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Clinical Articles

Management of Chronic Kidney Disease in a dog with Intermittent Hemodialysis

Randhir Singh

Department of Teaching Veterinary Clinical Complex (TVCC), Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana - 141 004, Punjab

Abstract

A case of 2 years old French Mastiff breed dog with history of anorexia, lethargy, mild diarrhoea and halitosis was presented in Medicine emergency at Multispecialty Veterinary Hospital, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab. The hemato-biochemical profile, urine analysis, radiographic and ultrasound findings of dog indicated stage IV chronic kidney disease (CKD). Intermittent hemodialysis (IHD) was selected as treatment of choice as the dog was already on standard treatment from past five days with no significant improvement in condition. After two IHD sessions, the dog showed quick improvement with reduction in uremic toxins, correction of electrolyte imbalance and improved quality of life.

Keywords: CKD, Intermittent hemodialysis, Dog

Chronic kidney disease (CKD), also known as chronic renal failure (CRF), is a condition in which the kidneys gradually lose their functional ability. The normal kidneys filter waste and excess fluids from the blood of dogs, which are then excreted in the urine. As CKD progresses, harmful amounts of fluid, electrolytes, and wastes accumulate in the body (Polzin, 2011). Being a progressive disorder that results in functional changes in the renal parenchyma, CKD is a now a day commonly diagnosed in small animal internal medicine practice, with high comorbidity and mortality rates, with a prevalence of 0.5-1.0 per cent in canines and 1.0-3.0 per cent in felines (Roura, 2018). Canine patients with CKD stage III having serum creatinine levels of 2.1-5.0 mg/dl show mild to moderate azotemia and clinical symptoms, requiring round-the-clock monitoring and patient treatment, whereas dogs in stage IV having serum creatinine levels of >5.0 mg/dl are at an increased risk of systemic clinical signs involving multiple organ involvement and extreme uremic crisis (Polzin, 2013).

Intermittent hemodialysis (IHD) is a form of extracorporeal renal replacement therapy (RRT) that includes a series of brief hemodialysis sessions over a period of time with the goal of restoring equilibrium to the patient's metabolic profile and homeostasis, which would otherwise be lost due to the pansystemic effects of extreme uremia (Bloom & Labato, 2011). In dogs with CKD, the primary aim of IHD is to enhance chronic progressive azotemia, correct acid-base, fluid, and electrolyte imbalances, and remove nitrogenous compounds and other toxins (Cowgill and Francey, 2012; Fischer *et al.,* 2004). In veterinary practice, the prognosis and treatment time for IHD vary depending on the seriousness of the underlying cause, the degree of renal damage, and the occurrence of comorbidities (Bloom and Labato, 2011).

Corresponding Author: dr.randhirlo@gmail.com

Case History and Observations

A 2 years old male French Mastiff breed dog weighing 43 Kg was presented at Medicine emergency of multispecialty Veterinary hospital, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab with history of anorexia, diarrhea, vomiting, dark yellow urine and halitosis from past eight days. Previously, from past five days, the dog was on prescription medicine from a private veterinary practitioner which included Dextrose normal saline (DNS), furosemide and Metoclopramide. On presentation, the dog was dull with rectal temperature – 102.5^{0}F, heart rate- 110bpm, respiration rate-34 breaths/minute, Blood pressure (Doppler)- 155 mmHg, mucous membrane-congested, and normal lymph nodes. Oral examination revealed halitosis with no appreciable ulcers. Blood, urine and serum samples were again taken from dog for evaluation of complete blood count (CBC), urine specific gravity, proteinuria, microscopic evaluation of urine and biochemical profile (ALT, GGT, total protein, albumin, glucose, BUN, creatinine, Na, K, P, Cl, and Ca). X-ray of chest (lateral and VD views) along with ultrasound of abdomen was also carried out. Results revealed Hb-7.8 g/dl, PCV- 21.50 per cent, TEC-3.55x10^6, TLC-17,070 involving neutrophilic leukocytosis with few toxic cells (N-84%, L-12%) and platelet count- 306x10^3.

Microscopic examination of urine revealed waxy casts (figure 1) with urine specific gravity 1.015 and 2+ Proteinuria. Biochemical profile revealed ALT- 37 u/L, ALKP- 99 u/L, GGT- 06 u/L, Total Protein- 6.7 g/dl, Albumin- 2.7 g/dl, Glucose 103 mg/dl, BUN- 240 mg/dl, Creatinine- 19.0 mg/dl, Phosphorus-13.9 mg/dl, Na-120 mEq/L, K- 5.1 mEq/L and Cl- 86 mEq/L. X-ray of chest revealed heart in fourth inter-costal space with increased sternal contact (figure 2) whereas, abdominal ultrasound showed hyperechoic renal cortex of both kidneys with satisfactory cortico-medullary differentiation, distended urinary bladder, enlarged spleen and mild amount of free fluid in abdomen suggestive of ascites. Based on history, clinical and laboratory findings, the case was diagnosed and treated as CKD stage IV. As the health of dog was progressively deteriorating even when on prescription medicine from last five days, intermittent hemodialysis (IHD) was considered as treatment of choice. Two IHD sessions were performed on alternate days with Fresenius 4008S machine, using jugular catheterization with 11.5 Fr. double lumen catheter, Fresenius Fx 8 dialyzer having surface area 1.4m^2. The dialysate K concentration was adjusted to 3.5 mEq/L whereas base and prescribed Na levels were kept at 142 mEq/L. The dog was loaded with levocarnitine @ 1g slow I.V. after end of each IHD session (inj. Carnisure 1g/5ml, *Torrent Pharmaceuticals Ltd*) and subsequently given oral maintenance dose of levocarnitine @ 500mg P.O. BID (Tab. Carnisure 500mg, *Torrent Pharmaceuticals Ltd*) for 15 days. The dog was also prescribed Amoxycillin and Potassium Clavulante 600mg I.V. BID X 4 days (inj. Augmentin 600mg, *GSK*), Ranitidine @ 2mg/kg S.C. BID X 4 days (inj. Aciloc, *Cadila Pharmaceuticals Ltd*) and furosemide @ 2mg/kg I.M. BID X 4 days (inj. Lasix, *Sanofi India Ltd*). The hemato-biochemical profile was carried out both before (Pre-session) and after end (Post-session) of each IHD session and the results (table 1) showed significant reduction in BUN, creatinine, Phosphorus along with correction of electrolyte imbalance after end of each IHD session. There was also marked clinical improvement in dog with return of normal appetite, complete cessation of emesis and normal physical activity.

Discussion

Generally, IHD prescriptions for dogs suffering from CKD aims to promote a better quality of life (QOL)

Table 1. Hemato-biochemical profile of dog undergoing IHD

Parameter	IHD Session I (session time: 40 minutes)		IHD Session II (session time: 3 Hours)	
	Pre-Session	Post- Session	Pre-Session	Post- Session
Hb (g/dL)	7.80	7.40	7.90	7.50
PCV (%)	21.50	22.0	21.80	22.50
TLC	17,070	16,760	14,090	14,350
TEC (x10^6)	3.55	3.69	3.89	4.17
Platelets (x10^3)	306	298	249	233
ALT (U/L)	37	40	294	305
ALKP (U/L)	99	101	349	367
GGT (U/L)	06	08	15	18
T. Protein (g/dL)	6.7	6.4	8.4	7.8
Albumin (g/dL)	2.7	2.5	3.1	3.0
BUN (mg/dL)	240	167	136	83.27
Creatinine (mg/dL)	19.0	13.03	6.2	3.39
Phosphorus (mg/dL)	13.9	9.8	9.5	6.27
Sodium (mEq/L)	120	144	148	141
Potassium (mEq/L)	5.1	4.2	4.6	3.96
Chloride (mEq/dL)	86	109	102	106.40
Glucose (mg/dL)	67	60	69	86

Ultrafiltration Goal (UF Goal):- Session I: 100ml; Session II: 500 ml

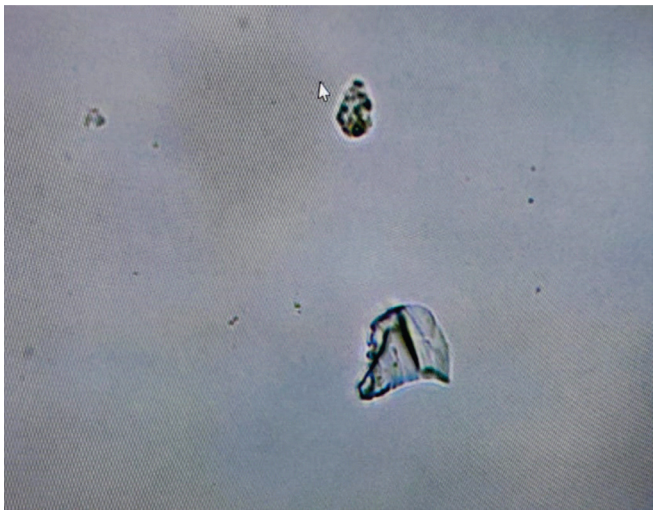

Fig. 1. Waxy cast in urine sample

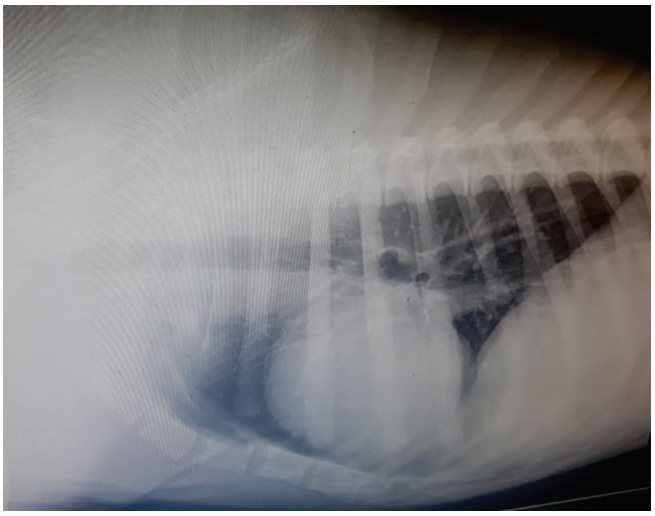

Fig. 2. Radiograph of dog showing increased sternal contact

than to reduce the acute uremia signs that are mostly observed and reported in the acute phase (Cowgill & Francey, 2012). Although, in the present study, IHD was more efficient at removing nitrogenous end products from the body and correcting electrolyte imbalance, the subsequent morbidities that present along with CKD may have implications for the survival of the patient. The higher the stage, the more difficult it is to control morbidities along with CKD (Melchert et al., 2017) The present case was selected for IHD due to severe refractory uremia from last few days. Initially, the first IHD session was deliberately kept less intense and effective owing to severe uremia to avoid sudden hemodynamic changes leading to major fluid shift. The dialyzer was selected on the basis of dogs' body weight (Cowgill, 2011) keeping a balance between effective surface area and priming volume. The blood flow rate was initially 2ml/kg/min during first session which was increased to 5ml/kg/min in second session to achieve desired outcomes. There was significant improvement in dog with reduction in levels of BUN, Creatinine, Phosphorus along with correction of electrolyte imbalances after the end of second session. After the end of first IHD session, the dog appeared more dull and fatigued with no inclination to stand or move. It was due to the fact that the dialysate used during IHD was dextrose free and due to which the circulating glucose levels also declined after end of the session. This post dialysis fatigue due to hypoglycemia was managed with intra venous infusion of 500ml of 5 per cent dextrose and subsequent use of dialysate solution with pre-added dextrose during second IHD session. After two IHD sessions the dog recovered with clearance of uremic toxins and correction of electrolyte imbalance manifested by improved physical activity, cessation of emesis and improved appetite. The dog was kept on oral medications like L- carnitine, furosemide, ranitidine and B-complex supplementation for next one week. The condition of dog was reassessed after one week over phone call with improvement in overall condition but reduced appetite. The hemato-biochemical profile one week post second dialysis session revealed Hb- 7.7 g/dL, TLC- 15.5 x 10^3, BUN- 63.5 mg/dL, creatinine 3.2 mg/dL and Phosphorus 5.8 mg/dL. The owner was prescribed appetite stimulating syrup containing buclizine hydrochloride @ 10ml P.O. BID (Syp. Aptiquik, *Pet Mankind*) and Amino Acid Supplement @ 15ml P.O. OD (Syp. Healthup pro, *Vetoquinol*) which improved the appetite of dog. The last hemato-biochemical profile of dog done on 30th day after second dialysis session revealed Hb- 7.5 g/dL, TLC- 14.8 x 10^3, BUN- 54 mg/dL and creatinine 2.2 mg/dL and Phosphorus 4.1 mg/dL.

Conclusion

Though IHD entails more risks due to invasive procedures than conventional care with medicines and fluid therapy, a well-trained veterinarian may minimize these associated risks. No significant problem was encountered during IHD sessions suggesting safety of IHD for dogs with CKD. Survivability may be more promising in dogs with early stages of CKD, as the probability of patient survival decreases as the disease progresses due to multi-organ involvement. For later stages of CKD, a more systemic approach is needed in conjugation with dialysis, since it may include multiple

organ failure (heart and liver), and simply correcting uremic signs with dialysis may not be enough.

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