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A Case of Severe Proteinuria Due to Glomerulonephritis in a Cat

Bir Kedide Glomerulonefritise Bağlı Şiddetli Proteinüri Olgusu

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ABSTRACT

Glomerulonephritis is characterized by inflammation of the glomeruli. It is rare in cats glomerulonephritis and its etiology is not fully understood, although it can occur in many diseases such as feline leukemia virus (FeLV) feline immunodeficiency virus (FIV) and panleukopenia. Glomerulonephritis in cats presents with clinical signs such as proteinuria, hypoalbuminemia and ascites, among others. In this case presentation a detailed evaluation of glomerulonephritis was aimed a 7-year-old neutered male tabby cat presenting with complaints of ascites, peripheral edema, loss of appetite, and weakness, and diagnosed based on clinical, laboratory and ultrasonography findings. Consequently, in cats exhibiting symptoms like proteinuria and ascites, glomerulonephrıtıs should be thoroughly assessed.

Keywords: Ascites, Cat, Glomerulonephritis, Proteinuria

ÖZ

Glomerulonefritis, glomerulların yangısıyla karakterize bir durumdur. Kedilerde glomerulonefritis nadir görülmektedir ve etiyolojisi tam olarak bilinmemekle birlikte kedi lösemi virüsü (FeLV), kedi immun yetmezlik virüsü (FIV) ve panlokopeni gibi birçok hastalıkta meydana gelebilmektedir. Glomerulonefritis kedilerde proteinüri, hypoalbuminemi, asites, gibi klinik bulgularla seyretmektedir. Bu olgu sunumunda asites, periferal ödem, iştahsızlık ve halsizlik şikâyeti ile getirilen, klinik ve laboratuvar ve ultrasonografi bulguları doğrultusunda glomerulonefritis tanısı konulan 7 yaşlı erkek, tekir ırkı kısır bir kedide glomerulonefritis detaylı bir şekilde değerlendirilmesi amaçlanmıştır. Sonuç olarak proteinüri ve asites gibi bulguları olan kedilerde glomerulonefritis mutlaka değerlendirilmelidir.

Anahtar Kelimeler: Asites, Glomerulonefritis, Kedi, Proteinüri

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INTRODUCTION

The nephron, which is the functional unit of the kidney, consists of glomeruli, Bowman capsule and renal tubule. The glomerular basement membrane surrounds the capillaries and acts as a glomerular filter.[1] Glomerulonephritis (GN) is a condition characterised by inflammation of the glomeruli in the kidneys, leading to proteinuria and renal dysfunction.[2-4] Although both dogs and cats are affected by glomerulonephritis, glomerulonephritis is more common in dogs and less common in cats.[5,6] According to the World Small Animal Veterinary Association-Renal Standardisation Study Group (WSAVA-RSSG), glomerulonephritis is classified as immune complex glomerulonephritis and non-immune complex glomerulonephritis, and according to histopathological definitions, it is classified as membranous glomerulonephritis, proliferative (mesangioproliferative) glomerulonephritis and membranoproliferative glomerulonephritis.[7,8] Although little is known about the types and prevalence of glomerular disease in cats, the most common form of membranous glomerulonephritis is reported.[9,10] Glomerulonephritis in cats is a complex condition that may be associated with various underlying diseases.[11] These diseases include feline leukaemia virus (FeLV), feline immunodeficiency virus (FIV), immune-mediated diseases, panleukopenia and congenital heart diseases.[10-13] It is observed in cats between 3-4 years of age on average. In addition, although it is determined that it is more common in male cats (64% to 100%), there is no explanation for this finding.[14,15] Glomerulonephritis is a clinically important disease characterised by proteinuria and renal failure in cats.[16] Clinically, findings such as weight loss, anorexia, lethargy, polyuria, polydipsia, vomiting, ascites or peripheral edema may be observed.[5] Laboratory findings include anemia, azotemia, hypertension, hypercholesterolemia and hypoalbuminemia.[4] Treatment of glomerulonephritis in cats usually involves a combination of therapies including corticosteroids and benazepril. In addition, studies are investigating the use of telmisartan in combination therapy in the treatment of nephrotic syndrome due to non-immune-mediated glomerulonephritis in cats.[17] Studies show that high doses of telmisartan can improve glomerular and tubulointerstitial damage in glomerulonephritis.[18] The mechanism of action of telmisartan includes anti-inflammatory effects through PPARγ activation in mesangial cells and contributes to its efficacy in the treatment of glomerulonephritis.[19] Also, Acetylsalicylic acid (ASA), commonly known as aspirin, has been studied in the context of glomerulonephritis, a condition characterised by inflammation in the glomeruli of the kidneys. Research suggests that ASA may play a role in the treatment of glomerulonephritis with its anti-inflammatory properties.[20]

Albumin is one of the major proteins lost in glomerulonephritis. Albumin is a large molecule protein and its passage is largely prevented by normal glomeruli due to its net negative charge. However, the damage occurring in glomerulonephritis disrupts the glomerular filter and permeability and causes the excretion of proteins, especially albumin, in the urine.[1] Hypoalbuminemia, which is characterised by low serum albumin levels due to proteinuria, leads to a decrease in vascular colloid osmotic pressure and causes ascites formation.[21]

This case report aims to give detailed information about a cat diagnosed with glomerulonephritis.

CASE PRESENTATION

The material of the case consisted of a 7-year-old male tabby cat with complaints of ascites, peripheral edema (Figure 1), anorexia and malaise. On examination, fluctuations were observed in the abdomen and subcutaneous tissues.

Figure 1. Peripheral edema in a cat diagnosed with glomerulonephritis.

Haemogram, serum biochemistry and urine analysis were performed. In haemotological analysis, anemia due to low hemoglobin was detected, while other values were between reference values. Serum biochemical analysis revealed hypoalbuminemia, hypoproteinaemia, globulin and decreased alanine aminotransferase (ALT) values, while urea (BUN) and BUN/creatinine ratio increased. Ultrasonographic examination revealed normal right kidney (Renal L: 4.52 cm, Renal H: 3.00 cm, Renal Width: 3.03 cm, Cortex: 0.98 cm) and left kidney (Renal L: 4.43 cm, Renal H: 3.08 cm, Renal Width: 2.91 cm, Cortex: 0.83 cm) (figure 2).

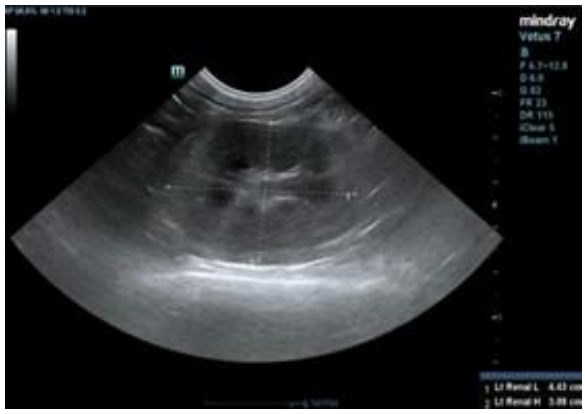

Figure 2. In a cat diagnosed with glomerulonephritis, ultrasonography of the kidney

Alkaline phosphatase, creatinine and glucose were found to be within the reference values. At the same time, increased urine protein to creatinine ratio (UPC) and urinary protein (UPRO) values were detected in serum biochemical analysis. The results of haematology and serum biochemical analyses are shown in Table 1 and Table 2. In urine analysis, proteinuria (300 mg/dL) was detected and the presence of blood in the urine (0.6 mg/dL) was also detected. The pH (5) was determined to be low. Other values were found to be within the reference ranges.

Table 1. Results of hematology analyses and normal reference values

HEMATOLOGY	CASE	REFERENCE RANGE
Hematocrit(HCT)	22.5 %	26-47 %
Hemoglobin (HGB)	8 g/dL	8,5 - 15,3 g/dL
Mean Corpuscular Volume (MCH)	14.9 pg	11,8- 18,0 pg
Mean Corpuscular Hemoglobin Concentration (MCHC)	35,4 g/dL	29,0-36,0 g/dL
Red Cell Distribution Width (RDW)	17,5 %	16,0- 23,0 %

A diagnosis of glomerulonephritis was made considering the clinical and laboratory findings. Telmisartan 1 mg/kg, q24h dose peroral and acetylsalicylic acid 18.75 mg/cat 3 times a week, peroral were used in the treatment. After 10 days of treatment, serum biochemical analyses and urine analyses were repeated. In serum biochemistry, BUN value (36 mg/dL) decreased compared to the first value, but it was still higher than the reference values. Other values were found to be within normal limits. UPRO (50 mg/dL) values decreased compared to the initial value, but were still higher than the reference values. UPC (0.17) decreased to normal reference values. After the treatment, all values in the urine analysis were found to be within normal reference values and the cat was discharged in a healthy condition.

Table 2. Results of serum biochemical analyses and normal reference values

SERUM BIOCHEMISTRY	CASE	REFERENCE RANGE
Albumin (ALB)	1 g/dL	2,3- 3,5 g/dL
Total Protein (TP)	3.1 g/dL	5,7- 7,8 g/dL
Alanine Aminotransferase (ALT)	20 u/L	22,0- 84,0 u/L
Urea (BUN)	58.3 mg/dL	17,6- 32,8 mg/dL
BUN/Creatinine Ratio	36.4 mg/dL	4,0- 33,0 mg/dL
Alkaline Phosphatase (ALP)	20 u/L	9,0- 53,0 u/L
Creatinine	1.6 mg/dL	0,8- 1,6 mg/dL
Glucose	106 mg/dL	71-148 mg/dL
Globulin	2.1 g/dL	2,6-5,1 g/dL
Urine Protein to Creatinine Ratio (UPC)	3.89	0- 0,4
Urinary Protein (UPRO)	350 mg/dL	1-30 mg/dL

DISCUSSION

Although glomerulonephritis is rare in cats, various types of glomerulonephritis have been reported in many studies.[4,9,11] A retrospective study based on clinicopathological data provides valuable information about immune complex glomerulonephritis in cats.[11] Collectively, these studies emphasise the importance of addressing feline glomerulonephritis to improve feline renal health.[4,11]

Proteinuria is a finding in cats with glomerulonephritis and may be associated with various underlying conditions.[23] In addition, some cats with glomerulonephritis have a relatively good prognosis despite severe proteinuria.[24] Cavana et al. reported severe proteinuria in a 5-year-old female cat with non-amyloidotic fibrillary glomerulonephritis in a case report.[22] In the presented case, proteinuria was found in the cat with glomerulonephritis. This was explained by the disruption of the glomerular filter and permeability by the damage occurring in glomerulonephritis and increased excretion of proteins in the urine due to impaired permeability.[1]

Hypoalbuminemia is a common finding in cats with glomerulonephritis.[4,25] In a retrospective study conducted by Rayhel et al. in cats with proteinuria, they reported that hypoalbuminemia was one of the clinicopathological variables observed in cats with glomerulonephritis.[4] In addition, Asano et al. reported the association of hypoalbuminemia with proteinuric renal disease and immune complex-mediated glomerulonephritis in cats in a study on membranoproliferative glomerulonephritis in young cats and also reported that hypoalbuminemia may be an indicator of the severity of glomerular damage and protein loss in affected cats.[16] In the presented case, hypoalbuminemia was found in the cat with glomerulonephritis. Glomeruli prevent the passage of net negatively charged molecules larger than 70.000 D. Albumin is approximately 65,000 D. However, its passage is largely prevented by normal glomeruli because of its net negative charge. The formation of hypoalbuminemia in glomerulonephritis may be explained by inability to prevent passage due to glomerular damage due to glomerulonephritis and intense albumin loss.[1]

Glomerulonephritis is a common cause of protein-losing nephropathy in cats and causes fluid accumulation in the abdominal cavity known as ascites.[4] Ascites is a clinical sign that can be observed in cats with various renal diseases including glomerulonephritis. In a study by Rossi et al. on immune complex glomerulonephritis in cats, it was found that ascites were a common finding in cats diagnosed with glomerulonephritis.[11] In the presented case, intense ascites and peripheral edema were found in the cat with glomerulonephritis. The cause of ascites was thought to be transudations resulting from the imbalance of hydrostatic and oncotic pressures along the intact vascular system or exudations resulting from the passage of fluid from leaking blood vessels into the pleural cavity. A decrease in oncotic pressure occurs due to hypoalbuminemia and intravascular fluid exudates out of the vessel and causes ascites formation.[26] Ascites formation in glomerulonephritis may be explained by a decrease in oncotic pressure due to hypoalbuminemia.

Anemia is a common condition in cats and may be associated with various underlying diseases including glomerulonephritis. It has also been associated with various clinicopathological features including glomerulonephritis, hypertension and azotemia in cats.[4] In a study by Nash et al. in 13 cats with membranous nephropathy, anemia was found in 85% of the cats.[10] In a retrospective study conducted by Rayhel et al. in cats with proteinuria, anemia was found in cats with glomerulonephritis. In the same study, hypertension and azotemia were also found in cats with glomerulonephritis.[4] In the presented case, anaemia, hypertension and azotemia were found in the cat with glomerulonephritis. Glomerulonephritis is an important cause of chronic kidney disease in cats and may lead to anemia due to decreased erythropoietin production and shortened life span of erythrocytes.[4] The anemia that occurs in glomerulonephritis may be explained by decreased production of the hormone erythropoietin due to kidney involvement. Studies show that mild to moderate hypertension is common in cats with chronic renal failure.[27] In addition, the renin-angiotensin-aldosterone system (RAAS) is thought to play a role in the development of hypertension associated with renal failure in cats.[28] Abnormalities in laboratory analysis are usually non-specific and reflect the underlying disease.[29] Azotemia is a common condition in cats with renal failure.[30] Glomerulonephritis is a condition leading to renal dysfunction.[2,3,4] The formation of azotemia and hypertension in glomerulonephritis can be explained by renal dysfunction.

In conclusion, glomerulonephritis is a rare but important condition in cats. Among the symptoms of glomerulonephritis, anemia, vomiting, weight loss, abdominal swelling, and low albumin levels may be observed, but the most prominent indicator is proteinuria. Understanding the relationship between proteinuria and glomerulonephritis in cats is very important for the correct diagnosis and treatment of this condition.

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