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Effectiveness of prescription renal diet VET- PRO renal in dogs with chronic kidney disease (CKD)

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Abstract

Dogs diagnosed with CKD based on history, clinical signs, haematology, biochemistry and ultrasonography were staged according to International Renal Interest Society (IRIS) and dogs under stage II and stage III CKD were selected and subjected to different therapeutic regimens Group I, II and III (eight dogs in each group). The dogs of group I were treated with conventional therapy as per the IRIS guidelines and homemade maintenance diet and group II received VET-PRO renal, a renal diet for 45 days as per the manufacturers recommendations along with the IRIS treatment schedule. The most prominent clinical signs of CKD in dogs were anorexia, weakness, weight loss, pallor mucous membrane, vomiting, melena, polyurea/ polydipsia, halitosis, oral ulcers, emaciation, nervous signs, diarrhoea, recumbency and congested mucous membrane. The symptoms were reduced by 10-12th day in 50% of the dogs in Group I CKD dogs and in Group II remission of symptoms was observed by 5-7th day. No symptoms reoccurred throughout the therapy period in the group II dogs received Vet PRO renal diet.

The findings of the therapeutic study revealed significant improvement in the haemoglobin, packed cell volume and total erythrocyte count in dogs received VET-PRO renal diet (Group II and III) in comparison to homemade food. The dogs of Group II and III showed significant reduction in SDMA, Creatinine and BUN when compared to '0' day and also when compared to Group I dogs. Significant hypokalaemia was seen in dogs with CKD which was improved markedly in dogs fed with VET PRO renal diet. Similarly sonographic changes were also improved in the dogs on renal diet when compared to CKD dogs maintained on home made diet.

Keywords: CKD dogs, VET PRO, renal diet

Introduction

Chronic kidney disease (CKD) is the most commonly recognized form of kidney disease in dogs and causes an irreversible and progressive loss of kidney function. This leads to a decreased ability to remove waste products from the body and perform homeostatic functions. It is most common in older dogs, but can occur at any age with significant morbidity and mortality. The prevalence of CKD has been estimated to range between 0.5% to 7% in dogs. Nephron damage associated with CKD is usually irreversible and the cause is often difficult to determine. Patient history, results of physical examination, urinalysis, haematology, serum biochemistry and nephrosonography provide a practical means of diagnosing CKD in dogs. Conservative medical management of CKD is designed to minimize the clinical and pathophysiological consequences of reduced kidney function. The CKD is a progressive disease with increasing incidence, having very little success rate in current conventional therapies once CKD reaches stage IV. Clinical intervention at stage II and III is best to decrease or stop further development of the disease. Even though the disease is progressive, appropriate treatment helps many dogs live comfortably for several months to years. Successful treatment of CKD requires a multi-modal approach, which involves identifying and eliminating exacerbating factors, combined with appropriate dietary and medical management (Sanderson *et al.* 2013) [20]. Recent studies suggest that, dietary supplementation with specific antioxidants is an important consideration for limiting renal oxidative stress and progression of CKD (Polzin, 2011) [18].

Materials and Methods

The study was conducted in Veterinary Hospital, Department of Veterinary Medicine,

Veterinary College, Hebbal, Bengaluru. Dogs diagnosed with CKD based on history, clinical signs, haematology, biochemistry and ultrasonography were staged according to International Renal Interest Society (IRIS) and dogs under stage II and stage III CKD were selected and subjected to different therapeutic regimens. Group I includes Stage II or III dogs were treated with conventional therapy as per the IRIS guidelines and homemade maintenance diet, Group II dogs were of stage II CKD and group III dogs include dogs in stage III CKD (eight dogs in each group). The dogs of group II and group III received VET-PRO renal, a renal diet for 45 days as per the manufacturer's recommendations along with the IRIS treatment schedule.

Eight apparently healthy dogs of different breeds aged between four to seven years were selected as control group for obtaining normal data for comparison of parameters under study.

The dogs under the therapeutic trials were monitored for a period of 45 days and the treatment regimens were evaluated at 30th day of treatment based on improvement in clinical signs, haematology, serum biochemical profile, urinalysis and nephrosonographic changes.

Results and Discussion

The most prominent clinical signs of CKD in dogs were anorexia, weakness, weight loss, pallor mucous membrane, vomiting, melena, polyurea/ polydipsia, halitosis, oral ulcers, emaciation, nervous signs, diarrhoea, recumbency and congested mucous membrane. The present findings were in accordance with earlier studies (Lucre *et al.*, 1980; Chew *et al.*, 1983; Hoppe *et al.*, 1990 Rubin, 1997) [10, 2, 6, 19]. The symptoms were reduced by 10-12th day in 50% of the dogs in Group I CKD dogs and in Group II remission of symptoms was observed by 5-7th day. No symptoms reoccurred throughout the therapy period in the group II dogs received Vet PRO renal diet.

Significant decrease in haemoglobin, packed cell volume and total erythrocyte count was observed in CKD dogs when compared to apparently healthy dogs (Table.1). The causes of anemia in CKD are reduced renal production of erythropoietin, reduced red blood cell survival, gastrointestinal bleeding and uremic inhibitors of erythropoiesis, bone marrow fibrosis and nutritional deficiencies. The mean total leukocyte count and platelets count were found to be within normal range. The findings of the therapeutic study revealed significant improvement in the haemoglobin, packed cell volume and total erythrocyte count in dogs received VET-PRO renal diet (Group II and III) in comparison to homemade food (Table. 2). This indicates that there is progressive improvement in renal function by feeding VET-PRO renal diet along with conventional therapy.

There was a highly significant elevation of SDMA, BUN and Creatinine values in dogs with CKD when compared with apparently healthy dogs (Table.3). These parameters are used to measure kidney dysfunction and are the basis for International renal interest society (IRIS) staging system. The raised BUN and Creatinine levels in CKD dogs could be due to retention of nitrogenous substances normally excreted by healthy kidneys. In addition gastrointestinal (GI) haemorrhages might have contributed to increase BUN concentration in CKD dogs as a consequence of increased GI absorption of nitrogenous compounds (Cowgill *et al.*, 1998) [3]. The dogs of Group II and III showed significant

reduction in SDMA, Creatinine and BUN when compared to '0' day and also when compared to Group I dogs (Table.4), which could be attributed to progressive improvement the renal function and health of the CKD dogs during the treatment period in Group II and III dogs which were on VET-PRO renal diet. The antioxidants which are present in the renal diet might have reduced the further damage on kidneys. Pillar *et al.*, 2015 [16] in their study stated that antioxidants will reduce the oxidative stress on the kidney and improves the GFR.

Hypoproteinemia and hypoalbuminemia were observed in CKD dogs due to an increased filtration of albumin through glomeruli, owing to its molecular size ((Booth, 1990 and Shaw and Ihle, 2013) [1, 21]. Total protein and albumin values were improved by in Group II and III dogs on 30th day of treatment when compared to Group I dogs. High quality protein in the VET-PRO renal diet has improved the protein status in the CKD dogs as feeding higher quality protein diets can decrease the risk of the development of protein-energy wasting and loss of lean body mass and can cause longer survival period in dogs with CKD. A possible approach to optimize dietary restriction of protein without contributing to LBM loss is to strategically supplement amino acids. Feeding higher quality protein diets may then be preferable, because it has been shown that dogs with CKD and a BCS of 4 or more out of 9 had longer survival than dogs with a thin BCS. (Parker and Freeman, 2011 and Pedrinelli *et al.*, 2020) [14, 15].

Significant hypokalaemia was seen in the affected dogs and non-significant increase in sodium and phosphorous levels (Table.3), could be due to declining glomerular filtration rate in CKD which leads to phosphorus and sodium retention and ultimately resulting hyperphosphatemia and hypernatremia (Cowgill *et al.*, 1998; Muralikrishna, 2003; Mrudula *et al.*, 2005) [3, 13, 12]. Significant improvement in potassium levels was seen by 30th day in dogs with VET-PRO renal diet when compared homemade diet group, which could be due to the added potassium in the renal diet. For CKD dogs with hypokalemia, it is helpful to offer a higher potassium-containing diet or oral potassium supplementation with either potassium gluconate or potassium citrate (Sieberg and Quimby, 2020) [22]. Potassium is a mineral that can either increase or decrease with chronic renal failure. The most common scenario is potassium depletion. Potassium depletion occurs with chronic renal disease due to a reduction in dietary potassium intake in animals that are not eating well, as well as an increase in loss through the urine. Dogs require the addition of extra potassium to their diets to maintain normal blood concentrations and to maintain electrolyte balance. Non-significant increase in the sodium and phosphorous levels were reduced to normal reference range by 30th day of treatment in Group II dogs (Table.4), which may be attributed to low levels of phosphorous in the VET-PRO renal diet which improved electrolyte balance and good renal filtration.

One of the first alterations in mineral status that occurs with renal disease is phosphorus retention by the kidneys and this is manifested as elevated phosphorus concentrations in the blood (referred to as hyperphosphatemia). This increase in body phosphorus concentration can lead to numerous deleterious consequences such as vitamin D deficiency. In dogs, dietary phosphorus restriction has been shown to slow the progression of renal failure. One goal in the management

of renal disease is to normalize blood phosphorus concentrations. By reducing hyperphosphatemia, these changes can be minimized or prevented. This can be achieved by reducing the amount of phosphorus contained in the diet or by reducing the intestinal absorption of dietary phosphorus by phosphate binders (Lucre *et al.*, 2008 and Girishkumar *et al.*, 2011) [9, 5].

The ultrasonographic changes observed in dogs with CKD were indistinct corticomedullary junction, slightly shrunken kidneys and hyperechoic cortex (Fig.1). Sonographic changes were improved slightly towards normalcy in Group II and III dogs by 30th day of treatment, which could be due to the reduced damage on kidneys and progressive improvement in the renal function by the regular feeding of renal diet. Whereas no much sonographic changes were observed by 30th day of in Group I CKD dogs. Dogs under therapeutic trials were monitored for about three months

period, which revealed that health condition was very much improved in dogs which received VET-PRO renal diet and survival rate was 100 percent whereas in group I dogs survival rate was 37.5 percent. Jacob *et al.* (2002) conducted a prospective study for 24 months and observed that dogs with CKD that consumed a therapeutic renal diet had survival time 3 times higher than those that consumed maintenance diets.

Further, palatability of the VET-PRO renal diet found very good. Acceptance of renal diet was in the range of good to excellent in the present study. There was no change in stool colour and consistency noticed in the dogs fed with renal diet. The odour of faeces was reduced in dogs fed with renal diet regularly, which could be attributed to the Yucca schidigera extract present in the VET-PRO renal diet caused modification of the colonic microbiota.

Table 1: Haematological findings in dogs with CKD on “0” day

Parameter	Control Group	Group I	Group II	Group III
Haemoglobin (g/dl)	13.6±0.6	8.24±0.36*	8.64±0.35*	9.32±0.48*
PCV %	44.6±1.22	34.5±1.34*	36±1.42*	34±1.68*
TEC x 10 ⁶ /µl	6.52±0.18	4.62±0.16*	4.36±0.18*	4.62±0.12*
TLC / µl	9300±262.17	12562±386.24	12050±366.67	11432±392.18
Platelets / µl	172200±2300	158000±1900	178000±2600	162000±2100

*-Statistically significant ($p \leq 0.01$)

Table 2: Haematological findings in dogs with CKD on “30th” day

Parameter	Control Group	Group I	Group II	Group III
Haemoglobin (g/dl)	13.6±0.6	9.24±0.42	13.88±0.58*	12.9±0.69*
PCV %	44.6±1.22	32.22±1.26	43.76±1.65*	41.24±1.45*
TEC / µl	6.52±0.18	4.68±0.68	6.2±0.23*	5.68±0.12*
TLC / µl	9300±262.17	9720±328.69	8942±328.24	9816.42±268.23
Platelets / µl	172200±2300	160000±1800	182000±2600	178000±2200

*-Statistically significant ($p \leq 0.01$)

Table 3: Serum biochemical profile in dogs with CKD on '0' Day

Parameter	Control Group	Group I	Group II	Group III
SDMA (µg/dl)	12±2.6	34±3.4*	18±3.6**	38±2.8*
Total Protein (g/dl)	7.92±0.16	5.94±0.16**	4.79±0.11**	4.82±0.12**
Albumin (g/dl)	2.88±0.06	2.06±0.08**	2.52±0.1**	2.24±0.07**
Blood Urea Nitrogen (mg/dl)	23.63±1.04	82.3±6.87*	69.3±6.41*	89.6±3.25*
Creatinine (mg/dl)	0.4±0.06	2.78±0.42*	1.49±0.23*	2.9±0.37*
Phosphorus (mg/dl)	4.08±0.16	4.45±0.64	4.12±0.62	4.68±0.14
Sodium (mEq/L)	143.8±0.68	159.2±1.5	148.5±1.7	149.2±1.8
Potassium (mEq/L)	4.34±0.12	2.62±0.12*	3.12±0.18*	2.86±0.16*

*-Statistically significant ($p \leq 0.01$)

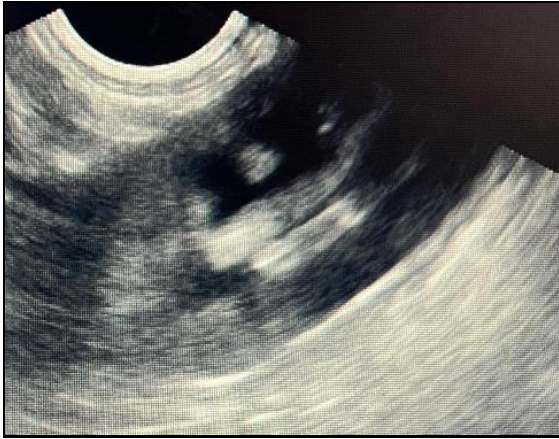
**-. Statistically significant ($p \leq 0.05$)

Table 4: Serum biochemical profile in dogs with CKD on 30th Day

Parameter	Control Group	Group I	Group II	Group III
SDMA (µg/dl)	12±2.6	32±2.2	14±3.2*	19±1.8*
Total Protein (g/dl)	7.92±0.16	5.86±0.16	6.64±0.11	6.48±0.09
Albumin (g/dl)	2.88±0.06	2.48±0.14	2.80±0.06	2.51±0.07
Blood Urea Nitrogen (mg/dl)	23.63±1.04	58.4±8.60	21.48±6.92*	23.38±2.16*
Creatinine (mg/dl)	0.4±0.06	2.66±0.51	0.46±0.38*	1.36±0.67*
Phosphorus (mg/dl)	4.08±0.16	4.40±0.27	3.92±0.62	4.02±0.26
Sodium (mEq/L)	143.8±0.68	154.4±1.79	143.5±1.42	144±1.06
Potassium (mEq/L)	4.34±0.12	2.42±0.13	4.42±0.14*	4.36±0.08*

*-Statistically significant ($p \leq 0.01$)

**-. Statistically significant ($p \leq 0.05$)



Diffuse increase in renal cortical hyperechogenicity and degeneration of the renal cortex

Conclusions

Based on the results of the present study it is possible to conclude that early diagnosis is important, so the proper treatment and clinical assessment can be established and, therefore, extend survival. Factors such as BCS and MMS at diagnosis influenced survival, which makes the assessment of these parameters of uttermost importance in dogs with CKD. Furthermore, the intake of a renal diet was determinant to increase survival and should be part of the recommendations for patients with this diagnosis. The present study brings to light important information to better understand the prognosis of CKD and also identify key nutritional points to provide a better quality of life and increase survival in dogs with chronic kidney disease.

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