Scientific Works. Series C. Veterinary Medicine. Vol. LXIV (1), 2018
ISSN 2065-1295; ISSN 2343-9394 (CD-ROM); ISSN 2067-3663 (Online); ISSN-L 2065-1295

PERITONEAL DIALYSIS IN A CANINE PATIENT WITH KIDNEY AND LIVER INJURY CONSECUTIVE TO BABESIOSIS

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Abstract
A 4 year old male Shi-Tzu, diagnosed with babesiosis and kidney and liver failure was treated using peritoneal dialysis for six days along with hidro-electrolytic balancing and parenteral nutrition in the Faculty of Veterinary Medicine's Clinic. At presentation the patient had 6 kg, 39.9˚C, jaundice, apathy, hematuria and lack of appetite. Recommendations were complete blood count, biochemistry blood test and blood cytology. Blood test results revealed elevated levels of blood nitrogen urea (BUN = 71 mg/dl), creatinine (CREA = 4.0 mg/dl) and bilirubin (T-Bil = 11.1 mg/dl). The peritoneal dialysis was performed using Dianeal PD4 1.4%. After six days of intensive care and peritoneal dialysis blood test results were BUN = 19 mg/dl, CREA = 1.0 mg/dl and T-Bil = 0.3 mg/dl.

Key words: *peritoneal, dialysis, injury, kidney, liver.*

INTRODUCTION

Peritoneal dialysis is a modality of renal replacement therapy that is commonly used in human medicine for treatment of chronic kidney disease and end-stage kidney failure. Peritoneal dialysis employs the same principle as other forms of renal replacement therapy: the removal of uremic solutes by diffusion across a semipermeable membrane. In hemodialysis and continuous renal replacement therapy, blood is passed through straw-like semipermeable membranes, which are bathed in a dialysate. By contrast, peritoneal dialysis uses the peritoneum as a membrane across which fluids and uremic solutes are exchanged. In this process, dialysate is instilled into the peritoneal cavity and, through the process of diffusion and osmosis, water, toxins, electrolytes, and other small molecules are allowed to equilibrate. The dialysate is then removed and discarded, carrying with it uremic toxins and water. This process is repeated continuously as needed to achieve control of uremia.

Although peritoneal dialysis is used primarily for the treatment of chronic kidney disease in people, reports from as early as 1923 demonstrate its role in treating acute kidney injury. Its use has also been described for removal of dialyzable toxins and to treat pancreatitis, electrolyte and acid base abnormalities, refractory congestive heart failure, and inborn errors of metabolism. In veterinary medicine, the most common use of peritoneal dialysis is in the treatment of the acute kidney injury, though it can be used for any of the aforementioned indications as well.

One of the most common indications of dialysis in dogs and cats is acute uremia. Dialysis abating rapidly hyperkalemia and can restore the electrolyte balance, helping to stabilize the patient and providing enough time for the renal function to recover at the normal parameters.

Dialysis becomes an option when the clinical consequences of acute uremia can't be managed effectively only medical therapy after 24 - 48 hours.

Dialysis is also effective in the management of chronic kidney disease animals in terminal stages. Dialysis may improve azotemia, electrolyte and acid-base minerals disorders, but also systemic hypertension, which complicates the chronic renal disease in these animals and requiring dialysis indefinitely.

The dialysis technique is perfect for managing specific acute poisonings.

The benefits include the ability to remove toxins which are already absorbed from the intestinal lumen, the elimination of substances

that are not absorbed by the intestinal charcoal, and that both the main compound and the active toxic metabolites can be removed.
Hyperhydration consecutive to systemic arterial hypertension, ascites, limb and pulmonary edema, and congestive heart failure, are a common complication of aggressive fluid based therapy in animals with kidney failure. Circulatory overload may be life threatening and cannot treat oliguric animals. Fluid overload is a constant feature of end-stage renal disease, intravenous or subcutaneous treatments or liquid supplements administered orally. This situation becomes possible when animals have an insufficient capacity to excrete fluids from the organism. These excessive fluid attempts can be easily removed by dialysis ultrafiltration capacity.

MATERIALS AND METHODS

A 4 year old male Shi-Tzu, diagnosed in a private practice with babesiosis and kidney and liver failure was referred to the Clinic of the Faculty of Veterinary Medicine Bucharest on the 13.04.2016 with modified general status, apathy, fever, jaundice and hematuria. Clinical examination: 6 kg body weight, 39.9°C body temperature, mild icteric mucos membranes. The patient was evaluated using CBC, blood biochemistry analysis and cytology exam.
The blood biochemistry analysis on the 13.04.2016, 22:33 pm showed BUN = 22 mg/dl (8.8 - 25.9), CREA = 1.1 mg/dl (0.5 - 1.6), T-Bil = 1.1 mg/dl (0.1 - 0.6), ALP = 225 U/L (10.6 - 150), GPT = 135 U/L(8.2 - 57.3), GOT = 82 U/L (8.9 - 48.5). The CBC showed HCT = 36.3% (37.0 - 55.0), HGB 14.2 g/dl (12.0 - 18.0), RBC 5.56 10^{12}/l (5.50 - 8.50), WBC 2.8 10^{12}/l (6.0 - 17.0), PLT 99 10^{12}/l (200 - 500) on 13.04.2016.
The cytology exam revealed positive Babesia canis infestation.
The recommended treatment for the first 24 hours was hydro-electrolytic balancing and parenteral nutrition.
On the 14.04.2016, at 17:51 pm, the blood biochemistry analysis showed the next results: BUN = 71 mg/dl (8.8 - 25.9), CREA = 4.0 mg/dl (0.5 - 1.6), T-Bil = 11.1 mg/dl (0.1 - 0.6), ALP = can't measure (10.6 - 150), GPT = 143 U/L (8.2 - 57.3), GOT = 212 U/L (8.9 - 48.5). The rest of the biochemical parameters were in normal range.
Between 13 and 14.04.2016 the following treatment was administrated: fluid therapy 6 ml/kg/h with Lactate Ringer and Nephrotect (6 ml/kg/day), B_{12} s.c. 50 µg/kg, once a week and Methylprednisolone 1 mg/kg s.c. twice a day.
On the 14.04.2016 in the afternoon a peritoneal catheter was surgically placed in order to perform peritoneal dialysis.

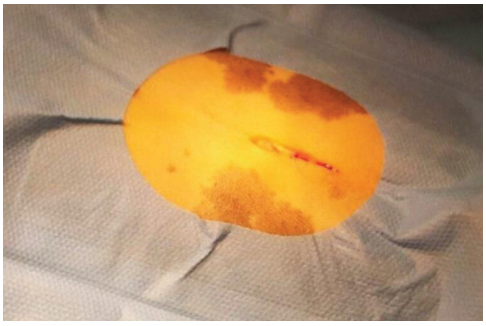

Figure. 1. The incision site, approximately 2 cm below the umbilical scar. (orig.)

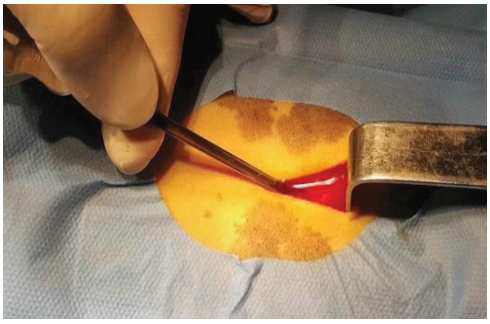

Figure. 2. Visualizing the linea alba in order to open and reach the peritoneum. (orig.)

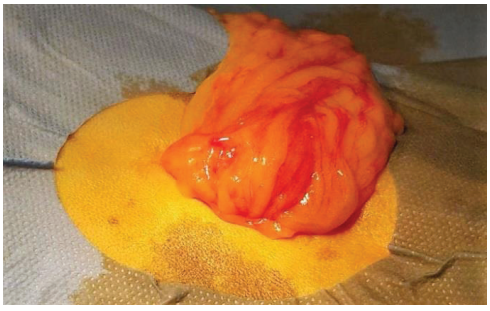

Figure. 3. Visualizing the omentum in order to perform the omentectomy. (orig.)

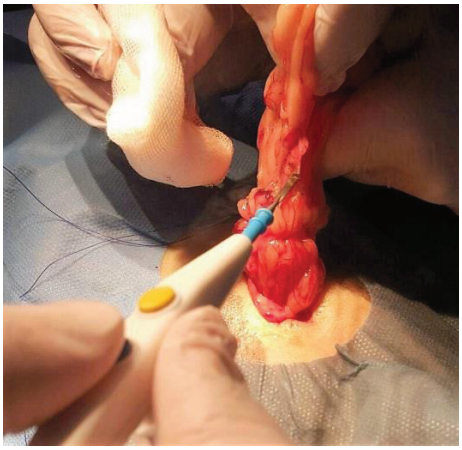

Figure. 4. The omentectomy after ligation, using an electro scalpel. (orig.)

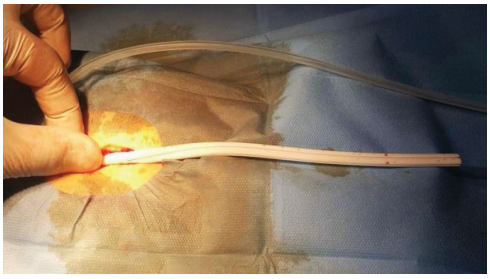

Figure. 5. A measurement of the catheter is done on spot in order to establish the catheter final length. (orig.)

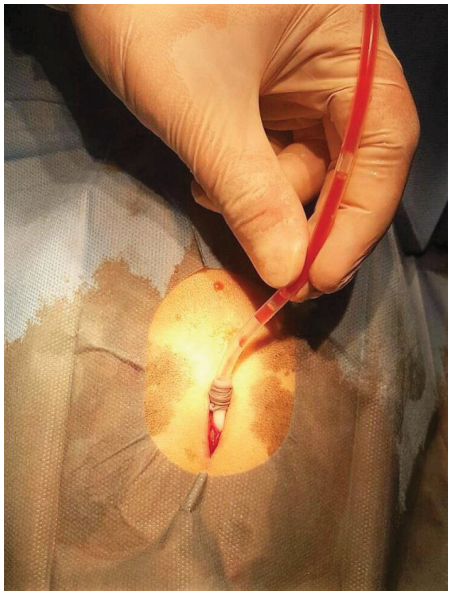

Figure. 6. The suture of the peritoneal catheter cuff, before closing the incision. (orig.)

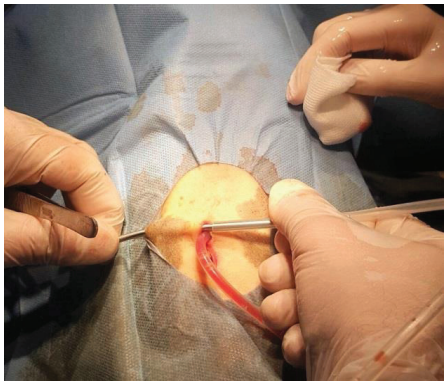

Figure. 7. The catheter passage under the skin. (orig.)

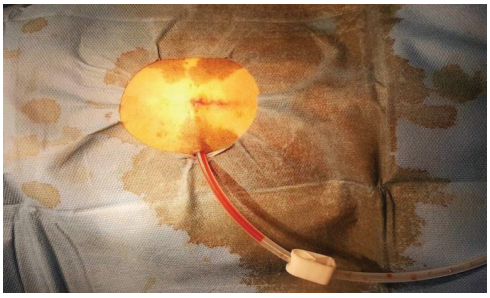

Figure. 8. Final aspect of the peritoneal catheter. (orig.)

Peritoneal dialysis was performed by the following protocol: 19^{00} - 15 ml/kg Dianeal PD4 was administered, after 30 minutes 20 ml was recovered; 20^{00} - 30 ml/kg Dianeal PD4 was administered, after one hour 80 ml was recovered; 22^{00} - 45 ml/kg Dianeal PD4 was administered, after two hours 120 ml was recovered; 00^{00} - 60 ml/kg Dianeal PD4 was administered, after four hour 300 ml was recovered. The therapy continued with 60 ml/kg every 4 hours.

RESULTS AND DISCUSIONS

On the 15.04.2016, after one day of peritoneal dialysis, the blood tests showed: BUN = 56 mg/dl (8.8 - 25.9), CREA = 2.3 mg/dl (0.5 - 1.6), T-Bil = 12.6 mg/dl (0.1 - 0.6), ALP = can't measure (10.6 - 150), GPT = 162 U/L (8.2 - 57.3), GOT = 361 U/L (8.9 - 48.5) and on the 16.04.2016 after two days of peritoneal dialysis BUN = 33 mg/dl (8.8 - 25.9), CREA = 1.4 mg/dl (0.5 - 1.6), T-Bil = 4.3 mg/dl (0.1 - 0.6), ALP = 500 U/L (10.6 - 150), GPT = 178 (8.2 - 57.3), GOT = 152 IU/L (8.9 - 48.5). On the 17.04.2016 BUN = 21 mg/dl (8.8 - 25.9),

CREA = 1.2 mg/dl (0.5 - 1.6), T-Bil = 1.7 mg/dl (0.1 - 0.6), ALP = 522 U/L (10.6 - 150), GPT = 226 U/L (8.2 - 57.3), GOT = 54 U/L (8.9 - 48.5). On the 18.04.2016 BUN = 23 mg/dl (8.8 - 25.9), CREA = 1.5 mg/dl (0.5 - 1.6), T-Bil = 1.0 mg/dl (0.1 - 0.6), ALP = 493 IU/L (10.6 - 150), GPT = 203 U/L (8.2 - 57.3), GOT = 18 U/L (8.9 - 48.5). On the 19.04.2016 BUN = 71 mg/dl (8.8 - 25.9), CREA = 1.0 mg/dl (0.5 - 1.6), T-Bil = 0.3 mg/dl (0.1 - 0.6), ALP = 119 U/L (10.6 - 150), GPT = 29 U/L (8.2 - 57.3), GOT = 12 U/L (8.9 - 48.5).

During the entire hospitalization period the hematology was performed daily and the results were in the normal physiologic ranges.

The fluid therapy was continued until the patient was discharged from the hospital.

On the 18.04.2016 the antidote for Babesiosis was administered (Imidocarb dipropionate 6.6 mg/kg i.m.).

On the 19.04.2016 we have seen an improvement of general patient status, the appetite was present, and the body temperature was 38.6˚C. On the next day, (20.04.2016), the patient was discharged from the hospital.

CONCLUSIONS

Peritoneal dialysis it is extremely laborious, but is a technically simple method and may be performed in any clinic with adequate technical assistance and supervision. Peritoneal dialysis is an effective treatment option for veterinary patients with acute kidney injury refractory to fluid therapy. It can be used as an adjunctive therapy to medical management, or can be used as a temporary means to stabilize a patient prior to a surgical procedure.

Peritoneal dialysis has a high rate of complications, but most of them are manageable with intense nursing care and careful attention to aseptic technique. Understanding the physiology of dialysis and fluid transport through the peritoneal membrane allows the clinician to make informed decisions regarding dialysate dose and treatment regimen.

Peritoneal dialysis is an important modality in the treatment of acute kidney and liver injury, consecutive to Babesia infestation.

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