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Abstract

Chronic kidney disease is one of the most common diseases in older cats. A 9- year -old male local cat was brought to the Teaching and Training Pet Hospital and Research Center with a history of off feed, weight loss, polyuria and skin disease. Clinical examination revealed dehydration and polydipsia and the cat was suspected of CKD. The Blood sample was collected for estimation of biochemical parameters e.g. ALP, ALT, AST, Phosphorus, Glucose, Total protein, BUN, Serum creatinine. The Urine sample was taken also for determination of Urine P^H, Specific gravity, Proteinuria, Glucose. Ultrasonography was performed to check the condition of kidney. Increased levels of BUN, Serum creatinine, Proteinuria, and thickened cortex of the kidney confirmed that the cat was suffering from CKD. The diagnosis and management of CKD at all stages requires the use of substantital evidence-based guidelines and principles.

Keywords: CKD, Ultrasonography, Biochemical Parameters.

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Introduction

Nowadays almost all elite class people have a pet. Most people prefer rearing a cat as their pet. Like human's cats are also suffer from many health issues when they are getting old like kidney disease, heart disease, liver disease and many more. The most frequent metabolic disorder in older household cats is Chronic Kidney Disease (CKD) (Brown et al., 2016). Its frequency will differ depending on the population (O'Neil et al., 2014). In a study, it was found that about 1.6-20% of cats all around the world are exposed to CKD at some point in their lives (Boyd et al., 2008; Watson., 2001; Ross et al., 2007). Household cats have a high frequency of CKD than dog. It has been hypothesized that dietary factors play a role in the development of CKD in cats (Lappin et al., 2006). At present people all over the world are too busy with their professions, they have less time to take care of their pets. So they prefer commercially available food for their pets instead of homemade food. These Commercially available feed, acidifying diet having lower amounts of potassium led to hypokalemia and thus developing CKD in healthy cats (Finch et al., 2016; Bang et al., 2007). Aging, Routine vaccination, Hyperphosphatemia, ischemia are considered as risk factor for initiation of CKD in cat (Brown et al., 2016).

CKD in cat develops gradually often extend many months or even years. Gradual weight loss, polyuria, polydipsia, dehydration, vomiting, Echimotic hemorrhage in eye due to high blood pressure, ammoniacal odor from mouth are the clinical sign of CKD (Sparkes et al., 2016). In laboratory diagnosis Higher creatinine level in blood, lower USG level on urinalysis, increased Blood Urea Nitrogen (BUN) level indicate the presence of CKD in cat. (Bartlett et al., 2010; Greene et al., 2014; Hughes et al., 2002; Jepson et al., 2009). Diagnosis of CKD might be challenging sometimes. There are very limited study was performed for diagnosis of CKD (Poly et al., 2020) in cats in aspect of Bangladesh which are significant. Previously, CKD was diagnosed based on clinical sign and symptoms because of lack of diagnostic tools in aspect of Bangladesh. Therefore the aim of this study is to emphasize on various diagnostic methods for detection of CKD in cat.

Case presentation:

A nine-year-old local breed male cat was brought to Teaching and Training Pet Hospital and Research Center, Purbachal, Dhaka, Bangladesh with the history of off feed, weight loss, polyuria and also having skin disease. The respective doctor examined the cat. On clinical examination, the cat was found dehydrated with sunken eyeball and body temperature showed 101 degrees F (Figure:1). Based on history and clinical signs the cat was primarily suspected of CKD. Doctor referred it to the laboratory for the investigation of biochemical profile of blood and urinalysis for confirmatory diagnosis. Ultrasonography was also done for its proper diagnosis.



Figure 1: Physical findings in cat with CKD include poor body condition, dehydration.

Blood collection and its biochemical analysis:

Blood was collected from medial saphenous vein of the cat and kept in two different vacutainers with anticoagulant and without anticoagulant (Figure:2). After collection of some parameters of blood e.g. Phosphorus, Glucose, Total protein, ALT, AST was estimated thoroughly by Humalyzer 3000 biochemical analyzer (Figure:3). After estimation, it was found that serum creatinine level was very high (3.3 mg/dl) where normal range is 0.9-2.2 mg/dl (O'Brien et al., 1998)) and blood urea nitrogen (BUN) level was too high (101.93gm/dl) where the normal range was 19-34 mg/dl (O'Brien et al., 1998). Total protein, ALT, ALP level was normal in range. AST level was little bit higher (Table 1).

Table 1: Biochemical analysis of blood of CKD cat.

| Parameters | Test results | Reference values |
|------------------|--------------|------------------|
| Phosphorus | 7.9 mg/dl | 3.0-6.1mg/dl |
| Glucose | 70.6 mg/dl | 60-120mg/dl |
| Total protein | 7.1 g/dl | 6-7.9 g/dl |
| ALT | 70 U/L | 25-97 U/L |
| AST | 50.8 U/L | 7-38 U/L |
| ALP | 46.0 U/L | 0-45 U/L |
| BUN | 101.93 mg/dl | 19-34 mg/dl |
| Serum creatinine | 3.3 mg/dl | 0.9-2.2 mg/dl |

*ALT: Alanine Aminotransferase; AST: Aspartate Aminotransferase; ALP: Alkaline Phosphatase; BUN: Blood Urea Nitrogen



Figure 2: Collection of blood.



Figure 3: Biochemical analysis of blood.

Urine dipstick test:

For urinalysis, urine of the cat was collected by catheterization and some parameters of urine e.g. specific gravity, pH, protein, glucose was checked by urine dipstick test (Figure:4). The pH and specific gravity of urine was found in the normal range. The Protein level was high from reference value. Glucose level was found in the normal range.

Table 2: Biochemical analysis of urine for CKD cat.

| Parameters | Test results | Reference values |
|------------------|--------------|------------------|
| pH | 6.3 | 6-7.5 |
| Specific gravity | 1.007 | 1.001-1.085 |
| Protein | 1.0 gm/dl | 0.2-0.4 gm/dl |
| Glucose | 100 gm/dl | 80-120 gm/dl |



Figure 4: Urine dipstick test for CKD diagnosis.

Ultrasonography:

For CKD diagnosis, it is important to check morphology of both kidneys. So, the cat was lied on lateral recumbency, and Ultrasonography of the ventral lower abdomen was performed for further confirmation of CKD. In USG, it was found that the cortex of kidney was thickened and the diameter of the medulla becomes decreased (Figure:5). The ratio of cortex and the medullary portion of kidney was below normal, which is seen in typical CKD patients. After that, the confirmatory diagnosis was done.



Figure 5: Hyperechoic and thickened cortex of Kidney.

Discussion

For the confirmatory diagnosis of CKD in cats, it is very important to check the biochemical profile of blood. In this case, an increased value of AST, Blood urea nitrogen (BUN) and Serum creatinine was found in biochemical test of blood (Table-1). AST is produced by hepatocytes and muscles. High levels of AST indicate muscle necrosis or liver damage (Poli., 2016). Blood urea nitrogen or BUN is the main byproduct of protein metabolism. High levels can be a sign of renal illness or failure, dehydration, shock, eating a high protein diet, ingesting specific toxins, poor kidney circulation and urinary blockage (Canon., 2016). Additionally, BUN levels rise in the conditions such as decreased blood flow through kidney, heart illness, hemorrhage, ischemia and post renal rupture (Poli., 2016). In this case, there also found elevation of serum creatinine level from the normal value (Table-1). Creatine is a waste product of muscle metabolism; its production rate is largely constant and related to the animal's muscular mass (Hall et al., 2014). It is expelled through the kidneys, and a considerable decrease in GFR (Glomerular Filtration Rate) will result in creatinine retention; however, non-renal conditions, including changes in muscle mass and the presence of dehydration, may also influence serum creatinine (Bartges., 2012). The serum creatinine level is the fundamental biomarker used by the IRIS system to stage renal illness (Canon., 2016; Braff et al., 2014).

Table 3: Stages of Chronic kidney disease based on serum creatine level (IRIS staging of CKD, 2019).

| Stage of CKD | Serum creatinine level (mg/dl) |
|--------------|--------------------------------|
| Stage 1 | <1.6 mg/dl |
| Stage 2 | 1.6-2.8 mg/dl |
| Stage 3 | 2.9-5.0 mg/dl |
| Stage 4 | >5.0 mg/dl |

Cats suffering from Stage 1 or Stage 2 CKD have chance of survivability if they are diagnosed and treated properly. In the case of stage 3 and 4, it is very difficult to survive and in most cases cats suffering from CKD stage 3 or 4 died within some days of diagnosis. In our study, the serum creatinine level of the cat was 3.3 mg/dl (Table-1). Therefore, the patient was suffering from stage 3 Chronic Kidney Disease (Table-3).

High proteinuria was found in urinalysis in this patient (Table-2). In a study, it was revealed that Proteinuria can develop as a result of CKD, and renal proteinuria is related with accelerated disease development and considerably lower survival duration (Syme et al., 2006; King et al., 2007).

International Renal Interest Society classified Feline CKD based on urine protein creatinine ratio (UPCR) and it is Non-Proteinuric: UPCR = <0.2, Borderline Proteinuric : UPCR = 0.2-0.4, Proteinuric : UPCR= > 0.4 .

Conclusion

CKD is a prevalent condition in middle-aged to elderly cats. In the majority of cases, the underlying reason is unidentified. Pre-existing renal damage at the time of diagnosis will be incurable in all cases. In case of early diagnosis and appropriate management, there will be a chance of survivability. Substantial proof-based recommendations and guidelines are required for the diagnosis and treatment of CKD at all phases.

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Brief biography

S.M. Ashraful Karim passed the SSC Examination in 2013 from Nasirabad Govt. high School and the HSC Examination in 2015 from Govt. Hazi Mohammad Mohsin College. Then he admitted to the Chattogram Veterinary and Animal Sciences University in 2015-2016 session under the faculty of Veterinary Medicine. Now he is an intern student, working on home and abroad for achieving different kinds of knowledge and experience in veterinary field. He likes to treat animals. He has great interest on Veterinary Medicine.