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A case report of acute renal failure with hepatic steatosis in a dog

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Abstract
A 6 years old, brown, male dog carcass was presented to the Department of pathology, College of Veterinary Science, Assam Agricultural University, Guwahati-22 for detailed post mortem examination with a clinical history of anorexia, lethargy, fever and gradual weight loss. Various hemato-biochemical parameters that have been estimated during the clinical phase of the disease showed extreme high concentration of blood urea nitrogen (BUN), bilirubin, ALT and AST, whereas blood profile revealed low level of hemoglobin (Hb), total erythrocyte count (TEC) and packed cell volume (PCV), which was indicative of anemia associated with renal dysfunction. At necropsy remarkable gross changes were observed only in kidneys and liver. The kidneys were noticeably large and pale and cut section revealed large, wide cortical area. Mild hepatomegaly with marked hepatic steatosis were observed throughout the hepatic surface. Microscopic examination of such kidneys revealed glomerular hypercellularity which completely occupying the Bowman's space indicating acute glomerulonephritis. Focal areas of tubular degeneration and cellular swelling of the tubular epithelium were also noticed. In liver, severe hepatic steatosis was observed which was characterized by large numbers of fat vacuoles of varying size in the hepatocytes. The fat vacuoles displace the nucleus towards the periphery of cell.

Keywords: Acute glomerulonephritis, dog, hemato-biochemical, liver, steatosis

Introduction
Kidney diseases are very common among dog and cats but often they are associated with poor diagnosis especially at the early stage of the disease. It is a major leading cause of death primarily in older dogs. Dogs may suffer from various kind of renal disorders such as acute and chronic form of interstitial nephritis, glomerulonephritis, tubular nephritis or nephrosis etc [1, 2]. Primary glomerulonephritis is one of the important clinical disease of dogs, which is clinically characterized by persistent proteinuria. Now a days the incidences of glomerulonephritis among dog population seems to be increasing. Earlier, glomerulonephritis was thought to be a rare disease, but now it is considered as emerging disease with its increasing number of clinical cases [3]. Early diagnosis of renal diseases is little bit of challenging but studies of haemato-biochemical biomarkers like serum creatinine, BUN, serum protein, ALT, AST, routine blood test are helpful to arrive at a diagnosis. In the present study, haemato-biochemical and histopathological changes in a dog that died due to acute renal failure associated with hepatic steatosis have been reported.

Materials and methods
The whole blood sample of about 5ml was collected through cephalic venipuncture. 2ml of blood was collected in EDTA containing vial for estimation of routine blood parameters whereas 3ml of blood was collected in a clot activated vial for separation of serum. Serum was then separated using a centrifuge machine at 3000rpm speed for 15 mins. This serum was immediately brought to the laboratory for biochemical analysis. Blood smear was prepared from the anticoagulant added whole blood sample in a clean grease free glass slide. After air dried fixed with methanol and stained with Giemsa stain. During necropsy, kidneys and liver were collected in 10% formol saline solution for histopathological techniques using standard protocol [4].

Result and Discussion
As per the owner the dog has clinical history of anorexia, lethargy, fever and weight loss with

pale mucous membrane. Biochemical examination revealed remarkably increase level of BUN, hyperbilirubinemia and increase activity of ALT and AST, and low level of total protein and albumin (Table.1). These findings were also correlates with the findings of previous workers [5, 6]. Persistent proteinuria observed in this case thought to be due to increase permeability of glomerular filter. Proteinuria might develop either as a result of abnormal trans glomerular passage of proteins due to increased permeability of glomerular capillary wall or their subsequent impaired reabsorption by the epithelial cells of the proximal tubuli [7]. Haematological parameters showed low level of Hb, PCV, TEC and increase value of TLC (Table.1). Earlier workers also reported low level of Hb, PCV, TEC with high level of TLC [3, 5, 6]. Decrease hematological values might be due to decrease production of erythropoietin by the damage kidneys, reduced survival of red blood cells, depression of bone marrow or due to deficiency of various nutrients [3]. Anisocytosis, few acanthocytes, leptocytes, and immature erythrocytes were recorded in the blood smear. The blood picture indicates that the animal was suffering from anaemia.

At necropsy, the whole carcass was found to be anemic, showed paleness in all visible mucous membranes. The kidneys were enlarged and renal capsule was stretched. Immediately after an incision renal capsule retract back and cortex bulges out through the incised capsule. Renal capsule was peeled off without any great discomfort exposing the pale, soft cortex. Cut surface revealed a paler cortical and medullary region with wider corical area (Fig.1). Similar gross findings were also reported by previous workers [9, 10]. The liver showed mild degree of hepatomegaly. The edges were rounded and the liver was enlarged. There was visibly well differentiable yellowish discoloration of hepatic parenchyma throughout. Greyish-white necrotic foci were also noticed. The gall bladder was found distended with bile without any obstruction. These hepatic lesions were similar with earlier findings. Apart from kidneys and liver lesions were also seen in the heart which was dilated and flabby.

Microscopically, renal blood vessels were found congested. Here the glomeruli are found to be chiefly affected. The glomerular lesions were characterized by hyperemia of the glomerular capillaries and increase cellularity of the glomerular tuft, which is due to increase proliferation of glomerular capillary endothelium and epithelial cells. As a result, the whole glomeruli look swollen and enlarged. The Bowman's space was completely occupied by proliferating glomerular tuft, few infiltrating cell and erythrocytes (Fig.2). Previous workers also observed similar histopathological lesions in kidneys [9, 10]. Mild degree of tubular degeneration was evident in few places (Fig.3), which might appear as a secondary lesion of acute glomerulonephritis. Focal areas of interstitial hemorrhages were observed. Some of the tubules shows cellular swelling of the tuber epithelial cells resulting stenosis of the tubular lumen. On histopathological examination of liver, dilatation and congestion of blood vessels with multi-focal areas of hemorrhage were noticed. Fat vacuoles of varying size seen in the hepatocytes of the entire hepatic parenchyma (Fig.4). The nucleus displaced towards the periphery of the hepatocytes and in many hepatocytes complete absence of nucleus was observed. Distortion of hepatic cords. In some hepatic lobes, hepatocytes undergo coagulative necrosis and Kupffer cells were seen predominantly with few infiltrating cells. Similar hepatic lesions were also observed by other workers in dogs [11]. Histopathological findings of kidneys and liver observed in this case, corelates with the haemato-biochemical alterations and the condition can be diagnosed as acute renal failure with hepatic steatosis.

Table 1: Haemato-biochemical parameters of a dog died due to acute renal failure with hepatic steatosis.

Sl. No.	Parameters	Values	Standard range [12]
1	BUN (mg/dl)	186.20	7-28
2	Creatinine (mg/dl)	14.50	0.5-1.7
3	Total protein (gm/dl)	4.40	5.4-7.1
4	Albumin (gm/dl)	2.01	2.6-3.3
5	Total bilirubin (mg/dl)	0.60	0-0.01
6	ALT (U/L)	96.50	8-57
7	AST (U/L)	87.46	9-49
8	Hb (gm/dl)	7.21	11.9-18.9
9	PCV (%)	24	35-57
10	Total erythrocyte count (10^6/µL)	3.42	4.95-7.87
11	Total leukocyte count (10^3/µL)	19.27	5-14.1

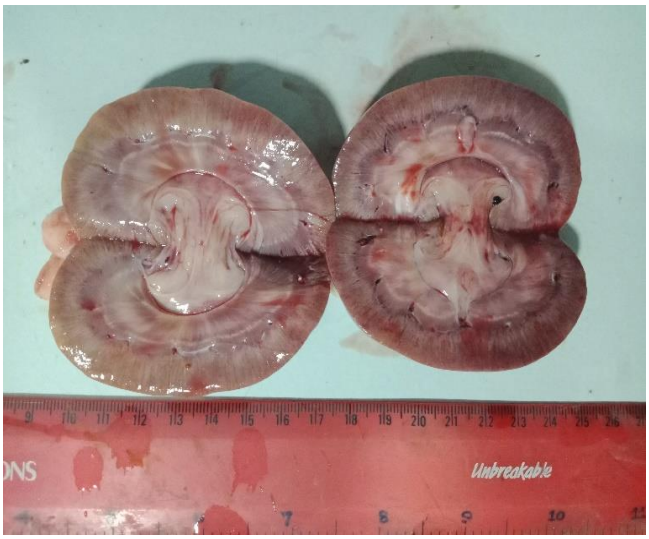

Fig 1: Longitudinal section of the kidneys showing paleness of cortex and medulla with wider cortical region.

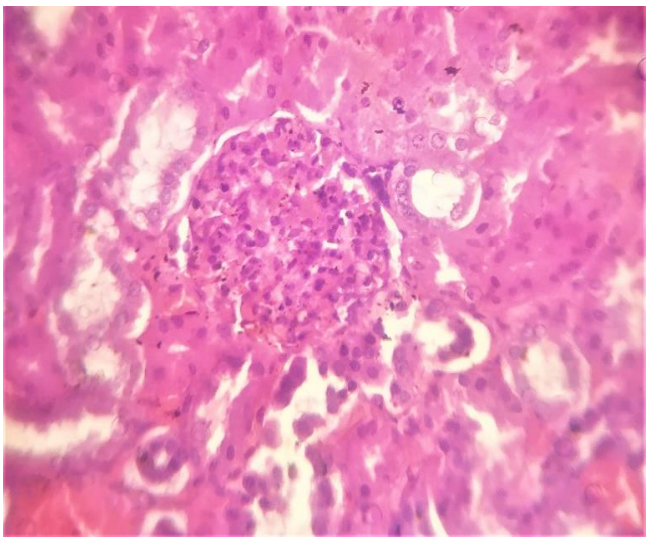

Fig 2: Photomicrograph of kidney showing glomerular hypercellularity, which occupying the Bowman's space and cellular swelling of the tubular epithelium. H&E x400.

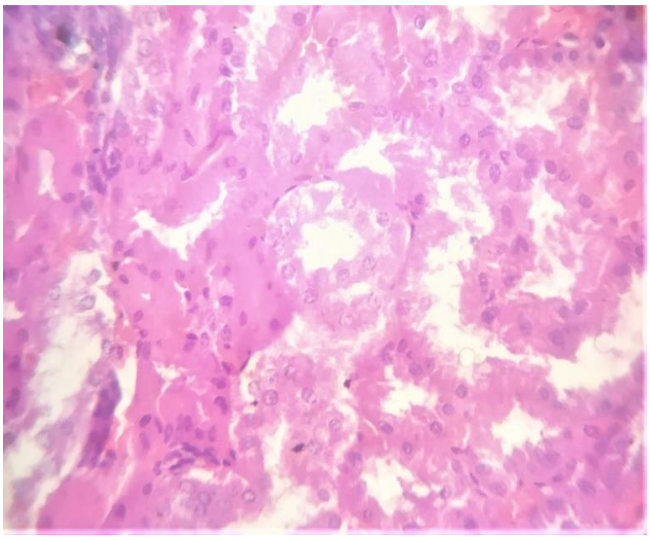

Fig 3: Photomicrograph of kidney showing degeneration of tubular epithelium. H&E x400.

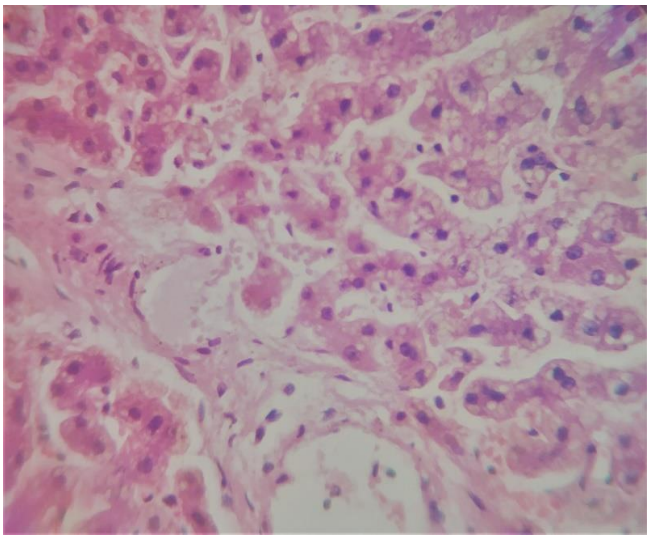

Fig 4: Photomicrograph of liver showing numerous varying size fat vacuoles at the hepatocytes and distortion of hepatic cords. H&E x400.

Conclusion

Acute glomerulonephritis is an emerging disease condition in dogs and many a times it is found to be associated with hepatic disorders like hepatic steatosis. Increase level of BUN, creatinine, anaemia along with persistent proteinuria can be considered as good biomarkers for diagnosis of acute renal diseases.

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