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Review Article

Caprine Obstructive Urolithiasis – A Review

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Abstract

Obstructive urolithiasis is a life emergency in small ruminants demanding immediate medical attention and clinical intervention. Wide range of pathophysiological and managemental factors including nutrition, watering, season, sex, hormones were attributed to this condition. Even though the condition occurs in both sexes, it is very common among male goats mainly due to the unique anatomical peculiarity of urinary tract of bucks. The condition causes great economic losses in terms of treatment cost and compromised breeding efficiency. The early treatment measures and preventive management strategies in caprine urolithiasis are of paramount importance in maintaining the health of animals and securing the livelihood of marginal and small-scale goat farmers. This review examines the common etio-pathological factors and medical and surgical management of caprine obstructive urolithiasis with special reference to preventive management strategies.

Keywords: Obstructive Urolithiasis, Goats, Urinary Diversion Technique, Preventive Management

Introduction

Urinary obstruction is a clinical emergency in goats. A delay in addressing this condition or improper treatment can rapidly progress to bladder or urethral rupture, uremic crisis and finally death of the animal. Kannan and Lawrence, (2010) reported a case of obstructive urolithiasis in a Saanen goat and leads to bladder rupture and finally death of the animal was happened. Obstructive urolithiasis is defined as the formation and lodgment of calculi along the course of urinary tract which blocks the normal flow of urine. Abnormal high concentrations of insoluble complexes in urine act as nidus for mineralization and favour urolith formation (Smith and Sherman, 1994). This condition is one of the most serious urinary tract disorders in domestic animals. Male small ruminants are commonly affected due to their peculiar anatomy which includes a long, narrow, tortuous urethra more prominent at the sigmoid flexure and ischial arch and thin urethral process (Videla and Van, 2016).

Incidence and Etiology

Uroliths are the concretions of solid mineral and organic compounds which can cause disease through direct trauma to the urinary tract and interfere with urinary outflow (Kalim *et al.*, 2011). Obstructive urolithiasis when untreated leads to high mortality rate due to rupture of urethra or urinary bladder resulting in death of the animal due to peritonitis and toxaemia (Cockcroft, 1993). According to Gera and Nigam (1979) in India, incidence of urolithiasis is very high in states of Punjab, Haryana, Uttar Pradesh, Bihar, Madhya Pradesh, Orissa, Andhra Pradesh and Tamil Nādu and mostly in bullocks, goat, sheep and buffalo (Dart *et al.*, 1997). In goats the most common sites of obstruction include the distal sigmoid flexure and the urethral process (Tibary *et al.*, 2004).

The study conducted by Sheikh *et al.* (2018) reported urolithias is more common among castrated male goats of less than two years of age and in winter season. Increased prevalence in male goats could be due to the anatomical differences in the conformation of urinary tract between the sexes. The bucks have long and tortuous urinary tract compared to females which have a shorter and wider urethra which allows the easy passage of any organised calculi (Matthews, 1999). The male animal possess long narrow urethra with ischiatic arch, sigmoid flexure and urethral process (Riedi *et al.*, 2018). The common site of obstruction in male animals are the distal sigmoid flexure and urethral process (Tibary *et al.*, 2004). Larson (1996) stated that urolithiasis equally affects male and female animals but obstruction occurs only in males. Castration is one of the identified etiological factors for the occurrence of the obstructive urolithiasis as castrated animal possess smaller urethral diameter (Bani Ismail *et al.*, 2007). Higher prevalence in castrated male goats could be due to the reduced effect of testosterone which causes penile hypoplasia thereby decreasing the bore size of urethra and failure of urethral process to mature (Singh *et al*., 2008). This could also decrease the hydrophilic colloids in urine and leads to calculi formation (Marsh and Safford, 1957).

Age group of two or below two years were reported to have more incidence of urolithiasis because the high proteinaceous diet in younger ages (Bhatt *et al.*, 1973) and under developed urethral process (Smith and Sherman, 1994). Amarpal *et al*. (2004) also reported a higher incidence of obstructive urolithiasis in buffaloes and caprines below six months of age. More incidence of this condition was found in animals fed with high grain diet with Ca: P ratio as low as 1: 1 (Wang *et al.*, 1997). A hyper protein diet and high phosphorus levels characterised by the large supply of concentrate to the animals are the highest risk factors identified for the disease development (Tiruneh, 2006). The study conducted by Haven *et al.* (1993) identified the causative dairy rations with excessive phosphate concentration and documented urolithiasis more in goats fed with pelleted diet intended for horses or lactating cows. Excess feeding of wheat bran which is rich in phosphorus and low calcium supported the development of phosphate calculi by increasing the precipitation of phosphate salts in urine (Ahmed *et al*., 1989). Seeds and seed by-products are commonly higher in phosphorus than roughages (Mcdowell, 1992). Pattern of feeding those changes from milk to concentrate after weaning is one of the main aetiology for the occurrence of this condition in young ruminants (Rafee *et al*., 2015).

Highest incidence of urolithiasis were reported in winter season due to the reduced intake of drinking water (Kopper, 1967) and scarcity of the green fodders and deficiency of vitamin A (Makhdoomi and Gazi, 2013). These factors along with lower water consumption will saturate the urine and lead to the precipitation of the solutes.

Chemical Composition of Urolith

The chemical composition of the urolith varies with geographical area and appears different in animals. According to the study conducted by Jones *et al*. (2017) seven different mineral combinations were found to cause urolithiasis in sheep and goats. These include combination of amorphous magnesium calcium phosphate (AMCP) and magnesium ammonium phosphate (struvite), pure AMCP, struvite and calcium carbonate, calcium oxalate, amorphous silica and struvite/apatite. The AMCP could be an intermediate form in the transition from amorphous phosphate to struvite (Chigerwe *et al*., 2013). According to Straub *et al*. (2005), infrared spectroscopic evaluation of AMCP produced similar wave pattern that of struvite and calcium calcium phosphate. The authors also documented that urine got supersaturated with magnesium, ammonium or phosphorus leading to a pH greater than 6.5. The stones like Silica urolith was also found associated with high dietary calcium to phosphorus ratio, grazing on semiarid ranges, increased feed intake of silica and reduced water intake (Makhdoomi and Gazi, 2013).

Effect of Magnesium, Phosphorus and Potassium

The high concentrate feeding and dietary mineral imbalance especially high intake of Mg, K and P can contribute to the formation of struvite urolithiasis. In the study of Wang *et al*. (1997) a high intake of magnesium was identified more important for the induction of urolithiasis in goats compared to high intake of phosphorus and potassium. Phosphorus participates in the formation of struvite crystal by the formation of $PO_4{}^{3-}$ and urine pH value plays an important role in controlling the urinary concentration of $PO_4{}^{3}$ The main route of excretion of P was identified mainly through faeces and only a lesser extent via urine in ruminants (Mc Dowell, 1992).

Magnesium gets excreted through faeces, urine and milk; urine is the chief pathway for the magnesium excretion in ruminants (Mc Dowell, 1992). Higher dietary Mg intake will lead to higher level of Mg in plasma and thereby increase the excretion through urine (Robbins *et al*., 1965). High dietary Mg cause high level of plasma Mg and urinary Mg combines with $NH_4{}^+$, K^+ and $PO_4{}^{3-}$and precipitated as crystals and calculi (Wang *et al*., 1997).

Diagnosis

a. *Based on clinical signs*

Clinical signs exhibited by the animal varies depending on the duration of obstruction, the site of obstruction and rupture status of urinary bladder (Janke *et al*., 2009), (Makhdoomi and Marudwar, 1992). The affected animal shows decreased rumen motility, increased heart rate and respiratory rate with no significant changes in body temperature (Sarker *et al.,* 2020). Increased intracystic and intra urethral pressure develops in pace with duration of obstruction upto 64 to 72 hours of obstruction and it declines after re-establishing the free flow or the seepage of the urine from the ruptured bladder. The increased retrograde pressure developed in the ureter leads to failure of vesico-ureteral reflex and results in mild to moderate degree of nephropathy depending upon the duration of obstruction (Makhdoomi and Marudwar, 1992). Retrograde pressure nephropathy impairs the mechanism of tubular reabsorption, tubular secretion, reduced glomerular filtration rate and renal blood flow and thus post renal obstructive uropathy and uraemia (Smith *et al.*, 1983). The increasing pressure and stretching of bladder wall results in inflammation, pressure ischaemia, devitalization, thinning, trabeculae formation, herniation of mucosa through the musculature of the urinary bladder. All these changes could lead to the seepage or voiding of whole stagnated urine into the peritoneal cavity resulting in uroperitoneum and peritonitis and the pathological sequelae that occurs during the obstruction damages the bladder walls, ureters and kidneys (Makhdoomi and Marudwar, 1992; Dubey *et al*., 2006; Buchholz *et al*., 2010).

The affected animals show inappetance, bruxism, muscle twitching, tenesmus with frequent urination attempts with raised pulse and respiration rate (Gugjoo *et al*., 2017). Complete anorexia or inappetence, stranguria or anuria and reluctance to walk is also regarded as frequent signs of obstruction with intact bladder. Bilateral ventral distension of abdomen generally was noticed with ruptured bladder (Sutradhar *et al*., 2018).

Nonspecific clinical signs in urolithiasis includes decreased appetite, separation from flock, congested mucous membranes and increased heart rate and respiratory rates (Sutradhar *et al*., 2018). Affected animals further shows signs of discomfort, attempt to void urine, strain intermittently or stay in a wide stance with their hind limbs stretched backwards (Gugjoo *et al*., 2017). If the condition progresses, the symptoms exhibited are reported as bilateral abdominal distension, tenesmus, colic, weight shifting, grinding of teeth, urethral pulsation. In terminal stages the temperature start decreasing due to the retention of metabolic wastes and their reabsorption leads to toxaemia (Radostitis *et al*., 2005). Stranguria, anuria, oliguria, hematuria, mineral deposits in the urethral hairs, uremic odour in breath, urinary bladder distension and pulsations of the pelvic urethra are most common findings reported Gangwar *et al.* (1990). Complete obstruction could lead to bladder or urethral rupture and after bladder or urethra rupture, animals show temporary improvement due to decreased pressure in the urinary bladder. In advanced cases, swelling in the ventral abdomen or prepuce could be noticed because of leakage of urine into the surrounding tissue through a ruptured urethra (Smith and Sherman, 2009).

b. Haemato-biochemical changes

The animals with obstructive urolithiasis show elevated erythrocyte and neutrophil count, haemoglobin (Hb) and increased packed cell volume (PCV) due to dehydration (Sharma *et al*., 1982), (Sarker *et al*., 2020). Neutrophil's count was found higher in the case of animals with intact bladder compared to ruptured bladder because of more stress in the case of intact bladder (Morris, 1990). In obstructive urolithiasis, urine gets accumulated in urinary bladder for more than the normal period. Then the urea gets reabsorbed into the blood leading to uraemia. The increased backpressure over the kidney due to urine accumulation could reduce the urine production by decreasing the glomerular filtration rate and finally a decrease in the urea excretion elevating the levels of BUN (Sharma *et al*., 2006). Liver enzymes like AST and ALT were also found elevated in bucks with obstructive urolithiasis (Ronco *et al.,* 2008). Estimation of creatinine value could provide a good indicator for renal function compared to estimation of urea (Carlson, 1990).

c. Radiography

Radiography is only effective in diagnosis of urolithiasis caused by the radiopaque urinary calculi. In the study by Jones *et al*., (2017) combination of AMCP/struvite and pure AMCP or struvite crystals were not visible on radiography even though they were radio-opaque. But calcium carbonate crystals were radiographically visible. Inability to view the AMCP/struvite or struvite uroliths on pelvic and abdominal radiograph of sheep and goats could be due to small urolith size and loose consistency. Radiographic techniques required to penetrate the abdomen might result in loss of detail of these moderately radio-opaque uroliths or the tissue superimposition which could obscure these uroliths (Weichselbaum *et al*., 1998).

d. *Ultrasonography*

Ultrasonography is a highly useful noninvasive method for diagnosing obstructive urolithiasis in small ruminants. The mean diameter of the urinary bladder in normal small ruminants varies between 2.1 cm to 7.5 cm and in the case of bucks with obstructive urolithiasis, the bladder diameter were detected extended to more than 10 cm (Ewoldt *et al*, 2008). Ultrasonographically, urinary calculi could be appreciated as hyperechoic with acoustic shadow and they could change their position in the bladder during the movement of patient or the transducer. Hyperechoic bladder wall with typical hyperechoic sludge in the bladder was confirmatory of urolithiasis in all cases (Nair *et al.*, 2020). In case of ruptured condition, the bladder gets collapsed resulting in uroperitoneum with portions of hyperechoic segments of bladder wall floating in the anechoic fluid (Tharwat, 2021).

The dilated urethra is another characteristic ultrasound feature of the animals with obstructive urolithiasis and this does not occur in healthy animals (Braun *et al*., 1992). Ultrasonography thus serves as an effective diagnostic modaliuty to detect the location of the calculi, identify the dilated urethra, and specifically help in diagnosis of cystitis, urethritis and rupture of the urinary bladder and urethra (Gazi *et al.,* 2012).

Treatment

1. Medical management

Even though surgical management by urinary diversion is the primary treatment of obstructive urolithiasis, the aim of medical therapy resorts to provide analgesia, correction of fluid and electrolyte imbalances, prevention of inflammation and infection and dissolution of remaining stones after relieving the acute obstruction. In mild cases, the animals can be treated by using tranquilizers, antispasmodics and litholytic drugs like Cystone (Gasthuys *et al*., 1993). Antispasmodic could promote calculus passage, reduce the urethral smooth muscle spasm and relaxing the retractor penis muscle (Mavangira *et al.,* 2010). Urinary acidification could increase the solubility of certain types of calculi such as struvite and acidifying agents used include hemiacidrin, Walpole's solution and ammonium chloride (Cockcroft, 1993). Walpole's solution has a pH of 4.5 and composed of sodium acetate (1.16%), glacial acetic acid (1.09%) and distilled water (97.75%). According to the study conducted by Janke *et al*., (2009) ultrasound guided cystocentesis in combination with percutaneous infusion of Walpole's solution could provide satisfactory results in the treatment of obstructive urolithiasis in male goats.

The use of xylazine should be avoided in the case of obstructive urolithiasis because it promotes diuresis leading to bladder rupture (Ewoldt *et al.,* 2008). Once the obstruction is relieved, treatments to acidify the urine should be initiated to solubilise additional stones and sediment. Ammonium chloride can be administered for this purpose at the dose rate of 200 mg/kg body weight orally with dosage adjusted to attain a urine pH of 6.0 to 6.5 (Jones *et al*., 2017). Intravenous fluid therapy will also help to stabilise critical patients before surgical treatment and reduces the risk for anaesthetic accidents due to hyperkalemia induced arrhythmia. After relieving the obstruction, diuresis is important to replace dehydration, reduce azotaemia and flush the urinary tract. A good intravenous fluid of choice for this condition is 0.9% NaCl solution (Matthews, 1999).

NSAIDs should be administered if the renal values fall within normal range to prevent inflammation and urethral stricture formation along with broad-spectrum antibiotics to prevent the infection from devitalized urinary tissues and cavitational accumulation of urine. Beta-lactams (penicillin's and cephalosporins) have good spectrum of activity and are excreted in urine (Ewoldt *et al*., 2008). The injection of antispasmodic drug will help to relieve the obstruction in mild case (Gugjoo *et al*., 2017).

2. Surgical management

As the tip portion of urethra is having a relatively narrow lumen and the presence of urethral diverticulum at the level of ischial arch prevents retrograde passage of a urinary catheter into the bladder, a retrograde catheterization is not recommended in goats (Palmer *et al*., 2002). As the urethral process is the primary site of calculi accumulation, amputation of urethral process gives temporary relief in majority of the cases with initial signs of obstruction. Other surgical management include wide variety of urinary diversion technques.

2.1: Urethral Process Amputation

Urethral process amputation is the line of treatment in case of localisation of calculi at the tip of urethra (Sun *et al*., 2010). After the exteriorisation of the penis, the urethral process is amputated using suitable size scissors. The penis should be exteriorized in the case of obstructed animals and the process is facilitated by the use of acepromazine at the rate of 0.05-0.1 mg/kg body weight intramuscular or intravenous or diazepam at the rate of 0.1 mg/kg body weight slow i/v to provide the proper muscle relaxation (Oehme and Tillmann, 1965). Extrusion of the glans penis in immature small ruminants could be a difficult task because of the normal attachment of the prepuce to the glans penis and this process completes after the onset of puberty (Smith and Sherman, 1994).

2.2: Tube cystostomy

Surgical tube cystostomy is the most commonly used urinary diversion technique recommended at field level for long term management obstructive urolithiasis in goats. This procedure involves proper placement of a Foley's catheter after cystotomy that drains the urine from the bladder (Fortier *et al.,* 2004). The overall survival rate is higher in animals treated by tube cystostomy as per the study conducted by Pooniya *et al*., (2019). Tube cystostomy is regarded as an alternative surgical technique over the perineal urethrotomy and urethrostomy because the later techniques are unsuitable for breeding animals and it cause loss of urethral patency and leads to urethral stricture formation (Haven *et al*., 1993).

Rakestraw *et al.* (1995) explained this technique using a 6-8 cm paramedian incision made approximately 3 cm to the left of midline and centered midway between the scrotum and distal extent of prepuce. In this procedure, cystotomy is performed for the removal of urolith. A Foley's catheter (12-14 F) is passed through a stab incision in the body wall of the inguinal region and placed into the bladder through a stab incision and sutured into place with cuff inflated. Following closure of the abdominal cavity, the extra part of the tube is sutured into the abdominal wall. The catheter is allowed to drain freely for several days initially. After one week, the Foley's catheter it is periodically occluded with a clamp to test the normograde urine flow. If the normograde urine flow is established, the catheter cuff is deflated and removed.

Todhunter *et al*. (1996) explained left flank approach of this technique and opined the presence of less cluttering of intestinal loops as major advantage of this site rather than right flank incisions.

2.3: Intraperitoneal tube siphoning of urine

This method of surgical technique was performed usually in the case of ruptured urinary bladder for an emergency. In this method the animal needs to be positioned in dorsal recumbency. A nick incision was given on skin about 5 cm left lateral side of urethral orifice and a Foley's catheter of suitable size fixed in peritoneal cavity to drains the urine (Pooniya *et al*., 2019).

2.4: Perineal Urethrostomy

In this technique, in which a permanent opening is made in the urethra which voids urine. The technique is still controversial as obstruction proximal to the site is a common sequela with common complication as stricture of urethra that occurs within the 2 months post-surgery (Oman *et al.*, 2019). The penis is approached via midline incision in a standing animal under epidural anesthesia. The ideal location for this procedure is caudal to the scrotum.

2.5: Vesico preputial anastomosis

In this procedure the urine is voided through the prepuce avoiding the major complication of urine scald (Cypher *et al*., 2016). After entry into the abdominal cavity through the linear incision, the urinary bladder cane be partially decompressed and exteriorised and later drained to the prepuce through the preputial orifice.

2.6: Bladder marsupialization

Urinary bladder marsupialization method is moderately successful in restoring the urination in goats (May *et al*., 1998). In this procedure, the apex of the bladder is marsupialized to the ventral body wall at the midline through a midline coeliotomy. Finally, a stoma is created from the bladder that allows free drainage of urine from the bladder. The major complication of this method includes the prolapse of bladder mucosa through the stoma, urine scald in the ventral part of the animal and ascending urinary tract infection through the marsupialization site (May *et al*., 2002).

2.7: Modified proximal perineal urethrostomy (MPPU)

Tobias and Amstel (2013) documented this technique as suitable for non-breeding male animals. In this method after the anaesthesia and positioning of animal in sternal recumbency, a 6-8 cm incision between two ischial tuberosities at 2 cm below from the anal opening is made. After separating penile body from the surrounding tissues, the dorsal penile artery is carefully identified and retracted cranially to prevent the accidental damage to the artery. The penile body is transected at the caudal aspect of the proximal end of the sigmoid flexure and catheterized. After catheterisation, the mucosa of the urethra is finally opposed to the skin with interrupted sutures. The major post operative complications of this procedure include haemorrhage, misdirected urine stream, bladder atony, dysuria, dehiscence, delayed healing , urine scalding, blockage of tube and death (Tobias and Amstel, 2013).

2.8: Modified Proximal Perineal Urethrostomy (MPPU) Using Direct Guided Urethral Catheterisation Technique

Modified proximal perineal urethrostomy with guided urethral catheterisation is an emerging technique for relieving the urinary obstruction in small ruminants. Nair *et al*. (2020) documented this technique as an effective procedure for quick relief of obstructive urolithiasis. A modified stented catheter is used to directly access the perineal urethra through a unique site at about two to three cm below the anus and between the pin bones by a guided gentle urethral puncture. The technique was proved highly successful in goats presented in early stages of urolithiasis with intact urinary bladder and perineal pulsations compared to tube cystostomy (Hansoge *et al.,* 2021). The correct selection of the size of the catheter and correct site of urethral puncture are the main challenges of this technique.

Preventive Management

a. Dietary modification

Struvite urolithiasis is found to be the most leading causes of morbidity and mortality in male goats with common identified risk factors including excess phosphates in the urine and concentrated urine with alkaline pH. The cornerstone of preventive management of caprine obstructive urolithiasis is identified to be through through acidification of the urine (Bartges *et al.,* 1999). The main therapeutic effort has been dissolution of the uroliths through acidification of the urine by ammonium chloride administration (Mavangira *et al.,* 2010). The total phosphorus content should never be greater than 0.6% of the total ration (Hay, 1991). High phosphorus levels are present in grains especially in sorghum, wheat, corn, milo and oats (Pugh, 2002). A curvi-linear relationship between dietary cation anion difference (DCAD) and urine pH has been demonstrated, with DCAD having minimal influence on urine pH until DCAD <20mEq/100g of dry matter (DeGaris and Lean, 2008). The Ca: P ratio should be maintained at 2.5: 1 or 2:1 as preventive management of urolithiasis (Hoar *et al*., 1970). Phosphorus excretion through the urine can be decreased by increasing the roughage ration in the diet and encourage the salivary excretion and the upper limit of magnesium level in the diet is identified as 0.6% of the total ration. (Sockett *et al*., 1986). Roughage based diets are more preferable to prevent the occurrance of urolithiasis. According to Sun *et al.*, (2010) *ad libitum* water, vitamin A supplements and a diet with minimum magnesium content and the calcium-phosphorous ratio of 1:1 will prevent the formation of struvite calculi. Oversupply of the ammonium chloride in diet will lead to refractoriness and development of rumen acidosis. Due to this reason supplementation of ammonium chloride needs to be withdrawn after three weeks (Schroeder, 2013). In areas with paddy grasses, the fortification of the dry paddy grass is essential to reduce the oxalate content of the grass (Kushwaha *et al*., 2011).

Other dietary modifications include elimination of alfalfa feeding, reduction of grain feeding, promote grazing and introduce ammonium chloride supplementation (Ewoldt *et al.*, 2008).

b. Water intake

The urine volume and water intake is also important identified factors for the prevention of urolithiasis. Adequate water should always be made available in the animal house (Hay, 1991). In a study conducted by Olsson and Hydbring (1996), water drinking habits of goats were found more during nights. The authors documented the effect of luke warm water in hyperhydration in heat-stressed lactating goats and also studied the plasma sodium and osmolality. Supplementation of *ad libitum* water with addition of sodium chloride to the flock will lead to increased water consumption and finally increase the urine output (Tan *et al.*, 2017). Except in Ethiopian Somali goats which have excess one time water intake capacity, regular intermittent free choice watering is stringly recommended for maintaining adequate hydration status and imporved feed intake in goats (Mengistu *et al.,* 2007).

c. Avoiding early castration

Early castration will reduce the positive influence of the testosterone for the development of normal urethral diameter and diminishes normal prepuce to penile attachments present in the early stage of life (Kumar *et al*., 1982). Ewoldt *et al.,* (2008) in their study documented that the intact animals have the largest urethral diameters and the early castrated animals have the smallest urethral diameters which may predispose to the obstruction of urethra.

d. Maintaining urine pH

The urine pH is also an important factor for the formation of urolithiasis in small ruminants. Acidic urine will reduce the formation of struvite crystals. Alkaline urine will favour the formation of phosphate and struvite calculi (Pugh, 2002). Anionic salts, mainly chlorides are used extensively for reducing the urine pH, increase urine output and prevent urolithiasis (Hay, 1991). Sodium chloride (1% - 4%), calcium chloride (1% - 2%) and ammonium chloride (0.5% - 2%) are conventionally added to the ration to increase water intake and production of acidic urine (Udall and Chow, 1965).

Conclusion

The caprine urolithiasis has a multifactorial occurrence. The timely diagnosis and appropriate veterinary intervention will save the life of the animal. Among the available treatment options, early surgical management by urinary diversion technique followed by long term medical management give satisfactory results. Adequate watering and proper knowledge about the rearing, feeding and maintaining of the animals will prevent the occurrence of this condition.

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Conflict of Interests

There is no conflict of interest.

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