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DEATH OF NON-DESCRIPTIVE MALE CALF DUE TO UROLITHIASIS FOLLOWED BY RUPTURE OF URINARY BLADDER

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ABSTRACT

The objective of the present study was to report a typical case of obstructive urolithiasis and subsequent rupture of the urinary bladder, causing the death of a non-descriptive male calf. The calves were brought to a teaching veterinary hospital with the symptoms of abdominal pain, the absence of urination manifested by discomfort, straining, kicking at the belly, twisting of the penis and frequent but unsuccessful urination. The clinical examination revealed that the calves were dull, depressed and distension of the abdomen. Post scrotal urethrotomy was performed aseptically and a large calculus was removed from the position of sigmoid flexure of the penis. Another two calves were not subjected to surgery due to their ill health and all were died after 2-3 days. A postmortem examination revealed that the urinary bladder was ruptured and subsequently urine was mixed with peritoneal fluid. A haemorrhagic condition was present at the point of rupture and peritoneum and bladder was adhesion at the point of rupture.

Keywords: Urolithiasis, paracentesis, urethrotomy

INTRODUCTION

Urinary calculi or uroliths are mineral concretions formed in the urinary tract. Calculi may be large enough to obstruct the flow of urine or small enough to be passed with the urine. Uroliths can originate in the kidney, ureter, bladder, or urethra and are referred to as nephroliths, uroliths, urocystoliths, or urethroliths, respectively (Brown, 2013). Formation of urolithiasis is usually the result of a combination of physiologic, nutritional, and management factors including excessive or imbalanced intake of minerals (Larson, 1996; Radostits *et al*., 2000). Both sexes appear to be affected equally, but problems occur mainly in males because of the anatomical conformation of their urinary tract (Larson, 1996). It is a very common and frustrating problem in small and large ruminants for owners and veterinarians. Mortality due to urolithiasis in suffering animals is very high due to rupture of the urethra or urinary bladder (Gasthuys *et al*., 1993). In cattle, urethral obstruction typically occurs at the level of the sigmoid flexure. The highest occurrence was found in the age group of under one year (60%) followed by (40%) above one year and non-descriptive calves were affected more (70%) (Khan *et al*., 2013). Surgical management of obstructive urolithiasis in male calves and bucks is possible if the obstruction is detected in its initial stages. Various surgical interventions such as amputation of the urethral process at its base near the glans penis in male ruminants, perineal urethrostomy, or tube cystotomy may be considered for relief of obstructive urolithiasis (Kahn, 2005). Cystorrhexis has been reported in yearling heifers (Roussel and Ward, 1985) and bladder rupture of the urethra or urinary bladder is very common (Gasthuys *et al*., 1993). As such, large animal clinicians depend on post-rupture laboratory diagnostic changes which provide valuable information for a correct diagnosis. Moreover, crossbred calves are more susceptible to urolithiasis (70%) than local non-descript calves (10%) (Khan *et al*., 2013) and diet given during weaning period may be contributing factors for development of obstructive urolithiasis in young ruminant (Radostits *et al*., 2000; Sharma *et al*., 2007). The present study place on record a typical case of obstructive urolithiasis and subsequent urinary bladder rupture leading to the death of a cross-bred calf.

Case details

Case 1: A five-month-old crossbred male calf was presented to the SA Quadery Teaching Veterinary Hospital, Chittagong Veterinary and Animal Sciences University, Chittagong, Bangladesh with symptoms including the absence of urination but with attempts at urination and discomfort for the previous four days. Symptoms demonstrated by the animal included, abdominal pain manifested by straining, kicking at the belly, twisting of the penis, and frequent attempts of unsuccessful urination. In a clinical examination, the calf was dull, depressed and exhibited a distended abdomen, dribbling urine, a distended urinary bladder, a body temperature of 100.5°F and increased heart and respiration rates. Post scrotal urethrotomy was performed aseptically according to a standard procedure. The calf was sedated using diazepam HCl (Sedil, Squire Pharmaceutical Ltd., Bangladesh).

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Local surface infiltration was conducted using 5 ml of 2% lidocaine hydrochloride (Jasocaine, Jeson Pharmaceutical Ltd., Bangladesh). After aseptic preparation of the site, an incision approximately 7-8 cm long was made through the skin and subcut exactly on the midline in the post-scrotal region.

The incision was deepened through the fascia between the two retractor penis muscles and through the bulbocavernosus muscle and corpus cavernosum urethrae. The urethra was incised just above the seat of obstruction and the urolith was removed (Fig. 1). After removing the urolith, a suitable sized sterilized catheter was passed anteriorly toward the urinary bladder and posteriorly toward the external urethral orifice; approximately 20 ml of red urine was expelled through the catheter. No other blockage was found within the urethral lumen. The incision site of the urethra was closed with 4/0 catgut and the associated muscles were sutured with sterilized nylon. Post-operative intramuscular injections of penicillin and streptomycin (Strepcin G, 2.5 gm/vial, The ACMI Laboratories, Dhaka, Bangladesh) were administered intramuscularly for five days and ketoprofen (2 ml) (Keto vet, Techno Drug Limited, Dhaka, Bangladesh) was administered for five days. The calf died three days after surgery. A post-mortem examination of the animal revealed a large amount of peritoneal fluid mixed with urine in the body cavity and surrounding tissues. The urinary bladder was found to be ruptured (Fig. 2A) ventrally resulting in urine accumulation in the abdominal cavity. We also found adhesion between the peritoneum and lateral surface of the bladder, inflammation of the urinary tract, and a haemorrhagic condition at the point of rupture (Fig. 2B). One or more stones were found at the point of blockage.

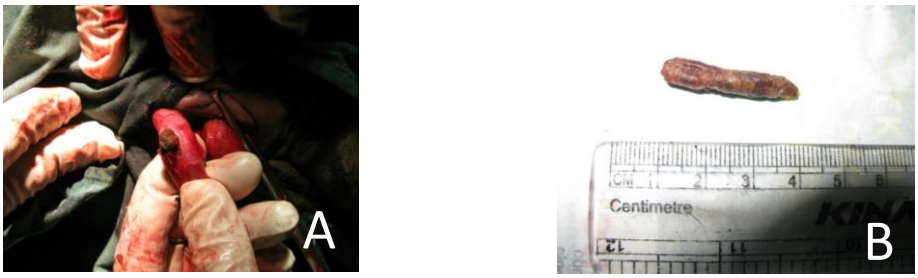

Fig. 1. Post scrotal incision was made on urethra (A) and about 3 cm long urolith was evacuated (B) from the urethra.

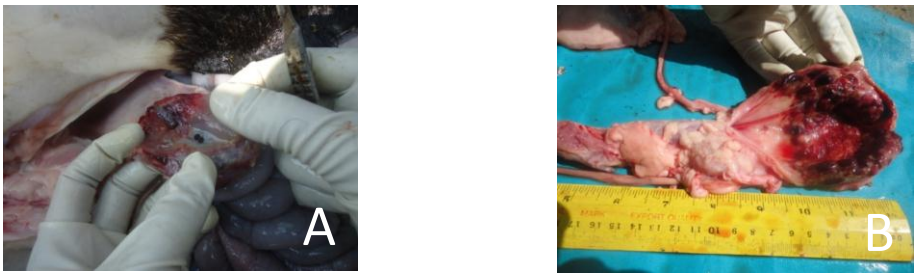

Fig. 2. Rupture of urinary bladder at ventral position (A) and severe hemorrhage within the urinary bladder at the point of rupture (B)

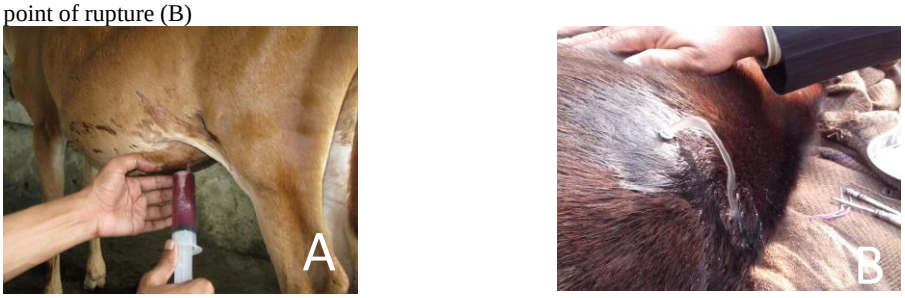

Fig. 3. Pink colored abdominal fluid was aspirated indicated rupture of urinary bladder (A) and abdominal paracentesis reveled straw colored fluid was come out from the abdomen (B).

Case 2: An eight-month-old crossbred male calf was brought to the SA Quadery Teaching Veterinary Hospital, Chittagong Veterinary and Animal Sciences University, Chittagong, Bangladesh with symptoms of complete retention of urination for one day. The abdomen was fully distended and the calf was severely dehydrated; the calf was very weak and unable to stand and move. On palpation of the abdomen, a fluid flushing sound was detected which indicated that more fluid was accumulated within the abdomen. An abdominal paracentesis revealed that pink colored fluid (Fig. 3A) was being expelled and it is possibly due to a rupture of the urinary bladder. The owner was convinced to sacrifice the animal for an accurate diagnosis making determination of the actual cause of the ruptured bladder. After death of the animal the post mortem findings reveal that a calculus was found in the position of sigmoid flexure and the rupture was done on ventral position of bladder.

Case 3: A twelve-month-old crossbred calf was brought to the Teaching Veterinary Hospital, Faculty of Animal Science and Veterinary Medicine, Patuakhali Science and Technology University, Dumki, Bangladesh with symptoms of dribbling urine and posture changes during urination. During this time, loss of appetite, severe dehydrated and the calf was very weak.

After one day, the abdomen was distended and the calf was unable to stand and was severely dehydrated. An abdominal paracentesis revealed pink to straw colored fluid (Fig. 3B) and the smell of this fluid was like urine. The owner was agreed to sacrifice this calf making determination of the actual cause of the retention of urine. On post mortem finding it was revealed that a big stone was found in sigmoid flexure and neck of urinary bladder. A multiple rupture was found on ventral position of bladder.

RESULTS AND DISCUSSION

Cattle with normal renal function excrete only small quantities of sodium and chloride in their urine, but excrete large amounts of potassium (Osbaldiston and Moore, 1971). The concentration of inorganic phosphorus in urine varies considerably depending on the dietary intake of calcium, phosphate, and vitamin D (Donecker and Bellamy, 1982). The specific gravity and specific density values of urine mixed with peritoneal fluid are 1.011 and 1.377 respectively, based on measurements made using a urine analyzer. The finding is consistent with the result of David and Peter, (1998). Urolithiasis occurs frequently in cattle receiving rations and oxalate uroliths can occur in ruminants, although such problems from oxalate ingestion may be relatively uncommon. Ruminant urolithiasis associated with oxalate ingestion has been reported and urolith formation may determine by water intake (Waltner-Toews and Meadows, 1980). In this study all calves were fed with straw, rice bran other than grazing in the field. Paddy straw contains high levels of oxalate if it is provided without urea treatment. All calves were supplied paddy straw without urea treatment which may have caused urolithiasis. Furthermore, no mineral supplementation was added to the diet of the animal leading to a calcium-phosphorus imbalance in the feed. Similar observations have also been reported by (Kallfeiz *et al.*, 1987; Larson, 1996).

Clinical signs associated with urolithiasis depend upon the severity of blockage and the reaction of surrounding tissue (Van Saun, 1997). Complete blockage results in various stages of stranguria, exaggerated and prolonged urination posture, urine dribbling, and hematuria. Affected animals may be depressed and lethargic, grind their teeth, and show abdominal distention and signs of pain (Van Saun, 1997). Rupture of the urinary bladder is the most common consequence of obstructive urolithiasis. While a discrete dorsal tear may sometimes heal spontaneously, ventral tears require surgical intervention and may be fatal (Tyagi and Singh, 1993). In the present case rupture was present on ventral wall, thereby suggesting that weak points anywhere in the bladder wall could rupture by the intraluminal urine pressure. Variable degree of hemorrhagic necrosis and lathery appearance of bladder surface in area could be due to rupture of vessels and capillaries during bladder rupturing. Bladder rupture seemed to have no effect on the uroliths retrieval. Younger animals to be affected more than adults. More concentrate feeding and the changes brought about by weaning may be contributing factors for more prevalence of obstructive urolithiasis in young ruminants (Radostits *et al*., 2000; Sharma *et al*., 2007). During weaning period the calves begin to consume sand which causes imbalance of calcium and phosphorus ratio leading to calculi formation. From the present study it was found that the improper calcium-phosphorus ratio in feed, reduced water availability predisposes the animals to urolithiasis. For preventive measures environmental and dietary factors should be considered during weaning period.

The common sites of calculi retrieval are the cystic lumen, neck joint and cystic neck. In 60% of cases where cystotomy with indwelling urethral catheterization was performed, calculi were retrieved from the sigmoid flexure of the urethra (Parrah *et al.*, 2010). In this case, surgical treatment was adopted as per the standard procedure outlined by Kumar (Kumar, 1996). Cystotomy allows removal of multiple urocystoliths, permits bidirectional urethral flushing, and reduces the risk of urethral stricture (Divers, 2013). The animal owner should

provide an ample amount of water at all times to maintain urine flow because dilution of calculogenic ions in the urine is of primary importance for the prevention of urolithiasis in ruminants. Water containers should be clean and clear to maintain water palatability and a sugar-free flavoring agent may be added to encourage water intake. Allowing access to pasture or browsing and addition of salt (NaCl) to the ration may increase water intake as well, thereby increasing urine flow. Furthermore, the addition of limestone ($CaCO_3$) to rations may help to prevent phosphatic calculi development. However, in cases of obstructive urolithiasis in calves, immediate surgical intervention is useful for preventing mortality and prolonging the life of the animal. Unfortunately in case of case 1, the calf was not able to survive because due to rupture of bladder and severe dehydration and peritonitis.

The results of this study serve to expand the understanding of urinary bladder rupture due to accumulation of urolith within urethra which may lead to the death of an animal. Because patients with a ruptured urinary bladder usually present with signs of peritonitis. Post-scrotal urethrostomy is also helpful if diagnosis is possible at an early stage; a urine analysis is a simple and non-invasive test that may contribute to early diagnosis of this condition. Rupture of the urinary bladder must be included in the differential diagnosis of acute abdominal distention. This is a rare but potentially fatal condition with a high mortality rate. From this study it was suggested that crystallization of urine can be prevented by modification of ration that induces urine acidification. Surgically it is possible to remove the urolith but in large flock it may not be feasible. Palliative preventive measures (Ca: P ratio of 2:1 in ration) may be taken for reducing the formation of urolith. Increased salt level to 4% of the diet in order to stimulate daily water consumption that helps to drain out the small nidus and the maintenance of adequate and abundant palatable water supplies should be highly considered in feedlot calf management.

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