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## Ultrasonographic diagnosis of uroabdomen due to urinary bladder rupture in a Kangayam bull calf

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### Abstract

A four month old male Kangayam calf was presented with the history of abdominal distension, anorexia, anuria and achezia for four days. Clinical examination of the calf revealed depression, dehydration (enophthalmos and reduced skin elasticity), bilateral abdominal distension with fluid thrill on tactile percussion, elevated pulse (98/min) and respiratory rate (48/min). Haemoconcentration (Packed cell volume 58 %), leukocytosis (16300/cumm), elevated blood urea nitrogen (236 mg/dl) and creatinine (9.4 mg/dl) were noticed. Ultrasonographic examination of distended abdomen showed anechoic free fluid with floating viscera and ruptured urinary bladder at ventral side. Ultrasonographic guided abdominocentesis revealed light yellow coloured fluid with low specific gravity (1.020), alkaline nature (pH 8.0) and urine smell. Peritoneal to serum creatinine ratio was 3.5. Based on ultrasonographic examination of abdomen and peritoneal to serum creatinine ratio (more than 2.0), the case was diagnosed as uroabdomen due to urinary bladder rupture. The calf was treated with antibiotic and fluid therapy to stabilize initially before surgical procedure. The animal collapsed during surgical preparation for transabdominal repair of ruptured urinary bladder.

**Keywords:** Kangayam calf, ultrasonography, urinary bladder rupture, uroabdomen, peritoneocentesis

### Introduction

Uroabdomen is accumulation of urine in peritoneal cavity by the rupture of distended urinary bladder (cystorrhesis). Uroabdomen commonly occurred in castrated male cattle by urolithiasis induced urethral obstruction and subsequent urinary bladder rupture (Constable *et al.*, 2017) <sup>[1]</sup>. In calves, the urinary bladder rupture was due to obstruction in the neck of the urinary bladder by fibrin casts, obstruction of urethra by haematoma formation in urethral submucosa and infection of umbilical artery in neonatal period (Lax and Drew, 1974; Betinelli and Nuss, 1990; Bell *et al.*, 2004) <sup>[2, 3, 4]</sup>. Urethral strictures in cattle caused by injury and necrotic inflammation of urethra and surgical procedures such as urethrotomy and castration or urethral compression by a tumour, abscess or haematoma and adhesions in urethra following surgical removal of urachal abscess causing urinary bladder rupture (Roussel and Ward, 1985; Gründer *et al.*, 2002; Braun *et al.*, 2014) <sup>[5, 6, 7]</sup>. In female cattle, urinary bladder rupture was observed after dystocia and due to necrotising cystitis (Carr *et al.*, 1993; Braun *et al.*, 2007) <sup>[8, 9]</sup>. The clinical signs in uroabdomen were pear shaped abdomen due to accumulation of urine, enophthalmos, dehydration, ruminal atony, tachycardia, gradual deterioration in demeanour and appetite (Braun *et al.*, 2006; Saravanan *et al.*, 2017; Ravi *et al.*, 2018) <sup>[10, 11, 12]</sup>. Elevated urea and creatinine concentrations in serum were consistent biochemical changes in cattle with uroabdomen (Roussel and Ward, 1985; Wilson and Mac Williams, 1998) <sup>[5, 13]</sup>. Ultrasonography of abdomen revealed ruptured urinary bladder, massive fluid accumulation and visceral organs suspended in the fluid (Floock, 2009; Braun and Nuss, 2015) <sup>[14, 15]</sup>. Two types of urinary bladder rupture were reported in cattle: multiple point leakage or discrete tears on dorsal wall of urinary bladder (Constable *et al.*, 2017) <sup>[1]</sup>. Abdominocentesis was performed on the ventral abdomen to obtain peritoneal fluid which showed light yellow or colourless and clear fluid with urine smell (Braun *et al.*, 2006) <sup>[10]</sup>. Elevated Urea and creatinine in peritoneal fluid and increased peritoneal to serum creatinine ratio above 2.0 were considered to be diagnostic in uroabdomen. The present study places a record on ultrasonographic diagnosis of uroabdomen in a male Kangayam calf.

### Case History and Observations

**Animal:** A four month old male Kangayam calf was presented to the Veterinary Clinical Complex, Veterinary College and Research Institute, Namakkal with the history of bilateral abdominal distension, anorexia, anuria and achezia for four days.

**Clinical examination:** The calf was dull and depressed and showed congested conjunctival mucous membrane, sunken eye ball (5mm) and skin turgor test (10sec) indicating 12%

dehydration and bilateral distension of abdomen (pear shaped) with fluid thrill on tactile percussion. The animal showed elevated pulse (98/min), respiratory rate (38/min) and normal temperature (38.8 °C).

**Haemato-biochemical examination:** Haemoconcentration (Packed cell volume [PCV] 58%), leukocytosis (16,300/cumm), elevated blood urea nitrogen [BUN] (236 mg/dl) and creatinine (9.4 mg/dl) were the major haematobiochemical alterations in the calf (Table 1).

**Table 1:** Haematobiochemical values of Kangayam bull calf with Uroabdomen

S. No.	Parameters	Observed value	Reference range (Constable <i>et al.</i> , 2017)
1.	Haemoglobin (g/dl)	13.8	8.5 – 12.2
2.	Packed cell volume (%)	58	22 – 33
3.	Red blood cells (x10 <sup>6</sup> /cumm)	7.4	5.1 – 7.6
4.	White blood cells (/cumm)	16300	4900 – 12000
5.	Total protein (g/dl)	6.8	5.7 – 8.1
6.	Albumin (g/dl)	3.2	2.1 – 3.6
7.	Blood urea nitrogen (mg/dl)	236	6.0 – 27.0
8.	Creatinine (mg/dl)	9.4	1.0 – 2.0
9.	Aspartate aminotransferase (U/L)	123	78 – 132

**Ultrasonographic examination:** Ultrasonographic examination was performed by using Mylab 40 Vet (Esoate Ltd). Hairs over abdomen were clipped and coupling gel was applied for better transmission of ultrasound. Transabdominal ultrasound examination using 5.0 to 8.0 MHz curvilinear probe on both side of entire abdomen from cranial abdomen including last two intercostal spaces to caudal portion and also from dorsal to ventral side revealed anechoic free fluid with floating viscera in the abdominal cavity (Fig 1). Transrectal ultrasound examination using 7.5 to 10.0 MHz linear probe showed ruptured of urinary bladder on ventral side (Fig 2).

**Abdominocentesis:** Abdominocentesis was performed under ultrasonographic guidance at ventral abdomen using 20 G hypodermic needle. Light yellow coloured copious fluid with specific gravity of 1.020, pH 8.0 and urine smell was obtained (Fig 3). Estimation of urea and creatinine in the peritoneal cavity was done and showed elevated urea (392 mg/dl) and creatinine (32.8 mg/dl). The calculated peritoneal to serum creatinine ratio was 3.5.

Ultrasonography examination and elevated peritoneal to serum creatinine ratio were useful to confirm the case as uroabdomen due to urinary bladder rupture.



**Fig 1:** Ultrasound picture showed anechoic fluid in peritoneal cavity with floating abdominal viscera



**Fig 2:** Ultrasound picture showed rupture of urinary bladder (Yellow arrow)



**Fig 3:** Peritoneocentesis showed light yellow coloured urine

### Treatment and Discussion

The calf was treated with amoxicillin and cloxacillin (@ 10 mg/kg bid i/m), dextrose normal saline (10 ml/kg i/v) and ringer's lactate (@10 ml/kg i/v). Transabdominal approach for surgical repair of ruptured urinary bladder was planned but the calf died during preparation for surgery.

In the present study, a four month old Kangayam bull calf was affected with uroabdomen. Uroabdomen was recorded in a buffalo calf, adult Kangayam bullock and four month old Kangayam male calf (Kumar *et al.*, 2011; Saravanan *et al.*, 2017; Ravi *et al.*, 2018) <sup>[16, 11, 12]</sup>. Highest incidence urethral obstruction was recorded in non-descriptive calves under one year of age group (60 %) followed by over one year of age (40 %) and urethral obstruction was at the level of sigmoid flexure (Khan *et al.*, 2013) <sup>[17]</sup>.

In the present study, the clinical signs were depression, anorexia, anuria, achezia, congested mucous membrane, increased pulse and respiratory rates, dehydration, bilateral abdominal distension and fluid thrill on tactile percussion. The clinical findings in the present study were also reported by several authors (Braun *et al.*, 2007; Biswas and Saifuddin, 2015; Abdelaal *et al.*, 2016; Saravanan *et al.*, 2017; Ravi *et al.*, 2018) <sup>[9, 18, 19, 11, 12]</sup>. Elevated temperature, respiratory and heart rate could be attributed to pain and hyperdynamic stage of toxemia and dehydration (Sharma *et al.*, 2006) <sup>[20]</sup>. Dehydration in uroabdomen mainly occurred by movement of water into peritoneal cavity due to an osmotic gradient where osmolality of urine was two to three times more than the osmolality of interstitial fluid and resulted in reduced skin turgor, enophthalmos and haemoconcentration (Wilson and MacWilliams, 1998) <sup>[13]</sup>.

Elevated blood urea nitrogen and serum creatinine were noticed in the Kangayam bull calf. It might be due to accumulation of urine in peritoneal cavity and subsequent absorption into systemic circulation leading to azotemia or uremia. Metabolic changes associated with uroabdomen in present study were also reported by Sockett *et al.* 1986; Saravanan *et al.* 2017; Ismail, 2018 <sup>[21, 11, 22]</sup>.

Transabdominal ultrasound examination revealed anechoic free fluid with floating viscera in the abdominal cavity and transrectal ultrasound examination showed ruptured of urinary bladder on ventral side in the present study. Transrectal ultrasound was useful in the identification of ruptured urinary bladder (Floek, 2009) <sup>[14]</sup>. Ultrasonographic examination reported to be best method of diagnosis in urinary bladder rupture in cattle (Saharan *et al.*, 2013; Braun and Nuss, 2015; Ismail, 2018) <sup>[23, 15, 22]</sup>.

In the present study, abdominocentesis revealed light yellow coloured copious fluid with low specific gravity (1.020) and alkaline pH (8.0) with urine smell. It had elevated urea and creatinine in peritoneal fluid indicating uroabdomen. In the present study, peritoneal to serum creatinine ratio was 3.5. Peritoneal to serum creatinine ratio of 2 or more was the important diagnostic test for confirmation of uroabdomen in cattle (Wilson and MacWilliams, 1998; Braun and Nuss, 2015) <sup>[13, 15]</sup>.

In the present study, the animal was administered with antibiotic and fluid therapy. The animal collapsed during surgical preparation for transabdominal approach of repair on ruptured urinary bladder. Uroabdomen could be a medical emergency and initial treatment should be aimed to stabilize the animal and correction of dehydration, electrolyte and acid - base abnormalities (Ravi *et al.*, 2018) <sup>[12]</sup>. The discrete dorsal tear of urinary bladder might sometimes heal spontaneously, ventral tears required surgical intervention and might be fatal (Tyagi and Singh, 1993; Khan *et al.*, 2013) <sup>[24, 17]</sup>.

Diagnosis of uroperitoneum would not be always straight forward, as other diseases also cause abdominal distension. Most of the time, uroabdomen would be diagnosed based on

the ultrasound examination, abdominocentesis and calculation of peritoneal to serum creatinine concentration ratio.

## Conclusions

Uroabdomen due to urinary bladder rupture was diagnosed based on clinical signs, ultrasound examination and peritoneal to serum creatinine ratio in a Kangayam bull calf. The animal died prior to surgical treatment for urinary bladder repair.

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