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**Biraj Kumar Sarma**

Department of Surgery and Radiology, Lakhimpur College of Veterinary Science, Assam Agricultural University, Joyhing, North Lakhimpur, Assam, India

**Dwijen Kalita**

Department of Surgery and Radiology, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

## Changes of haematological and biochemical parameters of canine having urinary system disorders

**Biraj Kumar Sarma and Dwijen Kalita**

### Abstract

The present investigation was carried out in two group of dog. The group I consist of eight apparently healthy dogs of either sex presented for routine health check-up and was considered as control group for the study of normal haematological and biochemical parameters. Group II was comprised of 30 numbers of clinical cases of dogs having urinary system disorders presented to the Department of Surgery and Radiology, College of Veterinary Science, AAU, Khanapara during a period of two years. The study was conducted to observe the haematological and biochemical changes of canine with urinary system disorders after confirmatory diagnosis from radiographic and ultrasonographic findings. The urethral calculi were diagnosed in dogs with plain radiography and cystic calculi could be diagnosed using both radiography and ultrasonography. Cystitis and renal cyst could be confirmed with ultrasonography. Dogs having Renal cyst were diagnosed with ultrasonography. Tumour in the urinary bladder of dogs were diagnosed by ultrasonography. After comparing all these, it was found that BUN, serum creatinine and ALP were found to be early indicators for detection of any abnormalities in urinary system. Total protein and albumin were found to be a good indicator in renal disorders.

**Keywords:** Calculi, urethral calculi, cystic calculi cystitis, renal cyst, radiography, ultrasonography

### Introduction

Urinary system disorder are the common and most important clinical problems encountered in dog which effect on the health condition and frequent causes for illness and death of the animal. Suffering of animal usually goes unnoticed until serious manifestations of clinical signs causing concern. Such late presentation requires quicker diagnosis. A haemato-biochemical study of any disease condition points towards the systemic disturbances. Changes which occur in the physical and chemical constituents of blood provide a better understanding of the disease processes and are helpful in differential diagnosis, therapy and prognostication (Kaneko *et al.*, 2008) [8]. Single or serial estimation of blood urea nitrogen (BUN) and serum creatinine concentrations were used for evaluation of urinary system disorders like glomerular filtration rate and renal functions in dog. These tests were only crude indications of renal function, since the amount of functional renal tissue must be reduced to about a third of normal before the values of these metabolites in blood begin to increase. The release of urinary ALP (alkaline phosphatase) was increased in tubular injury. This enzyme was an earlier known marker of renal injury in studies of gentamicin nephrotoxicity in dogs (Clemon, 1998) [5]. Radiography is a fascinating aspect of veterinary medicine. It literally offers insight into the internal hidden structures of an animal's body (Gillette *et al.*, 1977) [6]. It is useful for diagnosis of affections causing anatomical changes to the organs or body parts and thereby providing an abnormal image on a radiograph. Diagnostic ultrasound is an imaging modality which is useful in diagnosis of affections of internal organs. Ultrasonography provides instant information about a wide range of body systems, the dynamic functions of organs, basic living anatomy and various physiological processes. It determines the normal or abnormal size, shape, location, architecture and constituency of the internal organs. However, no imaging modality is complete in itself, but a planned use of various imaging techniques will enable treatment to be undertaken at an earlier stage with the potential for increased survival. Hence, the study of haematological and biochemical parameters are only remained as diagnostic tools. Urinary affections are common in dogs and a quite good numbers of clinical cases with such problems are presented to the Teaching Veterinary Clinical Complex, College of Veterinary

### Correspondence

**Biraj Kumar Sarma**

Department of Surgery and Radiology, Lakhimpur College of Veterinary Science, Assam Agricultural University, Joyhing, North Lakhimpur, Assam, India

Science, Khanapara, Assam Agricultural University for treatment. Appropriate diagnosis of various diseases of the urinary system is utmost necessary in providing early accurate treatment. Consequently, necessity has arisen for understanding the interpretation of haematological, biochemical, urinalysis, radiographic and ultrasonographic changes for such cases. Therefore, need arises for the evaluation of the different diagnostic procedures to narrow the gap between presentation of the animal and its final diagnosis and treatment.

### Materials and Method

The investigation was carried out in two group viz. Group I and Group II. The group I consist of eight apparently healthy dogs of either sex presented to the Teaching Veterinary Clinical Complex, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati-22, for routine health check-up and was considered as control group for the study of normal haematological and biochemical parameters. Group II comprised of 30 numbers of clinical cases of dogs with different urinary system disorders presented to the Department of Surgery and Radiology, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati-22, in a period of two years.

The parameters were studied to find out if there was any association between haematological, biochemical, urine analysis, radiographic and ultrasonographic findings. Venous blood (3ml) was collected from the cephalic or saphenous vein of each case in sterilized glass vials containing ethylene diamine tetra acetate (EDTA) at the rate of 1mg/ml of blood. Haematological parameters included Haemoglobin (Hb), Packed Cell Volume (PCV), Total Erythrocyte Count (TEC), Total Leucocyte Count (TLC), Differential Leucocyte Count (DLC). For biochemical studies, five millilitres (5 ml) of venous blood was collected in a sterile disposable syringe kept at inclined position and the serum was separated. The parameters Blood Urea Nitrogen (BUN), Serum Creatinine, Total Protein, Albumin and Alkaline phosphatase (ALP) were studied using a spectrophotometer (Chem ito UV 2100). The sample was examined for as the method described by Sastry (1998) [15].

The results of the various parameters were subjected to statistical analysis as per the methods described by Snedecor and Cochran (1994) [19].

### Results and Discussion

In case of haemoglobin (g/dl), there is significant ( $P < 0.05$ ) difference between the animals having cystitis ( $8.6 \pm 1.8$  g/dl) and tumour in urinary bladder ( $7.85 \pm 1.05$  g/dl) in comparison to the animal of control groups which bears Hb level ( $13.67 \pm 0.63$  g/dl). This reduction of haemoglobin in cystitis and tumour in urinary bladder might be due to anaemia following haematuria. Verma *et al.* (2006) [21] also observed similar findings in dogs with cystitis. Bhojne *et al.* (2001) [2] also reported significant reduction of haemoglobin (3.0 g/dl) level in a nine year old Spitz dog with bilateral renal calculi.

There was no significant ( $P > 0.05$ ) difference of packed cell volume (%) in between the animals of control group ( $40.25 \pm 1.72\%$ ) and the animals suffered from urinary system disorders except in cystitis ( $25.6 \pm 7.4\%$ ) and tumour in urinary bladder ( $21.6 \pm 3.4\%$ ). This might be due to haematuria followed by anaemia. as reported by Benjamin (2007) [1]. Similar findings were also reported by Verma *et al.* (2006) [21] in dogs with cystitis.

There was no significant difference ( $P > 0.05$ ) of total erythrocyte count ( $\times 10^6$ ) of the dogs of control group compared with the group with urinary system disorders.

In comparison to the animals of control group, there was significant ( $P < 0.05$ ) difference of TLC in cystitis ( $12.95 \pm 1.25 \times 10^3/\text{cu.mm}$ ) and urethral calculi ( $16.24 \pm 2.24 \times 10^3/\text{cu.mm}$ ) which indicated the presence of inflammation and infection in urinary system. Rajathi *et al.* (2006) [13] also observed leukocytosis in dogs suffered from urolithiasis and which might be due to urinary tract infection. In the present investigation, the increased TLC in patient with cystitis and urethral calculi might be due to presence of localized infection along with haemorrhage (Benjamin, 2007) [1]. Kumar *et al.* (2011) [9, 11] also observed similar findings in case of 15 numbers of dogs with acute renal failure.

In differential leucocyte count, it was observed that there was significant ( $P < 0.05$ ) increased of lymphocyte in cystic calculi ( $40.0 \pm 4.73\%$ ), uraemia of unknown origin ( $35.0 \pm 1.0\%$ ) and tumour in urinary bladder ( $32.5 \pm 1.5\%$ ) in comparison to control group ( $26.63 \pm 1.66\%$ ). It might be due to cystitis caused by prolong irritation cum chronic inflammation from the calculi and the tumour in the urinary bladder. Sastry and Rao (2000) reported that the lymphocyte level in DLC increased when there is chronic infection associated with inflammation in the body. Ranganath *et al.* (2004) also observed 25% lymphocyte in a case of cystic calculi. Verma *et al.* (2006) [21] also recorded an increased numbers in lymphocytic count in patient suffering from cystitis. There was slight increase of neutrophil count in renal cyst ( $73.0 \pm 5.0$ ), cystitis ( $72.0 \pm 16.0$ ) and in urethral calculi ( $73.2 \pm 3.97\%$ ) though these are non-significant ( $P > 0.05$ ). This might be due to acute infection in the urinary system. Clarke (1974) also reported neutrophilia due to urinary tract infection. Similar findings of Neutrophilic leukocytosis in 7 numbers of dogs with urinary calculi was also reported by Verma *et al.* (2006) [21]. The neutrophil level in DLC increased when there is acute infection inside the body reported by Vegad (2007) [20]. Kumar *et al.* (2011) [9, 11] also observed neutrophilia in 15 numbers of dogs with acute renal failure.

There was significant ( $P < 0.05$ ) elevation of blood urea nitrogen (BUN) in all the affected cases of urinary system disorders in comparison to control group. These changes might have been occurred as a result of post renal uraemia due to obstruction of the excretory pathway from urethral calculi, cystic calculi, cystitis and tumour in urinary bladder. Reduction of glomerular filtration rate due to loss of renal function from renal cyst might be the cause of increase in BUN. Vijaykumar *et al.* (1999) [22] observed mild elevation of blood urea nitrogen in cystic calculi of a dog. Bhojne *et al.* (2001) [2] observed significant elevation of blood urea nitrogen upto 272 mg/dl in a dog with renal calculi. Erythropoietin deficiency might be the main cause of anaemia and reduction of glomerular filtration rate (GFR) due to loss of renal function might be the cause of increase in BUN (Polzin *et al.*, 2000). Verma *et al.* (2006) [21] also observed similar findings in dogs with cystitis and cystic calculi. Rajathi *et al.* (2006) [13] observed elevated blood urea nitrogen in dogs with urolithiasis. Sharma *et al.* (2008) [17] observed significant elevation of blood urea nitrogen level during experimentally induced partial and complete urethral obstruction when compared to control group in male goat. Kumar *et al.* (2011) [9, 11] also observed increase level of blood urea nitrogen in 15 numbers of dog with acute renal failure.

There was significant ( $P < 0.05$ ) elevation of serum creatinine in all the affected cases of urinary system disorders in

comparison to control group. These changes might have been occurred as a result of post renal uraemia due to obstruction of the excretory pathway from urethral calculi, cystic calculi, cystitis and tumour in urinary bladder. Reduction of GFR due to loss of renal function from renal cyst might be the cause of increase in serum creatinine. Vijaykumar *et al.* (1999) [22] observed mild elevation of serum creatinine in cystic calculi of a dog. Erythropoietin deficiency might be the main cause of anaemia and reduction of GFR due to loss of renal function might be the cause of increase Creatinine (Polzin *et al.*, 2000). Bhojne *et al.* (2001) [2] observed significant elevation of serum creatinine 9.80 mg/dl in a dog with renal calculi. Verma *et al.* (2006) [21] also observed similar findings in dogs with cystitis and cystic calculi. Sharma (*loc. cite*) observed significant elevation of serum creatinine level during experimentally induced partial and complete urethral obstruction when compared to control group in male goat. Kumar (*loc. cite*) also observed increase level of blood urea nitrogen in 15 numbers of dogs with acute renal failure.

There was slight elevation of total protein in cystitis ( $7.58 \pm 1.56$  g/dl) and cystic calculi ( $7.33 \pm 0.35$  g/dl), but significant ( $P < 0.05$ ) reduction in renal cyst ( $4.23 \pm 0.65$  g/dl) and tumour in urinary bladder ( $4.76 \pm 0.42$  g/dl) in comparison to control group ( $6.18 \pm 0.32$  g/dl). Increase of total protein in cystitis might be due nephritis from the ascending infection from the urinary bladder. On the contrary, decrease in total protein in renal cyst and tumour might be due to inhibition of selective re-absorption in the proximal convoluted tubules from renal affections. As a result, albumin of high molecular weight couldn't absorbed from these and as a result there was reduction of level of total protein in serum. Mrudula *et al.* (2005) [11] reported that there was slight reduction of total protein level in serum of dogs with chronic interstitial nephritis than the apparently healthy dogs. Verma *et al.* (2006) [21] observed decrease in total protein in dogs having chronic renal failure. Kumar *et al.* (2011) [9, 11] also observed similar findings in fifteen numbers of dogs of acute renal failure.

There was significant ( $P < 0.05$ ) reduction of albumin in serum of the animal suffered from renal cyst. This might be due to damage of the renal tubules for which selective re-absorption was hampered. Sharma *et al.* (1981) [18] conducted a study by creating experimental uraemia in 7 cross-bred bulls and observed that there was non-significant ( $P > 0.05$ ) decreased of serum albumin concentration of the animals with urethral obstruction. Girishkumar *et al.* (2011) [7] conducted a study on chronic renal failure and found that there was reduced level of albumin in serum of dog with chronic renal failure.

There was significant ( $P < 0.05$ ) elevation of alkaline phosphatase in all the cases of urinary system disorders but except renal cyst and tumour in urinary bladder, but all are within the normal range. Mrudula *et al.* (2005) [11] reported that there was significant elevation of alkaline phosphatase level in sixty cases of nephritis of dog. Verma *et al.* (2006) [21] conducted a study on 37 dogs in chronic renal failure and observed elevated alkaline phosphatase values along with hypoproteinemia. The elevation of alkaline phosphatase might be due to tissue damage in as well as mineralization during cystic calculi and urethral calculi. Kaneko *et al.* (2000) reported that there was there was elevation of alkaline phosphatase in serum during tissue damage and mineralization. Caswell (2011) [3] reported that there was elevated alkaline phosphatase (ALP) of 731 U/L [reference interval: 23 to 212 U/L] in the animals with tumour in the wall of urinary bladder.

## Summery and Conclusion

The study was conducted to find out a early and accurate diagnosis of urinary system disorders in canine. Diagnostic procedures like haematological changes, biochemical changes, urinalysis, radiography and ultrasonography were carried out for confirmatory diagnosis. From the above study, it could be concluded that BUN, serum creatinine and alkaline phosphatase were found to be ideal indicator for detection of any abnormalities in urinary system. Total protein and albumin were found to be ideal indicator for detection of renal cyst supported by ultrasonography. Haematological cum biochemical study along urinalysis were found to be good supported by ultrasonography for diagnosis of tumour in urinary bladder and uraemia of unknown origin.

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