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Review on Surgical Managements of Urolithiasis in Ruminants

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ABSTRACT

Urolithiasis is the retention of urine subsequent to lodgment of calculi anywhere in the urinary conduct from up to urethral orifice. Urolith formation usually results from a combination of physiological, nutritional, genetic derangements and management factors. Decreased water intake, urinary stasis, altered urine pH, relative lack of inhibitors of crystallization, urinary tract infection, vitamin A deficiency, and high estrogen intake have all been implicated as risk factors. Urolithiasis is mainly attributed to excessive or imbalanced intake of minerals. Urolithiasis occurs not only in steers and bulls; it is also prevalent in heifers and cows but in heifers and cows the urethra is relatively large in diameter and obstruction is of very rare occurrence. Hence, compared to females, the susceptibility of males to obstructive urolithiasis would seem to be due to sexual differences in anatomy, and not to less frequent urolith development in females. The composition of urinary stones varies with geographical location. The basic mineral compositions of urinary calculi are usually varying in different animals. Silica, magnesium ammonium phosphate (phosphatic, struvite), calcium carbonate, and calcium oxylate are the most common types of crystals found in ruminants. The disease results in heavy economic losses to the livestock industry as it is attributed the fifth most prevalent cause of death in feedlot. Obstructive urolithiasis is a serious, potentially fatal condition, most commonly causing symptoms in castrated male animals, but also occurring in breeding males. Surgical management of obstructive urolithiasis is a successful method. The preventive measures focus on reduction of urinary concentration of calculogenic crystalloids; the diet can be adjusted to reduce urinary concentration of causative minerals.

Keywords: Calculi, Obstruction, Ruminant, Surgical management, Urolithiasis

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INTRODUCTION

Urolithiasis is a general term referring to the causes and effects of stones anywhere in the urinary tract including the kidneys and bladder. Nephroliths are uroliths located in renal pelvis and/ or collecting diverticula of kidney (Gasthuys, 1993) [1]. Nephroliths may be clinically silent, obstruct the renal pelvis or ureter, predispose to pyelonephritis or result in compressive injury to renal parenchyma leading to renal failure (Hoppe 1998) [2]. Uroliths in cattle, sheep, and goats are common (Connell, 1959) [3]. It occurs in both sexes, although obstruction occurs most frequently in males and steers (Nagy, 2011) [4]. The majority of urolith in cattle is either struvite or silica (Bailey, 1981) [5].

Urolith formation usually results from a combination of physiological, nutritional, genetic derangements and management factors. Decreased water intake, urinary stasis, altered urine pH, relative lack of inhibitors of crystallization, urinary tract infection, vitamin A deficiency, and high estrogen intake have all been implicated as risk factors. Urolithisasis is mainly attributed to excessive or imbalanced intake of minerals (Divers, 1990) [6]. Geographical and seasonal influences play an important role for range herds in semiarid areas (Ailleo, 1998) [7]. The role of water hardness in the development of urolithiasis is controversial (Borgi, 1999) [8]. Water hardness is defined as the amount of calcium and magnesium found in water and is expressed as the concentration of calcium carbonate (Haven, et al., 1993) [9]. Early investigators reported an inverse relationship between drinking water hardness and calcium urolithiasis (Churchill, 1978) [10].

Animals that consume additional water will be less likely to form highly concentrated urine and, as a result, urine will contain lower concentrations of calculogenic minerals. This will in turn minimize formation of crystals and uroliths. The simplest way of reducing the supersaturation of urine is to increase the urinary volume (Borgi, 1999) [8]. Urolithiasis refers to the presence of calculi in the urinary system. The disease commonly occurs in ruminants and invariably results in blockage of the urethra in male subjects (Lipsimita, 2011) [11]. Urinary stones or uroliths are one of the commonest causes of urethral obstruction and results in retention of urine, difficulty of urination, distention and rupture of the urinary bladder, and death in untreated cases (kannan, 2010) [12].

Surgical treatment is palliative that is only to provide a temporary relief from obstruction and or uremia. Urolithiasis, in countries like Ethiopia, presents an important economic repercussion where cattle-based agriculture is strongly linked with the livelihood of an important segment of the population. Losses are associated with the high mortality rate and condemnation of urineous carcass (Lipsimita, 2011 and kannan ,2010) [11,12]. The cause of urinary calculosis is complex and results from several interacting factors. Generally, nutritional and environmental factors are anticipated to play significant role in the formation of uroliths in domestic animals (Vangai, 2010) [13]. High level of oxalates and silica in pasture plants were considered as major factors in urolith formation of grazing animals (Dusty and jones, 2009) [14]. On the other hand, provision of concentrate ration, which is typically rich in phosphorus, or when there is an imbalance in calcium and phosphorus ratio, were stated as major causes of urolithiasis in feedlots (Unmack, 2011) [15].

Therefore, the objectives of this review are:

- To review the etiology, epidemiology and clinical manifestations of urolithiasis
- To highlight the surgical managements and preventions of urolithiasis in ruminants.

ANATOMICAL FEATURES of UROLITHIASIS

The problem of obstructive urolithiasis in steers and bulls depends on the fact that uroliths in the bladder often become large enough to obstruct the urethra and prevent the passage of urine if they should be swept into the urethra during the act of urination. If the obstruction is not removed the bladder becomes so distended that it ruptures, a condition that is almost invariably fatal in cattle. Less commonly, rough, irregular uroliths damage the urethral lining and urethral rupture rather than bladder rupture results. In such cases urine escapes into the tissues surrounding the point of rupture leading to the production of oedema-like swelling in tissues of the inguinal and ventral abdominal regions. The urethra in the steers, as a result of castration, is relatively narrow (Marsh, 1957) [16], and its obstruction may be brought about by a relatively small stone.

Another consideration related to ease of obstruction is the presence of two sharp bends in the portion of the urethra that traverses the sigmoid flexure of the penis. These two bends serve as catch points, where relatively small stones may be slowed in their passage. Scratching of the urethral lining induces reflex spasm in the surrounding musculature. These muscle spasms impede and fix the stone. A third "catch" point exists near the tip of the penis where the lumen is less expansible than elsewhere. Urolithiasis occurs not only in steers and bulls; it is also prevalent in heifers and cows (Whiting, 1958) [17], but in heifers and cows the urethra is relatively large in diameter and obstruction is of very rare occurrence. Hence, compared to females, the susceptibility of males to obstructive urolithiasis would seem to be due to sexual differences in anatomy, and not to less frequent urolith development in females. The ureters have strong muscular walls and carry the urine from the kidney to the bladder by peristaltic action. The ureters thus prevent damaging backing up of urine pressure on the kidneys. It appears to be the muscular strength of the ureters that creates the pressure that ruptures the bladder in urethral obstruction, rather than kidney secreting pressure. The increased muscular activity of the ureters in urethral obstruction is perhaps reflexly stimulated by relatively slight pressure increases affecting the kidneys.

Location of Calculi

The calculi may be lodged in any part of the urinary tract starting from renal pelvis to glans penis. However, the lodgment of the urolith in the bladder neck and urethra may lead to complete obstruction to urine flow thereby enhancing the acuteness and severity of the condition. The length of urethra, presence of sigmoid flexure and urethral process make the urethra more prone to the lodgment of calculi as compared to other parts of the urinary tract in the ruminants. Bovine urinary calculi are irregular size, diameter and mostly found at the insertion of retractor penis muscle in the distal sigmoid flexure. The diameter of urethral lumen at the sites of distal sigmoid flexure and urethral process are the narrowest, thus calculi can be easily trapped at these sites (Tiruneh, 2000) [18].

ETIOLOGY

The etiology is complex and multifactorial. Although urolithiasis is known to have numerous predisposing etiology factors (Rdostitis, 2005) [19], but exact mechanism of stone formation and growth is not fully known. Urinary calculi formation usually results from a combination of various physiological, nutritional and management factors. It may occur due to excessive or imbalanced intake of minerals (Hess, 2009) [20] in feedlots while fattening cattle receive rations high in cereal grain and oil meals. These feedstuffs have high levels of phosphorous and magnesium but relatively low level of calcium and potassium predispose to disease condition (Rdostitis, 2005) [20].

A calcium phosphorous imbalance results in high urinary phosphate excretion which is an important factor in the genesis of phosphate calculi (Unmack, 2011) [15]. Numerous additional factors have been incriminated as contributing causes of the development of phosphate calculi with resultant obstructive urolithiasis in cattle. These include heavy concentrate-low roughage diets, limited intake or deprived of water, dehydration, urine alkalinity, mineralized artesian water, supplies, excess of sodium bicarbonate in diet, vitamin imbalance e.ghypovitaminosis and hypervitaminosis and high protein rations (Rdostitis,2005) [20]. Less frequently uroliths composed of silica, carbonates or oxalate. Livestock grazing in pastures containing large quantities of oxalates, estrogen or silica are prone to develop these types of calculi (Loreeti,2013) [21].

Urolithiasis in castrated beef cattle has been reported to be associated with diethyl still percent, bestrol implants. Geographical and seasonal influences play an important role for range herds in semi-arid areas. In addition, the anatomy of the male ruminant urinary tract also contributes due to the potential narrowness of the passage and tortuous route. The sigmoid flexure is a common site for uroliths to lodge in all ruminant species (clotid, 1980) [22]. Uroliths may also be calves fount on lesser occasion at the ischial arch. In small ruminants the urethral process is an extremely common site for uroliths to lodge (Jennings,1984) [23].

EPIDEMIOLOGY

The distributions of urethral obstruction caused by uroliths vary based on range of geographic area and temperature. These ranges are associated with the presence of pasture plants containing large quantities of oxalate, estrogens, or silica. When cattle graze pasture containing plants with high levels of silica, uroliths occur in animals of all ages and sexes. The prevalence of uroliths is about the same in cows, heifers and bulls grazing on the same pasture and they may even occur in newborn calves. Females and bulls usually pass the calculi and obstructive urolithiasis is primarily a problem in castrated male animals (Radostits et al., 2007) [24].

Risk Factors

Several risk factors contribute for the formation of uroliths in ruminants; among these, concentrates play a significant role which is reported to be associated with uroliths formation in ruminants (Jones et al., 2009) [25]. The size of individual calculi and the amount of calculus material are both important in the development of urethral obstruction in bovines (Matthews, 2009) [26]. Once calculi form, the most important factor contributing to the occurrence of obstruction is the diameter of the urethra. Steers (castrated cattle) are most commonly affected because of the relatively small diameter of the urethra in these animals. Castration has a significant impact on the diameter of the urethra in steers. Bulls can usually pass calculi that are 44% larger than those that could be passed by an early castrated steers (Jones et al., 2009) [25].

Struvite (magnesium phosphate) and apatite (calcium phosphate) uroliths are commonly seen in animals fed high-grain diets, whereas animals consuming legumes are predisposed to calcium carbonate uroliths (Hay, 1991). Silicate stones are observed in animals grazing silicaceous plants and soils. Calcium oxalate stones may be associated with oxalate containing plants.

A significant factor in the availability of urolith components and their binding ability is urine Ph (Van-Metre and Diver, 2002) [27]. Struvite, apatite, and calcium carbonate uroliths are known to precipitate in alkaline urine with a ph of 8–10, Struvite crystallization occurs only at a ph range of 7.2 to 8.4 whereas apatite stones develop at a urine pH of 6.5 to 7.5. Urine pH may have little or no effect on silicate or calcium oxalate uroliths (Pugh, 2002) [28].

PATHOPHYSIOLOGY

Despite sophisticated surgical techniques and various supportive treatments prognosis of urolithiasis in bovine still remains unpredictable (Honeckand Sharma, 2009) [29]. Formation of calculi and development of urolithiasis is a complex process and occurs in a series of phases from formation of nidus, concencrtation of urine and lastly the precipitation of various salts from urine. Formation of urinary calculi is dependent on supersaturation of urine with soluble ionized minerals. Crystal formation occurs when the inhibitory capacity of mucopoly- saccharides, ions, and organic acids is exceeded. (Dusty and David,2010) [14].

A variety of risk factors exist for the development of uroliths in ruminant species. Decreased salt or water intake, urinary stasis, urinary tract infection, high urine pH [struvite, calcium phosphate, and calcium carbonate stones], which could however be achieved to a pH < 6.5 in goats (Vangai, 2010) [12] by dietary supplementation of ammonium chloride. Vitamin A deficiency, and high estrogen intake have all been implicated as risk factors (Jones, 2009) [25]. Due to continuous formation of urine and its accumulation in the bladder subsequent to urethral obstruction the bladder gets distended.

The increasing pressure and distended stretching of bladder wall resulted in inflammation, pressure ischaemia, devitalization, thinning, trabeculae formation, herniation of mucosa through the musculature of the urinary bladder leading to seepage or voiding of whole of the stagnated urine into the the peritoneal cavity resulting in uroperitoneum and peritonitis ,more so in bovine urolithiasis very little is documented about uropathy. The data regarding it is available mostly in dogs or human beings. There occurs a secondary damage to kidney caused by a retrograde intracystic pressure in complete urinary obstructed cases resulting in the uraemia (Makhdoomi, 1992) [30].

CLINICAL SIGNS

The clinical signs associated with urolithiasis depend upon the degree of obstruction to free flow of to urine. Severity of surrounding tissue reactions (Makhdoomi, 1992) [30].The major clinical signs reported during the onset of urolithiasis include anorexia, suspended rumination and decreased water intake. Animals suffering from partial obstruction dribble blood tinged urine after prolonged, painful attempts of urination, as the disease progress the symptoms depicted are abdominal bilateral distention, tenesmus, colic, and weight shifting, and grinding of teeth, urethral pulsation and tendency of rectal prolapsed. Animals may have an arched stance, tread their feet, swish the tail, or kick at their belly (Rdostitis, 2005) [19].

Urolithiasis should always be near the top of the differential list in male ruminants with signs of colic, particularly in sheep and goats. Stranguria, anuria, oliguria, hematuria, mineral deposits on the urethral hairs, uremic odor to the breath, urinary bladder distention and pulsations of the pelvic urethra may also be present. Less specific signs include rectal prolapse, rumen stasis, tachycardia and tachypnea. There is severe damage to the bladder and urethral mucosa by uroliths which leads to haematuria (Gangwar, 1990) [31], oligouria and dysuria. In terminal stages, the temperature starts decreasing, due to retention of metabolic wastes and their reabsorption results in toxaemia. Complete urethral obstruction results in death due to uraemia (Loreeti, 2013) [21].

LABORATORY FINDINGS

The available literature regarding haemato bio chemical alterations during the phase of urolithiasis are dynamic. There is haemoconcentration due to dehydration as a result of fluid leakage across peritoneum and neutrophilia. The increase in PCV, TLC and TEC was also reported (Jadon, 1989) [32]. An increase in nuetrophil count and leuckocytosis is due to stress (Socket, 1986) [33]. The most prominent and descriptive meaure of uraemia due to urolithiasis is Blood urea nitrogen [BUN], that can be used as an index of uraemia because of its dependability and simplicity in assessment (Rdostitis, 2005) [19]. There is rising trend of BUN (Socket, 1986) [33] during urolithiasis fromthe normal values in bovine which stand estimated so for by different workers as in bullocks, 19.71mg% and in calves 7.27mg%. During the phase of obstruction BUN levels are much higher ranging from 136.0-420 mg%. There has been a progressive increase in BUN levels at the rate of 53 mg% per day in an induced obstruction in Bullocks, however BUN above 200 mg% are reported to be detrimental for the surgical treatment. There occurs a regulation of BUN through saliva in ruminants; otherwise the values of urea nitrogen would be much higher in blood than are estimated (Makhdoomi, 1994) [28].

A creatinine test is used to measure the amount of creatine in a patient's blood or urine. This helps determine how well the kidneys are able to filter small molecules, such as creatine out of blood. Healthy individuals usually have about 0.8-1.4 milligrams of creatine per deciliter of blood. Elevated levels indicate kidney disease. As the disease progresses there is increase in the levels and creatinine (Socket, 1986) [33]. As the anorexia progresses there is severe muscle break down ith resultant hypoprotinemia elevated alkaline phosphate. Possible tissue hypoxia following retained urine with breakdown of high energy phosphate compounds cause hyperphosphataemia which serve as a more reliable index under clinical situations.

COMPOSTION OF UROLITH

The composition of urinary stones varies with geographical location. The basic mineral compositions of urinary calculi are usually varies in different aniamls (Basiri, 2008) [34]. Silica, magnesium ammonium phosphate [phosphatic, struvite], calcium carbonate, and calcium oxylate are the most common types of crystals found in ruminants. Silica urolithiasis typically occurs in the western United States in animals that are grazing pastures or eating feeds harvested from pastures with high silicate concentrations (Jones, 2009) [25].

Struviteuroliths [magnesium, ammonium or phosphorous] occur due to high grain feeding and low dietary calcium to phosphorous ration (Van saun, 2007) [35]. Struviteuroliths form when the urine become supersaturated with magnesium, ammonium or phosphorous and when urine pH is > 6.5 .The difference in susceptibility to struvite formation is due to magnesium oxide promoting the formation of alkaline urine whereas magnesium chloride promotes formation of acidic urine. In ruminants, silica urolithiasis is associated with high dietary calcium to phosphorous ratio, grazing on semiarid ranges; increased feed intake of silica and reduced water intake (Straub, 2012) [36].

DIAGNOSTIC IMAGING OF UROLITHIASIS

Diagnosis is based on history, clinical signs, and physical examination. Making a diagnosis involves integrating findings from the signalment, history, physical examination, clinical signs, time course of the disease and urinary tract imaging However radiology & ultrasonography may be required to differentiate patients with uroliths from urinary tract infections, granulomatous urethritis, prostatic disease and neoplasia (Radostitis, 2005) [19].

Radiology

Uroradiology is an up-to-date, image oriented reference in the style of a teaching file that has been designed specifically to be of value in clinical practice (Sueng, 2012) [37]. The modality of imaging chosen may include a combination of plain abdominal radiographs. Location of calculi can be determined by radiography (Busk and Ac kermam 1986) [38]. Radiography helps in differentiating between different types of uroliths as their radio densities provide a clue to the stone type (Kannan, 2010) [12]. Multiple stone in urethra and urinary bladder can also be recorded by radiography.

Ultrasonography

Sonography is a non-invasive, of reproducible and inexpensive method for diagnosis of urolithiasis, localization urethral calculi and rupture of urethra or the urinary bladder (Braun 1993) [39]. It is safer for both patient and the operator as it does not involve the use of ionizing radiation. If available, ultrasonography should be used as the primary diagnostic imaging tool although pain relief, or any other emergency measures should not be delayed by imaging assessments. It can identify stones located in the calices, pelvis, and pyelo-ureteric and vesico ureteric junctions, as well as upper urinary tract dilatation. For stones > 5 mm, ultrasound has a sensitivity of 96% and specificity of nearly 100%. For all stone locations, sensitivity and specificity of ultrasound reduces to 78% and 31%, respectively (Basiri, 2008) [34].

The volume, size and shape of the urinary bladder can be detected by cystosonography (khan, 2011) [40], besides changes in the wall thickness, intraluminal defects and seat of calculi lodgement can be detected. Abdominal sonography is useful to evaluate the bladder (Janene, 1995) [41] but is unrewarding for evaluation of the entire length of the tubes (Dubey, 2005) [42]. Cystotomy urethra. It can detect small calculi, radiolucent calculi and bladder mass like polyps neoplasia (Radostitis, 2005) [19], stones of 1 to 2mm of diameter that cannot be seen on X-ray, structures of varying size 1.50 to 2.7 cm floating in anechoic fluid [urine] in the urinary bladder with strong distal acoustic shadow can be detected. Scanning of bladder revels rounded to unevenly hyperechoic shadows with multiple spread tiny hyperechoic and patterns Makhdoomi 2008) [30].

SURGICAL MANAGEMENTS OF UROLITHIASIS

Different methods can be applied as management modalities, both medical and surgical for the management of urolithiasis has been developed in almost all the species (Jake etal., 2009) [43]. Management of obstructive urolithiasis is definitely surgical (House et al., 1996) [44]. Preoperatively the dehydrated animals are given dextrose saline as per the dehydration status (Radostitis et al., 2000) [45]. Surgical techniques used include penile transaction with urethral fistulation (Misk, 2003) [46], cystic catheterization, pelvic urethrotomy (Ravi Kumar, 2003) [47], percutaneous tube cystostomy and bladder marsupialization with various complications (Streeter et al., 2002) [48]. Recurrent urolithiasis calculi at multiple sites, badly damaged urethra, atonic bladder or severe cystitis are the common complications that may ensue in failure of surgical management of obstructive urolithiasis (May etal., 1998) [49].

Surgical intervention described for ruptured urinary bladder cases by is ischialurethrotomy with placement of an indwelling catheter and draining of urine from the abdominal cavity by paracentesis (Jennings, 1984) [50]. On the other hand, Bohkre and others treated urinary bladder rupture cases by cystography and placement of an indwelling catheter through bladder into the urethra to drain urine from the ventral portion of the bladder. In both surgical interventions, the purpose of placing an indwelling catheter is to drain urine that accumulated in the ventral portion of the bladder as tears are common in the dorsal aspect, and this prevent further spillage into the abdominal cavity and allows the bladder to heal (Bhokre et al., 1985) [51].

Urethrotomy

Urethrotomy is an operation which involves incision of the urethra, especially for relief of a stricture. Removal of uroliths by urethrotomy is the first line of treatment in many practices but should be the last resort as the complications of the urethrotomy are serious and most animals with urethral calculi have vesicle stones too. It is therefore preferable, to use retrograde hydropropulsion to return urethral calculi to the bladder and then to remove all calculi via a cystotomy or attempt dissolution in situ. The success is less than 9% for the first or subsequent urethrotomies. Most patients will be expected to experience failure with longer follow-up and the expected long-term success rate from any urethrotomy approach is 0% (Santucci and Eisenberg, 2010) [52].

Urethral stricture formation is a common side effect of urethrotomy, but the simplicity of the procedure makes it popular in breeding animals where the penis must remain intact. The urethrotomy incision may be allowed to heal without suturing because suturing may increase the likelihood of stricture formation. Some surgeons, however, recommend suture closure of the urethrotomy as soon as possible to prevent stricture formation (Van- Metre, 2004) [53].

Post scrotal Urethrotomy Procedure

Anesthesia: local infiltration on mid line behind scrotum for a distance of 5-6 inches. Post-scrotal urethrotomy is performed. The penis is exteriorized and checked for the presence of calculi behind the sigmoid flexure in the urethra. Making incision on the urethra and avoiding the calculi. Then catheter is passed towards the ischial urethra and one end of the catheter is taken out from the prepuce. Then the urethra is sutured with 3/0 cut gut in to layers by continuous pattern. The overlying subcutaneous tissue is apposed after sprinkling antibiotic powder and the skin is sutured with interrupted nylon. Then the catheter is anchored at the prepuce (Bhokre et al., 2011) [54].

Urethrostomy

Urethrostomy by definition means creating an opening in the urethra. This opening may be made as a temporary measure or it may be permanent. It is usually done to provide a new opening, through which the animal can urinate. Perinealurethrostomy is a surgical operation for the treatment of urethral obstruction; it consists of making a permanent opening in the urethra, the lining mucous membrane and the skin being joined by sutures (Jennifer et al., 2008) [55]. Urinary diversion techniques, such as antipubicurethrostomy and perinealurethrostomy, are unsuitable for breeding animals because of loss of urethral patency (Stone et al., 1997) [56].

When permanent diversion of urine flow proximal to an obstructed, severely damaged, or diseased urethra is required, urethrostomy is performed. Urethrostomy is also performed to diminish the risk of urethral obstruction due to recurrent urinary calculi. Urethrostomy, either per-scrotal or per-ischial as the site of calculi lodgment is widely recommended and practiced to relieve the obstruction. This technique is used primarily to bypass the diverticulum and allow introduction of a catheter into the urinary bladder to provide urine egress. It is also utilized to divert urine from the distal urethra when attempting surgical repair of urethral fistulae in bulls. Its primary limitations involve stricture of the stoma and or recurrent obstruction with additional calculi (Wolfe, 1998) [57].

Penile Amputation

Amputation of penis involves creation of a permanent perinealurethrostomy from the proximal part of the transected penis. The distal penis is resected and it is a salvage operation (Misk, 2003) [46]. Amputation of the penis is indicated following urethral rupture in steers, bulls, rams and bucks. This can be performed if urine has leaked into the tissues of the abdomen through a rupture of the distal urethra. The penis is then transected at a point which will leave a stump of about 2.5 cm protruding from the incision. The dorsal artery of the penis (which will lie on the ventral aspect of the stump) should be identified and ligated. Blood will ooze from the corpus cavernosum penis but this should not lead to significant blood loss. The skin incision is then closed, leaving the stump of the penis protruding from the incision (Hindson, 2002) [58]. Because of urine contamination of per penile elastic tissue at the site of urethral rupture, these animals are allowed to continue for several weeks to become acceptable for slaughter. One potential complication with this procedure is stenosis of the urethral opening in the penile stump (Wolfe, 1998) [57].

Surgical Procedure Penile Amputation

Administer epidural anesthesia and prepare an area on the posterior midline from the perineum to the scrotum for aseptic surgery. Make a 12-cm skin incision on the midline. Deepen the incision through the subcutaneous tissue and the very dense connective tissue between the semi-membranous muscles to expose the paired retractor penis muscles. Continue the dissection deep between the retractor penis muscles to locate the penis. Grasp the penis firmly and apply traction caudally and dorsally to bluntly dissect the penis from the surrounding tissue. If there is advanced necrosis of the elastic tissue the penis will separate from the prepuce and the entire penis can be pulled caudally through the incision. Once the penis is exteriorized, ligate and transect the retractor penis muscles as far proximally as possible, and ligate the dorsal vessels of the penis proximal to the point of amputation. Using a scalpel transect the penis 5 cm distal to the dorsal apex of the skin incision and open the urethra with scissors proximal to the incision apex (Jening, 1984) [50].

PREVENTION OF UROLITHIASIS

The aim of preventive measures should be reduction of urinary concentration of calculogenic crystalloids; the diet can be adjusted to reduce urinary concentration of causative minerals (smith et al., 1996) [59]. Mineral components of uroliths come primarily from the diet, making control of the mineral content of rations particularly important in prevention. In general, phosphorus should never comprise greater than 0.6% of the total ration, and the calcium/phosphorus ratio should be maintained at 2.5:1 or 2:1, achieved by the use of calcium salts (Hay, 1991) [60].

Proper use of the instrument during castration and education of animal attendants about the danger of hitting a male animal in the perineal region are needed to prevent traumatic cause of urethral obstruction. Provision of clean water in multiple sites and intentional salting moistened grass hay, induction of diuresis and maintenance of dilute urine would help a long way keeping urolithiasis in check (Pathak etal., 2009) [61]. Mineral components of uroliths come primarily from the diet, making control of the mineral content of rations is particularly important in prevention. In general, phosphorus should never comprise greater than 0.6% of the total ration and the calcium/phosphorus ratio should be maintained at 2.5:1 or 2:1, which can be achieved by the use of calcium salts, if necessary (Van-Metre etal., 2002) [62].

High phosphorus levels are present in grains, particularly sorghum, wheat, corn, milo, and oats (Gill et al., 2004) [63]. Phosphorus excretion into the urine may be decreased by the feeding of more roughage and the avoidance of pelleted rations, to encourage salivary excretion of phosphorus. Magnesium control is important even in prevention of uroliths, which do not contain magnesium in their primary structure. It is recommended that magnesium never comprise greater than 0.6% of the total ration and, because the magnesium in roughage diets is less available than that from concentrates, roughage based diets are preferable (Hay, 1991) [60].

CONCLUSION AND RECOMMENDATIONS

Urolithiasis is the causes and effects of stones anywhere in the urinary tract including the kidneys and bladder. Uroliths in cattle, sheep, and goats are common. It occurs in both sexes, although obstruction occurs most frequently in males and steers. The majority of urolith in cattle is either struvite or silica.urolithiasis is known to have numerous predisposing etiology factors but exact mechanism of stone formation and growth is not fully known.Urinary calculi formation usually results from a combination of various physiological, nutritional and management factors. If the urethral obstruction is complete, surgical treatment is necessary. These surgeries include: urethrostomy, urethrotomy and penile amputation. The disease can be prevented to a large extent by modifying the prevailing managemental practices. The patient needs special care following operation.

Based on the above conclusion; the following recommendations are forwarded:

- During ration formulation the ratio of calcium and phosphorus should be balanced;
- Proper amount of water and salt should be supplied to the animals;
- Trauma due to faulty burddizo*- castration and maltreatment should be avoided;
- Earlier calf castration should be avoided and antibiotics should be administered as post-operative care.

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