomy is the recommended technique for the management of urolithiasis. The primary objective of the study was to evaluate the combination of various surgical techniques for the treatment of urolithiasis, in particular to urethral obstructions in bullocks. However, tube cystostomy in Bullocks is one of surgical techniques and literature on it is scanty, except for clinical studies and case reports in calves. Therefore, the study was aimed at evaluating different tube cystostomy techniques with different tubes for urethral obstruction in bullocks along with urethrotomy and urinary bladder repair.

### MATERIAL AND METHODS

The study was conducted in clinical cases of adult bullock suffering from urethral obstruction weighing 225 to 530 kg, aged 3 to 16 years, referred to Veterinary College Hospitals, Bidar and Hassan for treatment during the year 2012-2016. All the animals were subjected to preclinical, physical, per rectal, urine, peritoneal fluid and hemato serological examination. The animals were randomly divided into five groups. A total of 48 bullocks were randomly selected for the study. Based on the history and clinical examination, 28 cases were diagnosed as urethral obstruction with the intact bladder. Among the bullocks with intact bladder, they were divided into Group I with 10 animals, II with 10 animals and III with 8 animals and 20 cases with rupture of the urinary bladder were divided into Group IV and V with 10 animals in each group.

Among 28 bullocks suffering from urethral obstruction with intact and distended urinary bladder, they were randomly divided into Group I, II and III. **Group I** were treated with urethrotomy followed by open surgical tube cystostomy through ischio-rectal fossa using Foley's catheter, **Group II** was treated with urethrotomy followed by open surgical tube cystostomy

through ischio-rectal fossa using PVC catheter, **Group III** was treated with minimal invasive styliet guided percutaneous tube cystostomy through ischio-rectal fossa followed by urethrotomy using PVC catheter.

Rest 20 bullocks with urethral obstruction with urinary bladder rupture. These animals were stabilized by draining the abdomen by trocarization or catheterization with supplementation of intravenous fluids prior to surgery and they were randomly divided into Group IV and V. **Group IV** were treated with urethrotomy followed by open surgical tube cystostomy through ischio-rectal fossa using Folley's catheter and **Group V** were treated with urethrotomy followed by open surgical tube cystostomy through ischio-rectal fossa using PVC catheter.

The results were evaluated by clinical observations, urine analysis, peritoneal fluid analysis, hematological and biochemical analysis.

### **Post-scrotal Urethrotomy**

Post-scrotal urethrotomy was performed before tube cystostomy in the animals of group I, II, IV and V and after percutaneous tube cystostomy in group III. The post-scrotal skin incision was given on midline and deeper tissue was incised. All the bullocks were restrained in right lateral recumbency for post-scrotal urethrotomy. Penis was exteriorized at sigmoid flexure and location of calculi if any was examined. An incision was made at the site of obstruction over urethra to remove the urinary stone. Urethral catheterization was done through the incision to ascertain patency distally till the tip of the penis. Retrograde catheterization was also done towards the bladder. The urethral incision was closed using chromic catgut no. 2-0 with the simple continuous pattern.

The penile fascia was opposed using chromic catgut no.1-0. Muscles and subcutaneous fascia were sutured using chromic catgut no. 2 using simple interrupted pattern. The skin incision was closed with nylon using vertical mattress pattern.

### **Tube Cystostomy by the open surgical method:**

Tube Cystostomy was carried out by an open surgical method in all the animals of the group I, II, IV and V. The bullocks were restrained in right lateral recumbency. Skin incision of ten to fifteen cm was given at the ischio-rectal fossa and sacrococcygeal muscles were separated. Haemostats were used to arrest the bleeding. The pelvic fascia was separated with blunt dissection. The pelvic diaphragm was bluntly separated to reach the urinary bladder. The bladder wall was brought to the site of the incision. Nick incision was made on the wall of the bladder with BP blade No. 11. The urine was drained through the incision site since the bladder was distended in group I, II and III. The incision was given at a separate site when the bladder was ruptured in group IV and V. The incision site on the bladder was held in place with stay sutures. The incision was extended and the lumen of the urinary bladder was explored with a fingertip. Repeated flushing of the bladder was carried out with normal saline to dislodge calculi if any. Either PVC or Foley's catheters were inserted as per the grouping of animals. The Foley's catheter was inserted into the urinary bladder of the bullocks of the group I and IV. Styliet was inserted into Foley's catheter to provide stiffness so that the tip could be easily inserted into the cystostomy site. The cuff of the Foley's catheters was inflated with 10 ml normal saline and was positioned in the lumen of the bladder. Purse string suture was placed to retain the Foley's catheter inside the lumen of the bladder.

The PVC catheter was used for cystostomy in the animals of group II and V. The styliet with blunt end was inserted into PVC catheter which was then placed into the lumen of the urinary bladder. Styliet was withdrawn and the catheter was secured in position by purse string sutures on the bladder wall.

The incision site (group I, II, IV and V) and ruptured site (group IV and V) on the urinary bladder were sutured with Cushing's pattern using chromic catgut no. 1-0. The fascia and musculature were closed with chromic catgut no.1 with the simple interrupted pattern. The subcutaneous fascia was closed using chromic catgut no.1 with the simple continuous pattern. The skin was opposed using simple interrupted pattern of sutures using nylon. The Foley's or PVC catheter was secured to the skin with finger trap stay sutures.

### **Tube Cystostomy by closed, minimally invasive percutaneous tube cystostomy method (group III):**

The blind method of percutaneous tube cystostomy (PCTC) was performed in eight animals of group III using PVC catheter through ischio-rectal fossa before doing urethrotomy. This procedure was done either in a standing position or in recumbent position if the bullock was recumbent. The site was anesthetized with 5-10 ml of 2% lignocaine hydrochloride inj. A nick incision was given on the skin at ischio-rectal fossa towards the left side of anal sphincter using BP blade no.11. The sterile style with beveled edge was passed into PVC catheter. The sharp beveled tip of the loaded styliet was pushed into the skin incision with the help of left hand. The right hand was placed into the rectum to guide the tip of the styliet towards the dorsolateral wall of the distended bladder (Plate no. 14). Once the tip of catheter touched the distended bladder, a sudden thrust was given on to the other end of the styliet with the left hand so as to pierce the wall of the distended urinary bladder. The styliet was advanced forward along with PVC catheter and pushed further into the bladder for ensuring correct placement. The styliet was withdrawn from the PVC catheter. The catheter was anchored at the point of insertion of skin using nylon suture. The urine was drained completely from the bladder.

Another styliet with blunt end was used to dislodge any plugs obstructing the free flow of urine from the bladder after placement of PVC catheter. Rubber connector was attached to free end of PVC catheter for administration of antibiotic and ammonium chloride.

### **Urinary bladder repair through ischio-rectal fossa:**

All the bullocks of groups IV and V were first stabilized by draining the abdomen followed by adequate fluid therapy. Bladder repair was carried out in group IV and V in ten bullocks of each group through ischio-rectal fossa. The bladder was sutured with continuous Cushing's suture using chromic catgut no. 1-0. Tube cystostomy was later performed using Foley's catheter in group IV and PVC catheter in group V for subsequent drainage of urine and medication of bladder.

#### **Postoperative management and removal of catheters:**

Ammonium chloride was administered orally @ 100g / 250 kg B.wt. /day for 30 days after surgery in all the groups. In addition, ammonium chloride 5%, about 100-200 ml was administered directly into the bladder through the tube cystostomy catheters (Plate no. 25). Each time after infusing the solution into the bladder, the catheter was blocked with a paper clip or 2 ml syringe plunger for Foley's catheter or 2 ml syringe with rubber connector for PVC catheter for a period of half an hour to retain the medicated solution inside the bladder. Enrofloxacin 1% solution was infused into the bladder through cystostomy catheters and was allowed to drain freely for the first four days. On the fifth day, the tube cystostomy catheters were occluded with medicated solution for more than 1 hr to build up pressure towards urethral catheter to allow urination through prepuce (Plate no. 26 and 27). If the animal was uncomfortable (kicking at belly, repeatedly getting up and down, looking at abdomen) after occlusion, the clamp was removed to allow the catheter to drain the bladder. With the catheter occluded, when the bullocks passed urine normally with full speed through the preputial opening with normal parameters, the cystostomy catheter was removed. The urethral catheters were also removed after 10 days.

Postoperatively, enrofloxacin inj. was administered @ 5 mg/kg B.Wt.by IM route for 7 days. Meloxicam inj. @ 0.2 mg/kg, B.Wt. was administered by IM route for 5 days. Fly repellent ointment was applied externally on wounds postoperatively up to 15 days. Sutures were removed on the 15<sup>th</sup> day.

### **RESULTS AND DISCUSSION**

Urethrotomy was conducted in all the bullocks of five groups. Initially, the post-scrotal site was used to trace the obstruction. Calculi were found at the sigmoid flexure in 68.42% cases (26). When calculi were not found at the site, an incision was extended towards ischial region or glans penis was exteriorized to locate calculi. Calculi were located at the ischial region in 4 bullocks (10.53%); near prepuce of the penis in 3 bullocks (7.89%); at the tip of the penis in 1 bullock (2.63%); and inside the urinary bladder in 4 bullocks (10.53%). Urethrotomy at post-scrotal region was less time-consuming. Whereas, ischial urethrotomy was associated with deeper dissection, bleeding and more time-consuming. The difficulty of exteriorization of the penis, locating the calculi and passing of catheter was also associated with ischial urethrotomy.

Urethrotomy did not reveal calculi in 10 bullocks (20.83%) and hence, urinary obstructions due to other causes were suspected. Some of the causes were detected during surgery or during post-mortem that included neoplasm, cystitis, and lesions in the kidney.

#### **The open surgical method of tube cystostomy:**

Tube Cystostomy by the open surgical method through ischio-rectal fossa was conducted using Foley's catheter in group I and IV and using PVC catheter in group II and V. The space available for manipulation was less. It was not possible to bring the distended bladder towards skin incision. Hence, nick incision was required to puncture the bladder, pass the catheter to remove urine and pull back the collapsed bladder towards the ischio-rectal incision. This facilitated the fixing of Foley's or PVC catheter into the bladder. In groups IV and V, the accumulated urine in the abdominal cavity was removed through ischio-rectal approach; the ruptured bladder was exteriorized and sutured. This was followed by tube cystostomy using Foleys or PVC catheter. (Group II – Plate no.28, 29 and 30)

#### **The closed method of minimally invasive percutaneous tube cystostomy:**

In group III animals, PVC catheter was used for percutaneous tube cystostomy. The percutaneous method was found quicker than open surgical method but was not accurate when compared to open surgical method of tube cystostomy. After percutaneous tube cystostomy, the PVC catheter came out of urinary bladder after 3 days in two bullocks. These were re-operated to insert the catheter. There was a recurrence of urinary obstruction in one bullock after two months. This required surgery by open tube cystostomy during which multiple calculi were removed from the bladder.

#### **Repair of the ruptured bladder through ischio-rectal fossa approach:**

Repair of the ruptured bladder through ischio-rectal fossa was followed in group IV and V. Passing of complete hand was not possible through the ischio-rectal approach. The collapsed bladder was grasped with long forceps and exteriorized through ischio-rectal fossa and the ruptured site was sutured. It was possible to visualise the rupture site through this approach. A separate nick incision was given on the bladder to insert either Foley's or PVC catheter depending on grouping.

#### **Causes of urinary obstruction and management:**

Different causes of urinary obstruction were noticed in the present study. In 38 bullocks out of 48, urolithiasis was the primary cause. In one bullock, the presence of large blood clot within the bladder, in addition to calculi was the cause of obstruction. In these bullocks, tumor within the bladder (2) and outside the bladder (1) was the cause of obstruction. In one bullock, trauma to the penis was the cause of obstruction. In remaining five bullock's urethritis and cystitis were the causes of obstruction. Urethrotomy was the primary managerial technique followed to remove calculi from the urethra. These bullocks had calculi within the urinary bladder and these were removed by tube cystostomy. The remaining causes of obstruction, administration of antibiotic and urinary acidifiers through the tube cystostomy was the managerial technique.

#### **Urination after surgery:**

Urine flow was re-established in the majority of the bullocks on day 1 through the catheters placed.

**Group I:** Out of 10 bullocks, 8 bullocks showed slow or drop by drop urination through the catheter placed by urethrotomy post-operative day. Urine flow was also maintained in survived bullocks, drop by drop through the Foley's catheter fixed at the site of tube cystostomy.

In the present study, the obstruction to the flow of urine was due to calculi in 7 and cystitis in one out of 10 bullocks which responded to urethrotomy combined with tube cystostomy using Foley's catheter. However, two bullocks which died within 5 days had neoplasm with in bladder.

**Group II:** Out of 10 bullocks, 8 bullocks improved with normal urination through the catheter from the prepuccial orifice within a first postoperative day. The obstruction to the flow of urine was calculi in 8 out of 10 bullocks which responded to urethrotomy combined with tube cystostomy with PVC catheter.

However, two bullocks died within two days, one due to the pelvic tumor and other due to trauma to the penis to faulty castration. Although the tumor was noticed during operation, resection of the tumor was not possible as it involved whole bladder and pelvic cavity.

**Group III:** Out of 8 bullocks which underwent percutaneous tube cystostomy, 6 survived (75%). Urine was drained from the distended bladder by the percutaneous closed method of tube cystostomy in all the 8 animals. Urination was restored drop by drop through the catheter placed in urethra through urethrotomy within a first post-operative day and at normal days in six bullocks.

Remaining two bullocks died within five days. Calculi were not found in these two bullocks during urethrotomy, however, only mucous plug and necrotic debris occluded urethra. The post-mortem of these two bullocks revealed severe lesions in the kidney.

**Group IV:** All the bullocks of this group had bladder rupture. Out of ten bullocks, six animals improved with a drop by drop to slow urination through prepuccial catheter placed during urethrotomy within one or two day post- operatively. The tube cystostomy helped in draining out the urine upto 12 days in 3 animals and upto 17 days in remaining animals. Most of the bullocks with ruptured bladder were anorectic when presented for treatment and continued to be anorectic for 5-8 days post-operatively because of ureamic changes. This lead to delays in recovery and functioning of the bladder.

Three bullocks died within two to three days due to the late presentation as there was severe uoperitoneum, peritonitis, and uremia. One bullock with a large blood clot in urinary bladder did not respond.

**Group V:** The animals of this group suffered from urinary obstruction and bladder rupture. Out of ten bullocks, six animals passed urine drop by drop or slowly through the catheter placed during urethrotomy within one or two post-operative day.

Acidic urine caused painful stimuli which resulted in dribbling, slow flow in the initial days of recovery through urethrotomy catheter in calves (Kane *et al.*, 1989). The raised tail, stiff gait was observed in few rams due to contact of acidic urine with incision site of tube cystostomy which was also a finding by Cockcroft (1993). This was not observed in bullocks of the present study as the quantity of urine formed was large enough to dilute the medication and prevent irritation. The bullocks passed urine with normal speed through the catheter placed in the urethra after 3 to 4 days in the present study.

The controlled occlusion of tube cystostomy catheter created pressure and speed of urination improved from normal prepuccial route over a period of seven days. Amarpal *et al.* (2010) reported that urine started dribbling through the urethral orifice after 4-5days and the flow of urine increased gradually. Free flow urine was observed in 12-15days without urethrotomy. The animal passed urine and showed no signs of obstruction during one year follow-up period. Whereas, Ewoldt *et al.* (2006) in a study comprising of 65 goats and 13 sheep reported mean of 11.5 days for normal urination after tube cystostomy without urethral flushing. In all animals, Foley's catheter was removed by deflating the balloon and pulling it out after animal resumed to normal urination. Tamilmahan *et al.* (2014) performed tube cystostomy without urethrotomy observed normal urination through urethra on 12-18 days in 35 male calves and 23 goats postoperatively with Whereas, Gazi *et al.* (2014) observed micturition after 10 days in 17 rams and 12 bucks. The success rate of 80% was recorded.

#### **Wound healing:**

In bullocks of group with ruptured bladder (IV and V), delayed wound healing at the site tube cystostomy was noticed which may be attributed to the loss of appetite due to uraemia. Whereas, the wounds healed quickly at the site of tube cystostomy in the animals with intact bladder (I, II and III) where systemic changes were less.

#### **Complications:**

Complications such as slipping, dislodgment, and blockage of PVC catheter were observed. PVC catheter slipped in two animals each in the groups II, III, and V. Whereas, Foley's catheter did not slip from the place owing to the presence of inflated cuff in groups I and IV. PVC catheter was found blocked in 5 animals (group II-2; group III-1 and groupV-2) whereas; Foley's catheter did not show any blockage. Singh (2005) observed obstruction and displacement which are similar to complications observed in the study. Ascending infection reported was not observed in the present study due to the use of antibiotics.

#### **Outcome:**

Survival rate was found better in groups I and II (80%) when compared to group III (75%), IV and V (60%). Survival rate of 60 per cent was observed in group IV and V where urinary bladder ruptured and uraemia were seen. The Higher rate of success of 83% was observed with intact bladder by Iselin *et al.* (2001) after tube cystostomy in small ruminants without urethrotomy.

Tamilmahan *et al.* (2014) observed normal urination through urethra on 12-18 days postoperatively without urethrotomy in 80% of buffalo calves (28 out of 35) and 86.7% goats (20 out of 23). Palli *et al.* (2016) observed the normal passage of urine by  $13.83 \pm 1.07$  days postoperatively in 23 out of 24 calves. Khurma *et al.* (2017) reported 86% recovery and normal urination through the urethra without urethrotomy on 8-12 days post-operatively in buffalo calves.

Ewoldt *et al.* (2006) reported the success with 86% in the long-term outcome of 12 months period. However, recurrence of 20% was recorded in 50 goats and 13 sheep within after 6-12 months. There was no recurrence of the condition in our study when followed up for 30 days after discharge. The results were in agreement with Rakestraw *et al.* (1995). Ewoldt *et al.* (2008) in another study mentioned 76% success in attaining normal urination after tube cystostomy in 48 out of 78 small ruminants out of which 65 goats and were 13 sheep. Whereas, Singh *et al.* (2010) reported a high success rate of 96.43% with tube cystostomy without urethrotomy in 16 goats affected with urolithiasis.

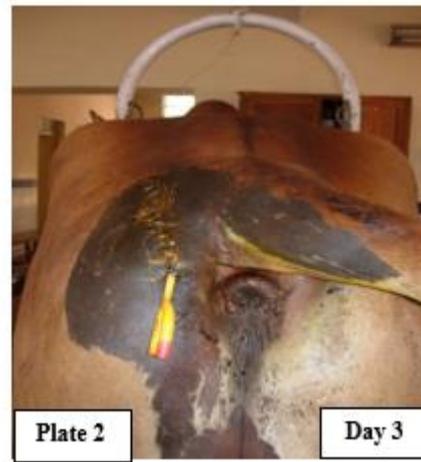
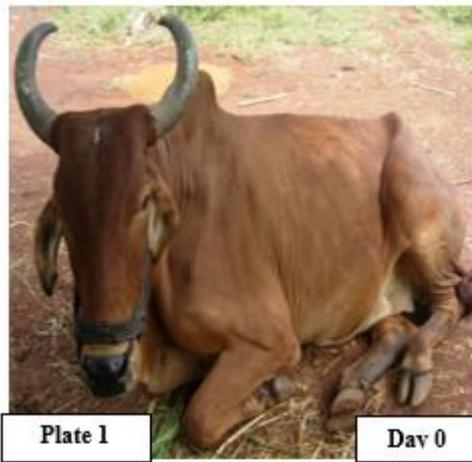
Gazi *et al.* (2014) observed micturition at 10 days after tube cystostomy without urethrotomy and reported 73% recovery rate in small ruminants comprising of 17 rams and 12 bucks. Amarpal *et al.* (2010) noticed that 12 goats passed urine through urethra from 5-9 days post-operatively. However, catheters were removed after 12-15 days. Videla and Amstel (2016) in a follow-up treatment in 12 goats observed urination after 5-9 days but catheters were removed after 12-15 days post-operatively.

## CONCLUSION

Surgical tube cystostomy was found very useful to restore urine pH and urination through normal route and correct urethritis and cystitis. Surgical tube cystostomy was found to be superior to percutaneous tube cystostomy. Tube Cystostomy was found useful for multiple calculi severe urethritis and cystitis as an alternative diversion technique and promoting urination through normal route at a subsequent period. Foley's catheter was found to be a better catheter for tube cystostomy. Clinical, physiological, hemato-biochemical changes were severe in the case of bladder rupture and return to normal with a combination of treatment. The combination of a urethrotomy, tube cystostomy and bladder repair through ischio-rectal fossa helped in the survival rate of above 60% in bullocks. Percutaneous tube cystostomy is also an alternative quicker method which prevents bladder rupture, avoids anorexia and uremia in bullocks with urinary obstruction. Tube Cystostomy performed using either Foley's or PVC catheter along with urethrotomy and bladder repair for adult bullocks was performed for both intact bladders and ruptured bladders with high success rate of 70.83%.

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**Plate 1** Photograph of animal recumbent due to bladder rupture on day 0 (before operation)

**Plate 2** Photograph of the same animal standing and passing urine through Foley's catheter after operation on day 3

**Plate 3** Photograph of the animal on day 15 after removal of skin sutures with Foley's catheter in place

**Plate 4** Photograph of the same animal after complete recovery on day 30