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Clinical, Haematological and Biochemical Findings Based Surgical Management of Obstructive Urolithiasis by Tube Cystostomy in Buffalo Calves (*Bubalus Bubalis*)

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Biochemical analysis, buffalo calves, cystorrhexis, intact bladder, tube cystostomy and urolithiasis.

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ABSTRACT

The objective of this study was to evaluate the clinical, hematological, biochemical and surgical management by tube cystostomy of acute urethral obstruction with or without bladder rupture in buffalo calves. A total number of 14 male buffalo calves with obstractive urolithiasis were prospectively studied. Most ofen males aged between 3 and 9 months.were affected. The affected calves were allocated to two groups; intact bladder group (n= 8), and ruptured bladder group (n= 6). Six apparently healthy buffalo calves were enrolled in this study as controls. Diagnosis of the disease was made on the basis of a history of anuria; clinical signs, selective biochemical analysis, abdominocentesis and ultrasongraphy, the confirmed cases of obstractive urolithiasis with either intact or ruptured bladder were managed by surgical tube cystostomy technique with Foley's catheter. Results of this study showed that, there was no significant change in the mean value of rectal temperature in both intact and ruptured obstructive urolithiasis. The mean average of respiratory rates and heart rates in the calves suffering from obstructive urolithiasis were significantly higher compared to the control group. Both diseased groups showed significant ($P < 0.05$) increases in the total red blood cell count, packed cell volume and neutrophils. The greatest increases were recorded in serum urea nitrogen and creatinine concentrations in both groups. Also the results showed an elevation in the level of total protein, glucose, inorganic phosphorus, potassium and magnesium but showed a decrease in the level of calcium, sodium and chloride. All cases showed uneventful recovery after surgical tube cystostomy. It was concluded that, clinical signs, abdominocentesis and selective biochemical analysis are very useful in diagnosis and prognosis of obstructive urolithiasis with intact or ruptured urinary bladder in buffalo calves. Surgical management by tube cystostomy may be a feasible method for management of obstractive urolithiasis in field conditions.

1. INTRODUCTION

Obstructive urolithiasis is a common serious problem in male ruminants (Floeck, 2009). The calculi formation results from a combination of physiological, nutritional and managemental factors. Excessive or imbalance intake of minerals has been reported as one of the factors for formation of urinary calculi (Larson, 1996; Braun, 1993, Floeck, 2009, Mohamed and El- Deeb, 2015). After formation of calculi in urinary tract, in which insoluble mineral and salt concretions develop and aggregate around a nidus of proteineous material within the bladder or urethra. They may lodge anywhere within the urinary tract, causing urine retention. Male animals are more likely to be affected because of an extremely long and tortuous course of urethra, in contrast to females having a shorter and wider urethra (Anderson et al., 1995; Matthews, 1999).

Young calves are frequently affected with obstructive urolithasis (Amarpal et al., 2013). Urethral obstruction is characterized clinically by a complete retention of urine, frequent unsuccessful attempts to urinate, distension of the urinary bladder and rupture of the bladder can be a sequel to acute urethral obstruction (Floeck, 2009). The obstructive urolithasis may cause a significant economic loss due to rupture of the bladder and urethra with subsequent azotemia and death (Radostits et al., 2007).

After bladder ruptures, uroperitoneum results in a series of abnormalities that arise from failure of the excretory process combined with solute and fluid redistribution between the peritoneal fluid and extracellular fluid (Floeck, 2009). Osmotic pressure from hypertonic urine promotes movement of extracellular water into the peritoneal cavity resulting in clinical dehydration. The bladder rupture leads to gradual development of ascites from uroperitoneum, ruminal stasis, constipation, depression and uremia (Schott, 2004). Abdominocentesis is used successfully in many species to aid in the diagnosis of abdominal disorders and in particular uroperitonieum (Anderson et al., 1995).

Diagnosis of obstructive urolithiasis is based on history, clinical, laboratory, and ultrasonographic findings (Mohamed and El- Deeb, 2015). History and clinical examinations remain the first steps while differential diagnosis needs to be refined by laboratory aids. Sonography is a non-invasive imaging technique and inexpensive method for diagnosis of obstructive urolithiasis in ruminants (Braun, 1993, Floeck, 2009, Mohamed and El- Deeb, 2015 and Abdelaal et al., 2016).

Treatment of obstructive urolithiasis is definitely surgical, once urethral obstruction is complete (Haven et al., 1993 and House et al., 1996; Misk and Semieka, 2003). The surgical techniques used include penile transection with urethral fistulation (Misk and Semieka, 2003), cystic catheterization (Hussain and Moulvi, 1986), pelvic urethrotomy (Ravikumar and Shridhar, 2003), percutaneous tube cystostomy (Streeter et al., 2002, Parrah et al., 2011, Gugjoo et al., 2013 and Kumar et al., 2016) and bladder marsupialization (May et al., 1998) with various complications. Tube cystostomy together with medical dissolution of calculi is considered an effective technique for resolution of obstructive urolithiasis in small ruminants (Ewoldt et al., 2006). It provides an alternative surgical technique in the management of obstructive urolithiasis. Advantages of the technique include fewer recurrences, preservation of the reproductive function of the animal, an opportunity for the removal of cystic calculi and simplicity of the technique (Williams and White 1991, Kumer et al., 2016 and Mangotra et al., 2017).

The present study was aimed to evaluate the clinical, hematological, biochemical and surgical tube cystostomy technique of acute cases of urethral obstruction with intact bladder or cystorrehxis in buffalo calves.

2. MATERIALS & METHODS

2.1. Animals

A total number of 14 non castrated male buffalo calves aged 3-9 months suffered from anuria and abdominal distension with a history of colic of varying duration belonging to the Veterinary Teaching Hospital at Mansoura University- Egypt during the period of October, 2015 to December, 2017. Obstructive urolithiasis was diagnosed by physical examination, ultrasonography to check the status of the urethra and urinary bladder. Further, abdomenocentesis was performed in the cases showing water belly appearance to confirm cystor-rhexis. The diseased calves were allocated into two groups: intact bladder group (n= 8 calves) and ruptured bladder group (n= 6 calves). In addition to six apparently healthy calves were enrolled as controls in this study.

2.2. Clinical assessment

All animals were subjected to thorough clinical examination according to Radostits et al, (2007). Heart rate (HR; beat/min), respiratory rate (RR; breath/min), rectal temperature (RT; C°) and general body condition (fair/dull and depressed) were recorded. Dehydration percentage was estimated by skin fold test at the site of neck following the criteria of Radostits et al., (2000) and the abdominal distension were examined.

2.3. Hematological and biochemical analysis

From each animal, 2 ml blood samples were collected from jugular vein using lithium heparinized BD vacutainer tubes and used for estimation of hematocrit value, erythrocyte count, total and differential leucocytic count. Other 5ml blood samples were collected in clean, dry centrifuge tubes without anticoagulant for serum collection. The obtained clear non hemolyzed sera were stored at -20 ^{o}C until used for measurement of all biochemical variables.

Total RBCs, hemoglobin concentration (Hb), PCV, leuckocytic counts (LC) and differential leuckocytic counts (DLC) were determined using a fully automated blood cell counter machine (Medonic CA620 Veterinary Hematology Analyzer –Sweden).

The concentrations of blood urea nitrogen (BUN) and serum creatinine, total protein (TP), calcium, inorganic phosphorus, sodium, chloride, potassium and magnesium were determined by using an automated biochemical analyzer (Biosystems A15, Spain). Glucose was determined by GOD-PAP method without deproteinization, by using commertial kits.

2.4. Surgical management by tube cystostomy

All animals were treated surgically by tube cystostomy technique on the day of admission. They were placed in right lateral recumbency. Left side of the abdomen was prepared for aseptic surgery. Local infiltration and lumbosacral epidural analgesia using lidocaine hydrochloride (Debocaine, 20mg/ml, Aldebiky, Egypt) was achieved in all animals to desensitize the proposed surgical site.

A paramedian linear skin incision was performed anterior to the rudimentary teat. After incising the skin, fascia, muscles and the peritoneum, the bladder was identified. The status of bladder was checked whether intact or ruptured. If the bladder was intact, a subcutaneous tunnel parallel to the prepuce was made through which the Foleys catheter was passed (Fig: 1A) with pointed end towards the incision. Foley's catheter was passed from outside to abdominal cavity where the catheter tip was held in stilt and directly stabbed the bladder at an avascular area and its bulb was inflated with sterile normal saline to fix the tube within the bladder. Further the peritoneum, muscles and skin were closed routinely. In cases of ruptured bladder (Fig: 1B), urine drainage was done slowly to protect the animals from peritonitis and shock. Cystorrhaphy was performed using size 1 polydioxanone (Unicryl M, Unimed, Kingdom of Saudi Arabia; Fig: 1C) followed by catheter placement after necessary debridement. The bladder was irrigated with normal saline to remove concretions and cystic calculi. In cases where skin became necrosed and delicate to make subcutaneous tunnel, Foley's catheter was secured on the ventral abdomen (Fig: 1D)

2.5. Postoperative management and follow up

Antibiotic (penicillin–streptomycin [30,000 U/kg penicillin, 10 mg/kg streptomycin], Penstrep, Norbrook Laboratories, Corby, Northamptonshire, NN18 9EX, UK) was administered intramuscularly for 5 days and meloxicam (0.5 mg/kg of BW; Metacam, Boehringer Ingelheim GmbH, Ingelheim, Germany) was administered for 3 days post operatively. Owners were advised to give ammonium chloride at 100 mg/Kg body weight, twice daily, orally for 30 days. Local antiseptic dressing with dilute liquid povidone iodine was done for a week. The catheter was allowed to drain freely until normal urination resumed. Catheters were removed after normal urination resumed through urethra. Follow-up information was obtained by visit and telephone inquiries.

2.6. Statistical analysis

Data were analyzed using the packaged SPSS program for windows version 10.0.1 (SPSS Inc., Chicago, IL). All data were presented as mean ± standard error (mean ± SE). Differences between affected and healthy animals were determined by analysis of variance (ANOVA). Significance level was set at $P \leq 0.05$.

3. RESULTS

The general condition in 14 clinical cases of acute obstructive urolithiasis ranged from fair to depression. Anorexia or reduced appetite was seen in all diseased calves. Eight of the 14 calves were restless and had signs of colic, such as treading, kicking at the abdomen, tail switching and sinking of the back (distended bladder), while in the other 6 calves, they showed a uremic breath, dry muzzles and the symptoms of acute pain were releaved, in the other affected calves(ruptured bladder). Table1 summarized the physiological parameters in all groups. The result showed that, the mean values of RT in the affected calves was 38.6 ± 0.20 ^{O}c. The comparative mean values for RT recorded in cases of obstructive urolithiasis with intact and ruptured bladder was non-significant ($p < .05$). The mean RR and HR in the calves suffering from obstructive urolithiasis were higher than the control group. Comparatively the values in the cases with ruptured bladder were higher than in the cases with intact ones, but the difference was statistically non-significant ($p < 0.05$). The mean time of skin fold test in diseased calves either with intact or ruptured bladder were profoundly higher than normal instantaneous return values of skin fold.

The hematological and biochemical data of the affected calves were summarized in Table (2). In the affected calves, the results showed elevated erythrocytic count, PCV% and neutrophils. Increased the concentrations of TP, glucose, inorganic phosphorus, magnesium and potassium above the normal range. Also the data showed that there were a decrease in the serum values of the calcium,sodium and chloride. The BUN and creatinine levels in the clinical cases of obstructive urolithiasis were significantly ($p< 0.05$) higher than the control group. Comparatively these values were higher in the cases of ruptured bladder compared to the cases of intact ones.

Following tube placement, flow of urine through the tube was observed in all the cases. The signs of acute pain and distress reduced immediately after surgery and animals started to feed normally after 6- 5 hours. Catheter was removed at an average period of 12-15 days, in some cases catheter was removed almost after a month due to delayed normal urination. Majority of the cases showed uneventful recovery.

4. DISCUSSION

Urolithiasis is considered of a great economic importance in fattening steers being fed heavy concentrate ration. Urolithiasis equally affects the male and female animals but obstruction occurs only in males (Larson, 1996 and Radostits et al., 2000) due to the presence of sigmoid flexture. Although the occurrence of obstructive urolithiasis is usually sporadic, outbreaks affecting a large number of animals have been recorded (Manning and Blancy, 1986 and Smith, 2002).

The major underlying cause of ruptured bladder in all admitted cases was found to be the presence of one or more calculi blocking the pathway of urine outflow in the urethra. The result of this study found that, the general condition were fair in the clinical cases of obstructive urolithiasis with intact bladder while it were dull and depression in other cases with ruptured bladder. The general body condition was thus mainly associated with the status of urinary bladder (rupture or intact). General body condition was found fair in the cases that had diseased for 24 – 96 hours, dull and depression in those cases that had illness for 48 – 120 hours (Hooper, 1998), Radostits et al., 2000 and Smith, 2002).

In this study, the calves with intact bladder showed symptoms like kicking at belly, treading with hind feet, swishing of tail, and tendency of rectal prolapse, straining for urination, urethral thrill and arched back. Pulsation of urethra and rectal prolapse could probably be due to continuous efforts made by the animals for urination. Kicking at belly, treading with hind feet, swishing of the tail and arched back point to the discomfort felt by the animal due to the distension of the bladder. (Monoghan and Boy, 1990).

Abdominocentesis is necessary to detect uroperitoneum after rupture of the bladder. However, it is often difficult to identify the fluid obtained from the peritoneal cavity as urine other than by appearance and smell. Warming the fluid may facilitate detection of the urine odor (Hooper, 1998, Radostits et al., 2000 and Smith, 2002) .

In the present study, the mean average RT was within the normal reference range. The RT in intact bladder cases was slightly higher than the cases with ruptured bladder. The slight variation of RT could probably be due to the variation in the stage of uraemia, duration of illness and degree of haemodynamic changes. These findings are agreement with those of Sockett et al., (1986) who reported normal RT as well as hypothermia in cases with obstructive urolithiasis. Gangwar et al., (1990) found no change in the values of RT after experimental creation of urethral obstruction in cattle calves. However the findings of the present study differ with those of Jadon et al., (1987) and Singh and Sahu (1995) respectively who recorded increased and decreased levels of RT in experimentally induced urethral obstruction in buffalo calves.

The mean RR was higher than the normal reference value recorded during this study corroborate well with Hooper (1998) and Smith (2002). Increased RR could be attributed to toxaemia as a result of retention of metabolic waste products during obstructive urolithiasis. Higher RR could also be due to pain caused by urethral calculi, abdominal crisis,electrolyte aberrations like hypocalcaemia, and hypovolumic shock (Wilson and Lofstedt, 1990). The RR was further higher in the cases of ruptured urinary bladder. This could be attributed to the pressure excreted over diaphragm by accumulated urine in the peritoneal cavity and to the severe systemic changes influenced by excessive accumulation of metabolic waste products like BUN and creatinine However, the findings of the present study differ from those of

Singh and Sahu, (1995) who observed decreased RR in experimentally induced uraemia in buffalo calves.

The higher mean HR recorded in the present study is in total accordance with the observations (Singh, 2005, Hooper 1998 and Smith, 2002). Increased HR could be attributed to the reflex response of baro-receptors and chemo-receptors, sympathetic stimulation or para-sympathetic inhibition of SA node (Sobti et al., 1986), progressive hyperkalaemia (Sharma et al., 1982) dehydration, biochemical alterations, inter-compartmental fluid shifts and myocardial asthenia (Sharma et al., 1982), accumulation of toxic metabolic waste products, pain and progressive systemic disturbances. The stage of uraemia or duration of illness could be the factors responsible for variation in the heart rate. Increase in heart rate was more in the cases of ruptured urinary bladder than the cases with intact urinary bladder, which might be due to the fact that systemic changes and accumulation of waste products could be more in the cases of ruptured urinary bladder.

The skin fold test and the degree of dehydration are closely related to each other as the loss of skin elasticity is primarily due to loss of fluid from the interstitial and intracellular spaces (Radostits et al., 2000a). Dehydration is detectable only when at least 4 – 5 % of body water is lost. An acute loss of more than 12 % of body water is life threatening (Radostits et al., 2000b).

The data of haematological examination showed that the mean Hb was within the normal reference range reported for animals (Sastry, 1983, Jain, 1986, Swenson and Reece, 1993, Brar et al., 1999 and Radostits et al., 2000a), but it was more in the cases of ruptured urinary bladder than the cases of intact ones. However, the Hb range was towards higher side in both the groups. The mean value of PCV recorded in the animals of this study was higher than the reported reference values. Comparatively, the mean value of PCV was higher in the cases of ruptured urinary bladder than the cases of intact one. A high Hb and PCV might be attributed to haemoconcentration due to dehydration (Sharma et al., 1982, Sockett et al., 1986 and Radostits et al., 2000a).

Higher values for neutrophils in the cases of intact urinary bladder than in the cases of ruptured one confirm the findings of Muhee (2006), and could be due to more stress in the cases of intact urinary bladder. Pain and stressful conditions could be considered the possible reasons for mild leucocytosis in the cases of ruptured bladder (Morris, 1990).

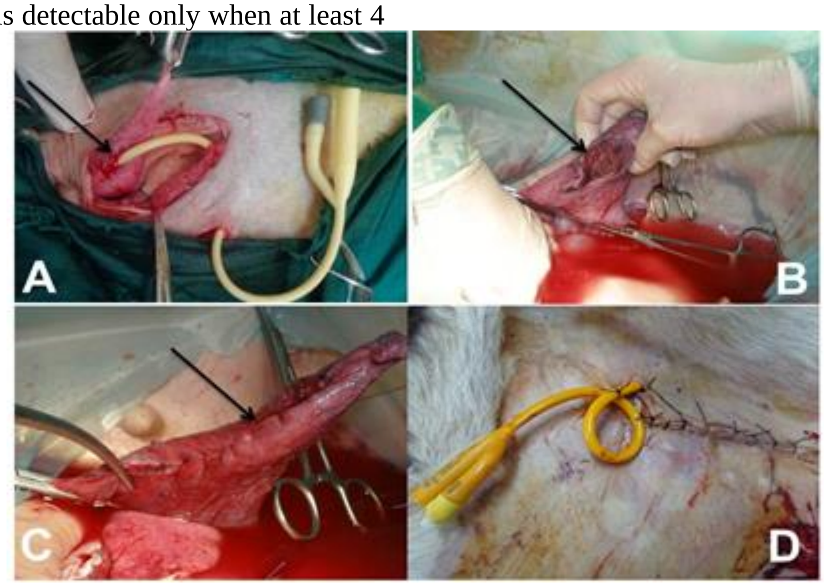

Figure 1: A) Foley catheter passed into a stab incision into the intact bladder (black arrow) and through a subcutaneous tunnel on the ventral abdomen parallel to prepuce in a buffalo calf B) Ruptured bladder (site of rupture; black arrow) C) Site of cystorraphy D) Foley's catheter secured at multiple sites on the ventral abdomen.

Table 1: RT (C^O), RR (breath/ min), HR (beats/min) and STT (seconds; mean±SEM) in buffalo calves with intact bladder (n= 8), ruptured bladder (n= 6) compared to healthy calves (n= 6)

Parameters	Intact bladder (n = 8)	Ruptured bladder (n= 6)	Control (n= 6)
RT (^{0} c)	38.5	38	38.9
RR (Breaths/m)	26.73 ± 1.20*	33.00 ± 3.40*	14
HR (Beats/m)	98.87 ± 2.30*	103.8 ± 4.30*	76
STT (Seconds)	4.40 ± 0.61*	5.33 ± 0.71*	Instantaneous return

*P < 0.05

Table 2: Haematological and biochemical findings (mean±SEM) in buffalo calves with intact bladder (n= 8), ruptured bladder (n= 6) compared to healthy calves (n= 6)

Parameters	Intact bladder (n= 8)	Ruptured bladder (n= 6)	Control (n =6)
RBCs (×10^6/mm^3)	7.2± 12*	8.0±239*	6.10±78
Hb (g %)	11.43 ± 0.34	12.05 ± 0.31	11
PCV (%)	39.73 ± 0.54*	41.47 ± 1.10*	35
TLC (x10^3/cumm)	8.42 ± 0.25	8.95 ± 0.23	8
Neutrophil (%)	38.67 ± 1.10*	37.27 ± 1.40*	28
Lymphocyte (%)	49.87 ± 1.30	49.26 ± 1.36	48.21
Monocyte (%)	4.13 ± 0.42	5.13 ± 0.40	4
Eosinophils (%)	7.40 ± 0.50	7.80 ± 0.60	7.9
Basophil (%)	0.80 ± 0.11	0.66 ± 0.13	0-2
BUN (mg/dL)	57.67 ± 1.8**	65.40 ± 4.3**	16.1
Creatinine (mg/dL)	3.9 ± 0.31**	4.8 ± 0.25**	1.12±0.21
Glucose (mg/dl)	90±32*	115±21*	56±15
T.Proteins (g/L)	67.13 ± 1.6	73.46 ± 2.4*	71.6
Calcium (mmol/L)	2.05 ± 0.02*	1.90 ± 0.011*	2.77
I.Phosphorus (mmol/L)	2.01 ± 0.21*	2.5 9± 0.26*	1.92
Sodium (mmol/L)	133.86 ± 1.5*	131.74 ± 1.2*	142
Chloride (mmol/l)	76±5*	74±7*	95±6
Potassium (mmol/L)	5.26 ± 0.24	5.78 ± 0.35*	4.65
Magnesium (mmol/L)	0.98± 0.05	1.120 ± 0.05*	0.92

*P < 0.05 **P < 0.01

The higher values for serum BUN and creatinine which recorded during this study are in agreement with those of Villar et al., (2003); Tsuchiya and Sato (1991).The findings are also in agreement with those of Sheehan et al. (1994) who reported impaired clearance of urea and creatinine in urinary tract obstruction. In obstructive urolithiasis, urine gets accumulated into the urinary bladder for more than normal period of time. The urea gets reabsorbed into the systemic circulation and causes uraemia. Further, backflow of urine may create pressure over the kidney to reduce the urine production by decreasing glomerular filtration rate and ultimately decrease urea excretion in urine (Sharma et al, 2006). This mechanism explains the reason behind the raised values of BUN in the case of obstructive urolithiasis. The mean values of BUN in the cases of ruptured urinary bladder was higher than that the intact ones, which could be due to movement of urea from the high concentration in peritoneal cavity to the interstitial and intravascular compartments. The higher values for BUN in ruptured bladder cases are in total consonance with those of Smith (2002) and Donecker and Bellamy (1982).

The higher mean value for creatinine in the clinical cases of obstructive urolithiasis in this study is in consonance with the findings of Villar et al. (2003). Similar findings have also been reported by other workers (Sockett et al, 1986, Singh et al, 2005 and Sharma et al, 2006). Creatinine is the waste product of creatine, which is involved in the muscle contraction. The concentration of creatinine in blood increases mainly because of excretory dysfunction and renal damage. Its concentration in blood is not influenced by diet; therefore, creatinine levels in blood could be a better prognostic indicator of renal function as compared to urea (Carlson, 1990).

Higher TP observed in the cases of ruptured urinary bladder might be due to more dehydration.However, the findings are also in contrast with many other workers. Donecker and Bellamy (1982) and Kumar et al. (1998) found increased TP variability in the results reported by different workers could be attributed to different levels of hydration in the animals of their studies. The values for sodium and chloride during the present study were lower than normal reference range which in agreement with Donecker and Bellamy (1982) and Sockett et al. (1986) who observed hyponatraemia hypochloremia and hyperphosphataemia in cattle subjected to experimentally induced rupture of the urinary bladder. Hypocalcaemia and hyperphosphataemia recorded in the present study could be attributed to many factors and their interplay. Feeding of concentrate diets, low in calcium and rich in phosphorous content could be one of the contributing factors, as absorption of calcium is affected by calcium phosphorous ratio within the gut and an increase in phosphorous will reduce absorption of calcium (Brobst et al., 1978).

Further reduction in serum calcium concentration in cases of uroperitoneum could be due to anorexia, and a competitive effect of hyperphosphataemia (Sockett et al., 1986). A decreased glomerular filtration rate might be the cause of hyperphosphataemia in cattle with renal damage. Further there is an inverse relationship between calcium and phosphorous and fall in serum calcium values as observed in this study might be the cause of increased inorganic phosphorous level. Elevated levels of phosphorous in animals having ruptured urinary bladder could be due to the greater absorption of phosphorous through peritoneum into the circulation as urine has very high concentration of this mineral. Greater degree of dehydration and subsequent haemoconcentration could also be responsible for slightly higher phosphorous in ruptured urinary bladder cases. These findings are in total consonance with those of Brobst et al. (1978), Donecker and Bellamy (1982), Singh et al.(1984), Sockett et al. (1986), Singh et al. (1987) and Sharma *et al*. (2005).

Urolithiasis with intact bladder and cystorhexis was better confirmed in the present study by abdominocentesis and ultrasonography (Mohamed and El-Deeb, 2015). Dehydration predominantly observed in the calves with cystorhexis in the present study which could be attributed to the loss of fluid from interstitial and intracellular spaces into peritoneal cavity as explained by Donecker and Belly (1982). Metabolic alkalosis, hyponatremia, hyperkalemia are noticed in the ruminants suffering from urolithiasis (Makhdoomi and Ghazi, 2013) and it was corrected by giving normal saline intravenously as observed in the present study.

Postoperative complications like cystitis, peritonitis, were not at all recorded in any of the animals in this study. The treatment of obstructive urolithiasis is primarily surgical (Van Metre et al., 1996). Before surgical procedure, animal must be stabilized by giving normal saline as metabolic derangements like hyperkalemia, hyponatremia and hypocalcemia exists (Makhdoomi and Ghazi, 2013). Tube cystostomy provides an alternative to number of the surgical techniques available for management of urolithiasis. Urethrostomy and urethrotomy have been used to relieve the obstruction. However, postoperative leakage of urine from the site of obstruction leads to necrosis of urethra and subcutaneous tissues (Gugjoo et al., 2013). The tube cystostomy gives passage for removal of urine and prevents its accumulation which might lead to the rupture of bladder or the urethra (Dubey et al., 2006). Medical dissolution of the calculi is achieved by giving urine acidifiers and calculolytic drugs. The average duration of removal of catheter was about 12-15 days. Though in some previous reports, 14 days of hospitalization has been reported in goats (Ewoldt et al., 2006). Regular flushing of the catheter with the normal saline was done to prevent the blockade. The tube cystostomy has advantages like improved potential for preservation of breeding function of the animal and urinary continence, and the opportunity for removal of cystic calculi (May et al., 1998, Parrah et al., 2011, Singh et al., 2014 and Kumar et al., 2016).

5. CONCLUSIONS

Obstructive urolithiasis causes severe alterations in haematological and biochemical profile of the buffalo calves including PCV, BUN, creatinine, calcium, inorganic phosphorus sodium and chloride. Clinical signs, abdominocentesis and selective biochemical analysis are very useful in diagnosis and prognosis of obstructive urolithiasis with intact or ruptured urinary bladder in buffalo calves. Tube cystostomy is a quick, practical and field applicable effectively used methods for treatment of obstractive urolithiasis along with medical dissolution of calculi and with proper postoperative management in buffalo calves.

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