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CLINICAL STAGING EXPRESSION OF CHRONIC KIDNEY DISEASE IN DOGS

Radu CONSTANTINESCU, Victor CRIVINEANU, Gheorghe V. GORAN, Mario D. CODREANU, Mihai CORNILĂ

Faculty of Veterinary Medicine, 105 Spl. Independenţei, 050097, Bucharest, Romania,

Corresponding author e-mail: constantinescur.radu@gmail.com

Abstract

Chronic kidney disease (CKD) is defined as the presence of functional or structural renal abnormalities, characterized by progressive loss of kidney function and/or structure. CKD includes all cases described as renal insufficiency or renal failure, but also the less advanced forms of kidney disease.
Dogs of any age can be diagnosed with CKD, but it is more commonly seen in older dogs, without sex or breed predisposition, with an exception represented by inherited kidney disease.
The CKD staging was based on serum creatinine values of 20 dogs, presenting a wide variety of clinical features, from clinically healthy to signs of uremic encephalopathy.

Key words: *canine, chronic, kidney, staging.*

INTRODUCTION

Chronic kidney disease (CKD) is the most commonly recognized form of kidney diseases in dogs, characterized by morphological disorders of the renal parenchyma (of different degrees) with or without functional type of renal failure (clinically detectable). CKD occurs in systemic or organ diseases, usually associated with morphological and/or functional disorders.
CKD refers to the kidney damage that has existed for at least 3 months, with or without decreased glomerular filtration rate. After this period, the kidney adaptive compensatory function has already reached the lower limit.

The aim of this article is to provide an update of the relationship between clinical abnormalities and chronic kidney disease stage and to facilitate application of appropriate clinical practice guidelines for diagnosis, prognosis, and treatment. The International Renal Interest Society (IRIS) has developed a method to estimate the stages of CKD. Stages are numbered I through IV where one is the least severe and four is the most severe (Table 1). IRIS Staging of CKD has been accepted by the American and European Societies of Veterinary Nephrology and Urology. Serum creatinine remains the most commonly used parameter in order to estimate kidney function.

Table 1. Stages of Chronic Kidney Disease in dogs.

Chronic Kidney Disease	Serum Creatinine Values (mg/dl/µMOL/L)
STAGE	
Stage I	<1.4 / <125
Stage II	1.4-2.0 / 125-179
Stage III	2.1-5.0 / 180-439
Stage IV	>5.1 / >440

MATERIALS AND METHODS

The study was conducted in the Department of Internal Medicine, Faculty of Veterinary Medicine Bucharest, over a period of 5 months, from June to October 2013. Twenty dogs of different ages, genders and breeds were diagnosed with CKD, presenting various clinical signs.

The dogs were clinically examined, a complete blood cell count, serum biochemistry panel, and urinalysis were evaluated, followed by abdominal ultrasound examination, in order to evaluate the kidney damage.

The clinical signs may be severe or may be subtle and slowly progressive, represented by polyuria/polydipsia, dehydration, decreased appetite, vomiting, weight loss, constipation, diarrhea, anemia, anorexia and uremic signs.

Abnormalities in the serum biochemistry panel were represented mainly by serum creatinine, blood urea nitrogen, phosphataemia, kalemia and lipidemia.

Each case was evaluated based on serum creatinine values and framed in IRIS Staging of CKD. Staging of chronic kidney disease is performed in order to facilitate appropriate treatment and monitoring of the patient.

RESULTS AND DISCUSSIONS

Two dogs were diagnosed with stage I CKD, non-azotemic, based on serum creatinine values. Except polyuria and polydipsia, which was present in one case, the clinical signs were absent (Table 2).

In stage II CKD were diagnosed three dogs, presenting mild clinical signs, polyuria and polydipsia, mild renal azotemia (Table 3).

Dogs with moderate azotemia are classified as stage III CKD (Table 4).

Table 2. Stage I CKD

Nr	Breed	Age (yr)	Sex	Weight (kg)	Clinical Abnormalities	Serum creatinine (0.4-1.8 mg/dL)	BUN (7-27 mg/dL)	Phosphataemia (2.1-6.3 mg/dL)	Kalemia (4-5.6 mmol/L)	Lipidemia (110-320 mg/dL)
1.	Pug	6.9	M	6.5	None	1.4	30	4.6	3.9	162
2.	Labrador Retriever	10.6	F	30.1	Polyuria/polydipsia	1.4	38	4.4	4.3	194
Average value						**1.4**	**34**	**4.5**	**4.1**	**178**

Table 3. Stage II CKD

Nr	Breed	Age (yr)	Sex	Weight (kg)	Clinical Abnormalities	Serum creatinine (0.4-1.8 mg/dL)	BUN (7-27 mg/dL)	Phosphataemia (2.1-6.3 mg/dL)	Kalemia (4-5.6 mmol/L)	Lipidemia (110-320 mg/dL)
1.	Basenji	8.2	M	10.2	Polyuria/polydipsia	2	46	5.2	3.3	172
2.	Boxer	10.6	F	19.8	Polyuria/polydipsia	1.8	44	4.8	3.7	165
3.	Labrador	10.9	F	24.9	Polyuria/polydipsia	2	54	5.3	4.1	152
Average value						**1.9**	**48**	**5.1**	**3.7**	**163**

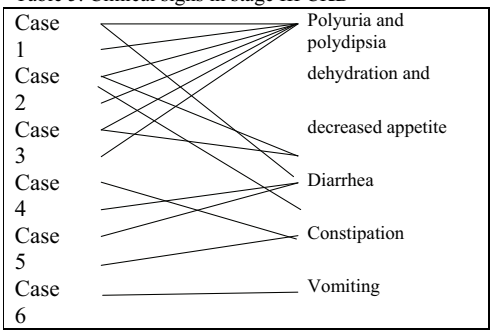
Table 4. Stage III CKD

Nr	Breed	Age (yr)	Sex	Weight (kg)	Weight (kg) after 2w from the first visit	Weight loss %	Serum creatinine (0.4-1.8 mg/dL)	BUN (7-27 mg/dL)	Phosphataemia (2.1-6.3 mg/dL)	Kalemia (4-5.6 mmol/L)	Lipidemia (110-320 mg/dL)
1.	Samoyed	10.9	M	28.2	26.2	7.1%	3.8	67	7.1	4.2	230
2.	Doberman	11.2	M	39.6	37.3	5.8%	4.6	78	7.6	3.8	258
3.	Labrador Retriever	11.9	F	27.3	26.8	1.83%	4.5	82	8.0	5.3	220
4.	Labrador Retriever	13.2	M	32.2	31.2	3.1%	5	80	6.7	4.7	268

5.	Rottweiler	12.9	M	36	35.1	2.5%	4.9	74	9.1	4.0	245
6.	Rottweiler	11.1	F	38.2	37.1	2.9%	5	56	5.3	5.1	233
Average value						**3.9%**	**4.6**	**72.8**	**7.3**	**4.5**	**244**

In stage III many extrarenal clinical signs are present, and also clinical signs referable to their loss of kidney function. Some of the most common signs include polyuria and polydipsia, dehydration, poor hair coat, decreased appetite, vomiting, weight loss, constipation, diarrhea.
In all cases polyuria and polydipsia, dehydration and decreased appetite were present, diarrhea was present in two cases, vomiting was present in three cases, and constipation was present in three cases (Table 5).

Table 5. Clinical signs in stage III CKD



Also, a moderate increase in systolic and diastolic blood pressure value was noticed (Table 6).

Table 6. Value of SBC and DBP in stage III CKD

	SBP	DBP
Case 1	170 mmHg	116 mmHg
Case 2	165 mmHg	105 mmHg
Case 3	180 mmHg	121 mmHg
Case 4	178 mmHg	117 mmHg
Case 5	172 mmHg	122 mmHg
Case 6	175 mmHg	119 mmHg

Stage IV CKD includes 9 dogs with severe azotemia, associated with clinical signs of uremia (Table 7).
In this stage the clinical signs were represented by anorexia (6 dogs), "uremic" (ammonia-smelling) breath and stomatitis with mouth ulcers (3 dogs), gastritis (4 dogs), enterocolitis, (4 dogs) and diarrhea (3 dogs).
Hypertension and uremic cardiomyopathy were noticed in all cases, in case 2 the SBP 176 mm Hg, and DBP 121 mm Hg, and in case 7 the SBP 166 mm Hg, and DBP 114 mm Hg, in the other cases the SBP was over 180 mm Hg, and DBP over 120 mm Hg.

Table 7. Stage IV CKD,

Nr	Breed	Age (yr)	Sex	Weight (kg)	Weight (kg) after 2w from the first visit	Weight loss %	Serum creatinine (0.4-1.8 mg/dL)	BUN (7-27 mg/dL)	Phosphataemia (2.1-6.3 mg/dL)	Kalemia (4-5.6 mmol/L)	Lipidemia (110-320 mg/dL)
1.	Poodle	13.3	F	22	19.8	10%	8.2	>130	7.0	2.9	320
2.	Chow Chow	10.6	M	25.6	24.2	5.4%	6.2	112	8.1	2.5	336
3.	Shar Pei	14.1	F	18	16.2	10%	8.4	>130	8.2	3.1	310
4.	German Shepherd Dog cross	12.6	F	22.7	20.2	15%	7.1	96	7.9	2.7	330
5.	American Pit Bull Terrier	12.8	M	24.1	22.2	7.8%	6.5	109	8.1	2.9	340
6.	Australian Shepherd Dog	13.4	F	26.8	24.2	9.7%	6.8	127	8.4	2.6	332
7.	German	11.6	M	24	22.9	4.5%	5.1	104	7.1	2.1	356

	Shepherd Dog										
8.	Beagle	13.9	M	11.3	9.8	13.3%	7.8	>130	10.8	2.7	318
9.	Boxer	14.2	F	22.2	19.1	14%	6.7	>130	5.5	2.9	330
Average value						**9.5%**	**7.0**	**–**	**7.9**	**2.7**	**328**

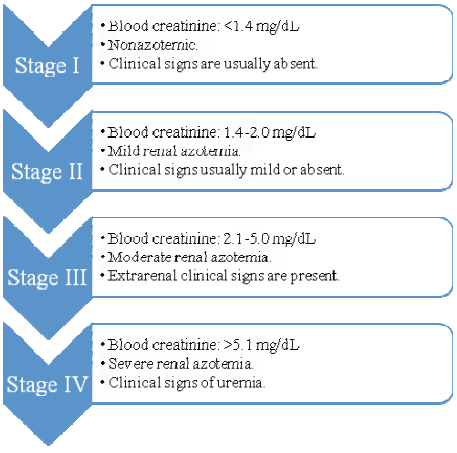
In this stage signs of uremic encephalopathy – pre-comatose stage were present, appeared as a result of uremic "intoxication", in cases 1, 3, 8 and case 9. Abnormalities in the serum biochemistry panel included hyperlipidemia, hyperphosphatemia and metabolic acidosis in all dogs.

Serum creatinine should never be interpreted without consideration of the clinical findings and urinalysis. Some dog breeds may normally have higher values for serum creatinine. In general large body size may be associated with a higher upper limit of serum creatinine in dogs.

Due to the presence of the clinical signs, most dogs are diagnosed in stage III or IV CKD (Table 8).

One important effect of loosing kidney function includes anemia, which is caused by inability of the kidneys to form erythropoietin. Anemia worsens the weakness, lethargy, and loss of appetite of dogs with advanced chronic kidney disease. Hypertension may cause stroke-like signs, such as mental dullness, sudden behavioral changes, coma, or seizures, and injury to the kidneys and heart.

Table 8. Staging System for Chronic Kidney Disease



CONCLUSIONS

Chronic kidney disease is an insidious condition that remains unrecognized until blood and urine tests are performed or the clinical signs are present.

CKD progression had not a know a timeline, and also a well defined sequence with high incidence in dogs aged over 12 years.

In CKD I-III stages there were no specific clinical renal signs, while in stage IV gastrointestinal, neuromuscular, cardiac, ocular, metabolic, hydroelectrolytic and hematologic signs were found, due to uremic "intoxication" and possibly due to some systemic diseases.

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