



Obstructive urolithiasis in farm animals

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Abstract

Obstructive urolithiasis is common in ruminants, especially in castrated bucks and bulls. It is a multifactorial disease that occurs in animals across the globe. It can occur due to metabolic disorders, dietary imbalances, urinary tract infections, anatomical malformations, early castration before attaining sexual maturity, and environmental factors like soil and water. The diagnosis is mainly based on clinical signs, history, radiography, and ultrasonography.

Keywords: Urolithiasis, ruminants, metabolic disorder, winter, male

Introduction

Urolithiasis is a common metabolic disorder of ruminants. It is a common cause of morbidity and associated mortality in ruminants, especially bucks, and buffaloes. The highest incidence of this condition is seen in goats, followed by buffaloes and cattle (Amarpal *et al.*, 2013; Sharun *et al.*, 2020). Early castration and high concentrate feeding could be the most important precipitating factors in females. Irrespective of the etiology, obstructive urolithiasis is an emergency condition that warrants prompt intervention. Maximum incidences of urolithiasis are reported during the winter season (Sharun *et al.*, 2020). Reduced water intake during the winter season could increase the concentration of urinary solutes and promote their precipitation. The major contributing factor to urolithiasis is the dietary origin (Manjusha *et al.*, 2021). Improper diagnosis could lead to cystorrhesis and the death of the animal (Makdhoomi *et al.*, 2013)

Predisposing factors

Feeding protein-rich diet, castration before puberty, sex, age, calcium phosphorus imbalances in diet, reduced water intake, sudden change in feed, deficiency of vitamins, hormonal imbalances, and management issues are some of the predisposing factors (Gugjoo *et al.*, 2013). Castration



performed at a very younger age can hinder the development of the reproductive tract in animals. Even though the occurrence is rare in females, there have been reports of urolithiasis in female ruminants (Manjusha *et al.*, 2021). The anatomical peculiarity of the male reproductive tract predisposes to calculi development. It could be attributed to the narrow urethral tract found in males compared to the wide opening in females. The female: male ratio for calculi development is 1:75 and 1:81 for goats and buffaloes, respectively (Amarpal *et al.*, 2013). Winter season is highly predisposed to calculi formation as water intake decreases.

Although calculi formation occurs in the bladder, the site of their lodgment varies between different animals. For example, in bucks, the site of obstruction of calculi is at the tip of the urethral process (Vermiform appendage), and in cattle and buffalo, the site of lodgment is the distal sigmoid flexure. In addition, the uroliths may rarely form in the renal pelvis and obstruct the urethra in females.

Type of calculi

Uroliths are a combination of organic and inorganic substances composed of organic and inorganic components. The organic matrices include proteins, sugars, and cells; the inorganic crystalloids include magnesium, calcium, and phosphate. The mineral components are responsible for the supersaturation of urine due to increased renal excretion, change in urine p^H , negative water balances, and absence or presence of crystal inhibitors. The four major types of calculi found in domestic animals include struvite, calcium carbonate, calciumoxalate, and silicates.

Clinical signs

The clinical signs vary with the status of the urinary bladder. Animals with ruptured bladder show anuria and bilateral abdominal distention. In contrast, animals with intact bladder is associated with clinical signs including anuria, abdominal distention, restlessness, haematuria, colic, anorexia, respiratory distress, sunken eyes, reluctance to walk, tail lifting, rectal prolapse due to frequent straining and twitching of penis. The animal would be recumbent and progress to shock in case of severe azotemia.

Diagnosis

The diagnosis of urolithiasis is mainly based on history, clinical signs, abdominocentesis, and radiographic and ultrasonographic examinations. History plays an important role in the diagnosis and treatment of urolithiasis. Obstructive urolithiasis is one of the differential diagnosis in the majority of sick male animals. A complete physical examination is mandatory in all cases. In some affected males, the urethral pulse could be palpated while performing per rectal examination, and grits could be seen on the preputial hairs. Survey radiographs can detect radiopaque calculi like calcium



carbonate. Transabdominal radiography can detect intact bladder in acute cases and ruptured bladder in delayed cases. Biochemical analysis, including serum or urine creatinine values, could be used to rule out azotemia. Hyperkalemia and hypermagnesemia could be noticed in most cases.

Treatment

Treatment includes medical management, supportive care, feeding management, and surgical correction. Surgery is preferred over medical management in most cases. Medical management includes the administration of antibiotics, fluids, analgesics, anti-inflammatory drugs, and pH modulators. Struvite calculi is the most common calculi detected in the ruminant urine sample. Therefore, a urinary acidifier like ammonium chloride is given @ 200mg/kg body weight per day to dissolve the calculi. In addition, urine pH needs to be evaluated frequently. Treatment goals include maintaining the patency of the urethra, controlling infection, providing analgesia, and correcting fluid and electrolyte imbalances. Surgical correction is the ultimate choice for obstructive urolithiasis. The different surgical options include urethral process amputation (goat and sheep), urethrotomy or urethrostomy (cattle and buffalo), and tube cystostomy (cattle, buffalo, sheep, and goat).

Control and prevention of urolithiasis

Feed and water are the most important factors to be considered. The four main aspects of controlling urolithiasis include optimizing the urinary tract, increasing the dilution and volume of urine, managing the mineral components, and decreasing the matrix components. The male animals had to be castrated after attaining puberty. Ad libitum water mixed with salt should be provided to increase the urine volume and dilution. A low-protein diet should be fed to reduce the matrix components. The mineral component can be adjusted by making necessary changes in the feed.

Conclusion

Obstructive urolithiasis is a medical and surgical emergency irrespective of the cause of occurrence. Incidence of urolithiasis is highly correlated with seasonal variations, with most cases reported during extreme summer and winter. Early detection and treatment can save the life of the animal in the majority of cases.

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