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PERITONEAL DIALYSIS IN CHRONIC RENAL FAILURE ON CAT

Bogdan Alexandru VIȚĂLARU, Vasilica-Flory PETRESCU

University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Veterinary Medicine, 105 Splaiul Independentei, District 5, 050097, Bucharest Romania

Corresponding author email: alexandrumv@yahoo.com

Abstract
An 11 years old, castrated, male cat, mixed breed was referred to the Clinic of the Faculty of Veterinary Medicine Bucharest for vomiting, loss of appetite, anorexia, faintness, sharp breath, inability to exercise, oliguria and lethargy. Results from a complete blood (cell) count (CBC), serum chemical profile, and urinalysis submitted at that time were abnormal. The patient had chronic renal failure (Creatinine 10.9 mg/dL - reference range 0.8-2.4 mg/dL, BUN 124 mg/dL - reference range 16-36 mg/dL). The rectal temperature was 36.5ºC, the patient presented anemic mucous membranes, mild dehydration (persistent skin fold thickness for 2-3 seconds) and slight sensitivity to palpation in the renal lanyard. Abdominal ultrasound showed that kidney presented uncharacteristic drawing, irregular outline, abundant microlithiasis, and following examination of urine was found massive proteinuria, absent bacteriuria, minimal hematuria (50), pH 6.2, abundant FAM. Urinary density was 1.025. The patient was presented at Hemodialivet Clinic with the following renal parameters (Creatinine 9.9 mg/dL-reference range 0.8-2.4 mg/dL, BUN 107 mg/dL-reference range 16-36 mg/dL). The established treatment consisted in peritoneal dialysis, rehydration and electrolyte balance, parenteral nutrition. We used PD4 peritoneal dialysis Dianeal PD4 1.25. The patient was submitted to intravenous fluidotherapy with 5% Glucose, Sodium Chloride 0.9 %, B_{12} vitamin, Arnetin, Emeset CRI. Recommendation for oral treatment: Ipakitine bid, Azodyl bid and kidney diet food. Continuous evaluation of hematological and biochemical blood parameters is vital for the establishment of appropriate therapies in renal patients. Hydroelectrolytic rebalancing associated with continuous peritoneal dialysis, erythropoietin therapy and using appropriate renal diet are the key to success in intensive care of renal patients.

Key words: *creatinine, dialysis, electrolytes, fluidotherapy, peritoneal.*

INTRODUCTION

Peritoneal dialysis temporarily replaces the excretory renal function based on the transfer of solutions through a semi-permeable membrane. It uses the principle of diffusion; solutions found in the highest concentration pass through the membrane pores helping to purify the blood of toxins and eliminate them from the body (Vițălaru and Micşa, 2015).

Chronic kidney disease (CKD) is characterized by the inability of the kidneys to perform their duties due to massive loss of nephrons which is installed over a period of several months to years. CKD is a long-term nephropathy with progressive evolution leading to end-stage anuria (Himmelfarb and Sayegh, 2010).

Loss of excretory function leads to azotemia. The inability of the kidneys to synthesize erythropoietin and calcitrol leads to aregenerative anemia and renal secondary hyperparathyroidism (Bartges and Polizin, 2011).

Normally, the end products of metabolism are excreted in urine but, in patients with chronic renal failure, waste products, which normally are excreted in the urine, accumulate in the blood resulting in uremic intoxication (Elliott and Grauer, 2007). The obvious goal of dialysis treatment is to remove "uremic toxins" (including water) from the patient using dialysis fluid introduced into the peritoneal cavity and a system for biological membranes (Bartges and Polizin, 2011). Peritoneal dialysis is an important therapeutic tool for mitigating clinical signs of uremia and giving the kidneys time to recover in cats with chronic kidney injury when conventional therapy is no longer effective (Bhatt and Suthar, 2011).

MATERIALS AND METHODS

An 11 years old, castrated, mixed breed, male cat, was referred to the Clinic of the Faculty of Veterinary Medicine Bucharest for vomiting, loss of appetite, anorexia, faintness, sharp

breath, inability to exercise, oliguria, and lethargy. Results from a complete blood (cell) count (CBC), serum chemical profile, and urinalysis submitted at that time were abnormal. The patient had chronic renal failure (Creatinine 10.9 mg/dL - reference range 0.8 - 2.4 mg/dL, BUN 124 mg/dL - reference range 16-36 mg/dL). The rectal temperature was 36.5ºC, the patient presented anemic mucous membranes, mild dehydration (persistent skin fold thickness for 2-3 seconds) and slight sensitivity to palpation in the renal lanyard. Abdominal ultrasound showed uncharacteristic pattern of the kidney, irregular outline, hyperecogenity of the medulla (Figure 1) and following examination of urine showed massive proteinuria, absent bacteriuria, minimal hematuria (50), pH 6.2, abundant FAM. Urinary density was 1.025.

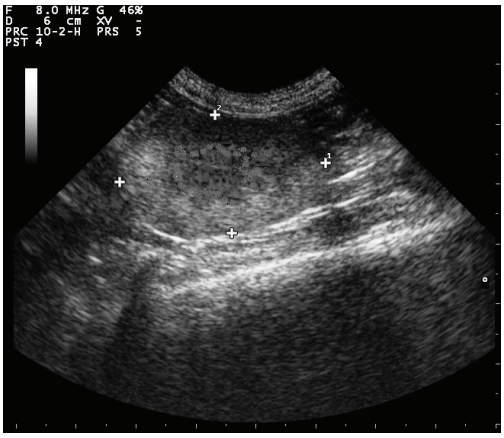

Figure 1. Abdominal ultrasound of the kidney showing irregular outline, hyperecogenity of the medulla

RESULTS AND DISCUSSIONS

On 26th of August 2015, 2 days after rehydration and electrolyte balance, renal parameters were as follows: Creatinine 11.0 mg/dL (reference range 0.8-2.4 mg/dL), BUN 110 mg/dL (reference range 16-36 mg/dL).
On 27th of August 2015, creatinine values decreased to 10.6 mg/dL (reference range 0.8-2.4 mg/dL), and BUN 116 mg/dL (reference value 16-36 mg /dL).
On 28th of August 2015, renal parameters were as follows: Creatinine 11.3 mg/dL (reference range 0.8-2.4 mg/dL), BUN 112 mg/dL (reference range of 16-36 mg/dL). We started the following fluidotherapy protocol: i.v. 12h/day 20ml/h: NaCl 180 ml, 5% Glucose 60 ml, Vit. B_{12} 200 µg, Arnetin 8 mg, Emeset 2 mg. Protocol was maintained until the 2nd of September 2015.
On the 2nd of September 2015, the patient was referred to Hemodialivet Clinic with the following renal parameters: Creatinine 9.9 mg/dL (reference range 0.8-2.4 mg/dL), BUN 107 mg/dL (reference range 16-36 mg/dL) and received treatment for rehydration and electrolyte balance after the following protocol: iv CRI 24h, 10ml/h: NaCl 180 ml, 5% Glucose 60 ml, B_{12} vitamin 200 mg, Emeset 8 mg, Arnetin 2 mg. This fluidotherapy protocol was maintained until the 7th of September 2015.
On the 7th of September 2015, the following parameters have been evaluated: Glucose 163 mg/dL (reference range 71-159 mg/dL), Creatinine 6.5 mg/dL (reference range 0.8-2.4 mg/dL), BUN 75 mg/dL (reference range 16-36 mg/dL) and considering these values we decided to start peritoneal dialysis using standard procedures with Dianeal PD4 1.25.
A peritoneal catheter was placed under general anesthesia with Propofol i.v. 5 mg/kg in bolus and local analgesia with Lidocaine, after omentectomy (Figure 2).

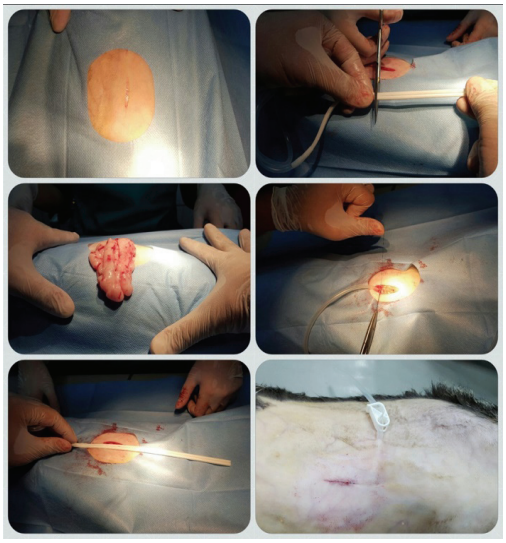

Figure 2. Placing the peritoneal catheter for peritoneal dialysis in the patient after omentectomy

The fluidotherapy remained the same for the next five days. We maintained the peritoneal

dialysis with Dianeal PD4 to 4 dialysis per day using 120 ml.

On the 11th of September 2015, renal parameters were as follows: Creatinine 5.2 mg/dL (reference range 0.8-2.4 mg/dL), BUN 52 mg/dL (reference range 16-36 mg/dL). We decided to reduce fluidotherapy to 4 h/day according to the protocol i.v., 20ml/h NaCl 60 ml, 5% Glucose 20 ml, B_{12} vitamine 100 µg, Arnetin 4 mg, Emeset 1 mg. This fluidotherapy protocol was continued until the 21st of September 2015.

Because of the decreasing of renal parameters from 11th of September 2015 until the 15th of September 2015, the number of peritoneal dialysis was reduced to 3 dialysis per day using 120 ml for each dialysis. In these days, there were increases in renal values and we decided to use 4 dialysis per day until the 21st of September 2015, when fluidotherapy was stopped because the patient presented appetite and started to drink water.

From 21st of September 2015 until 30th of October 2015, peritoneal dialysis was performed 4 times per day using 120 ml Dianeal PD4 and due to lower hematocrit - 18.3% (reference values 24-45%) and hemoglobin 5.6 g/dL (reference values 8-15 g/dL) we started to use Darbepoietin alfa 0.6 mcg/kg subcutaneously once a week until the minimum physiological value of hematocrit was reached. We administered one tablet of Hemovet per day, oral, for 14 days and Milgamma 0.5 ml/day, subcutaneously, for 2 days.

After the stabilization of the hematocrit, the administration of Darbapoietin was discontinued for a period of about 1 month.

On the 30th of October 2015, due to decrease in renal parameters we have reduced the number of peritoneal dialysis to 3 dialysis per day using 120 ml for each one. During these days, we observed increases in renal parameters and we returned to 4 dialysis per day until the 7th of December 2015.

On the 7th of December 2015, we observed that the liquid extracted from the peritoneal cavity was cloudy and with floaters and the analysis confirmed the presence of peritonitis 163 leukocytes/mm^3 (reference range <100 leukocytes/mm^3) and 78% PMN (reference range >50 % PMN). To treat peritonitis, we used Ceftriaxone, 1000 mg/L dialysate.

On the 1st of January 2016, we have observed a drastic decrease of HCT to 9.5% (reference range 24-45%) and HGB 2.9 g/dL (reference range 8-15 g/dL).

On the 5th of January 2016, a severe anemia - HCT 5.8% (reference range 24-45%) and HGB 1.8 g/dL (reference range 8-15 g/dL) was observed and an urgent transfusion was performed using 20 ml of untested blood from a healthy cat. We decided to replace Darbapoietin with human erythropoietin, NeoRecormon 100 UI/kg/week and to give Hemovet 1 tablet per day, oral, for 1 week.

After transfusion, HCT values reached 12.3% (reference range 24-45%) and HGB 4.0 g/dL (reference range 8-15 g/dL).

On the 15th of January 2016, renal parameters had the following values: Creatinine 6.1 mg/dL (reference range 0.8-2.4 mg/dL), BUN 55 mg/ dL (reference range 16-36 mg/dL). Ceftriaxone administration was stopped due peritonitis remission.

Between 22nd of January 2016 and 29th of January 2016 the appetite was absent and the patient received a fluidotherapy protocol: i.v. CRI 24h, 10ml/h: NaCl 180 ml, 5% Glucose 60 ml, B_{12} vitamine 200 µg, Arnetin 8 mg, Emeset 2 mg. Peritoneal dialysis was continued with Dianeal PD4 using 4 dialysis per day, 120 ml each.

On the 4th of February 2016, biochemical blood parameters had the following values: Glucose 167 mg/dL (reference range 71-159 mg/dL), Creatinine 4.7 mg/dL (reference range 0.8-2.4 mg/dL), BUN 68 mg/dL (reference range 16-36 mg/dL), TP 5.1 g/dL (reference range 5.7-8.9 g/dL), Albumin 1.7 g/dL (reference range 2.3-3.9 g/dL), ALKP 368 U/L (reference range 14-111 U/L) TBIL 3.6 mg/dL (reference range 0.0-0.9 mg/dL), Amylase 342 U/L (reference range 500-1500 U/L). The patient is still under treatment in this moment.

Throughout the treatment, one tablet of Azodyl was administered after each dialysis and Ipakitine 1g twice a day, dissolved in 5 ml of water, administered orally. The patient received renal diet throughout the treatment.

Blood parameters and biochemical evaluation were performed continuously throughout the treatment every week to record patient's evolution (Table 1).

Table 1. Evolution of biochemical and blood (cell) count during treatment

Parameters	GLU (71-159 mg/dL)	BUN (16-35 mg/dL)	Creatinine (0.8-2.4 mg/dL)	HCT 24.0-45.0%	HGB 8.0-15.0g/dl
24.08.2015	112	124	10.9	17.7	5.1
26.08.2015	134	110	11.0	17.5	5.2
02.09.2015	145	107	9.9	18.2	6.3
09.09.2015	163	75	6.5	17.5	4.8
11.09.2015	132	52	5.2	18.0	5.6
15.09.2015	95	54	5.6	17.3	6.1
19.09.2015	74	40	5.5	17.5	6.0
21.09.2015	128	36	6.2	18.3	5.6
02.10.2015	207	33	5.4	17.5	6.1
09.10.2015	123	37	4.6	17.8	6.0
16.10.2015	178	32	4.8	17.3	6.0
23.10.2015	165	36	4.5	18.4	6.3
30.10.2015	125	45	4.4	17.4	6.0
06.11.2015	129	62	4.2	13.7	4.6
13.11.2015	100	77	5.8	21.5	6.6
20.11.2015	92	78	5.4	23.8	8.1
27.11.2015	94	85	6.9	32.1	9.6
03.12.2015	149	81	8.3	36.5	12.3
07.12.2015	90	90	9.7	19.8	6.4
18.12.2015	110	68	8.7	18.5	6.1
26.12.2015	131	78	7.3	17.5	5.7
01.01.2016	138	60	7.2	9.5	2.9
05.01.2016	183	63	7.0	5.8	1.8
15.01.2016	176	55	6.1	12.4	4.0
22.01.2016	218	52	6.7	11.3	3.8
29.01.2016	117	70	6.9	12.0	3.9
04.02.2016	167	68	4.7	11.2	3.0

CONCLUSIONS

Continuous evaluation of hematological and biochemical blood parameters is vital for the establishment of appropriate therapies in renal patients.

Changing the protocol of peritoneal dialysis from 4 dialysis per day using Dianeal PD4 to 3 dialysis per day resulted in the increase of the values of renal parameters.

Hydroelectrolytic rebalancing associated with continuous peritoneal dialysis, erythropoietin therapy and using appropriate renal diet is the key to success in the intensive care of renal patients.

In the presented case, the use of human erythropoietin, NeoRecormon, in detriment of Darbeopietin had significantly better results.

Administration of Ceftriaxone in a dose of 1000 mg/L dialysate represents the therapeutic solution to arrest peritonitis as a complication of peritoneal dialysis.

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