Peritoneal Dialysis: Key Therapy in Kidney Failure in Small Sized Dogs

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Abstract

Peritoneal dialysis (PD) is a highly effective therapeutic method employed to remove toxic byproducts and metabolites from the body when this role can no longer be fulfilled by the kidneys that are either permanently damaged as in chronic kidney failure, or need time and proper treatment to recover from other diseases of the kidney itself or pathologies that may affect the renal function as they progress. This technique uses the peritoneum ability to act as a filtering membrane, through which the toxins, such as urea and creatinine, pass into the peritoneal cavity, being subsequently removed along with the dialysate.

The study describes the evolution and follows the dynamic of the biomarkers in 5 dogs suffering from kidney failure, that did not respond well to specific treatment and for whom peritoneal dialysis was the best therapeutic approach.

Peritoneal dialysis was performed in 5 dogs, with ages between 5 and 15 years old, during 6 months, using Diaenal PD4 glucose 1.36% W/V/13.6mg/ml produced by Baxter. Blood samples were taken from each dog before the procedure, and then twice a week to monitor the electrolytes, creatinine and urea levels. Also, before introducing the dialysate into the peritoneal cavity, the patients underwent ultrasound examination to evaluate the kidneys and to exclude other problems that would prevent this maneuver, and 2 hours after administering the dialysate to measure the absorption rate.

All 5 patients exhibited an important recovery after 8-14 dialysis sessions, showing that the procedure was able to maintain kidney stability, a fact proved also by the levels of metabolites involved in the clinical evolution. Ecography performed before and after dialysis revealed that the hydration level is key point in the success of the procedure.

Peritoneal dialysis is a more affordable and less invasive procedure to gradually eliminate the uremic toxins. It can offer temporary support for kidneys until the recovery of renal function is done, or when hemodialysis cannot be used as a basic treatment.

Keywords: *dialysis, dogs, failure, kidney, peritoneal*

INTRODUCTION

Peritoneal dialysis (PD) is a highly effective therapeutic method employed to remove toxic byproducts and metabolites from the body when this role can no longer be fulfilled by the kidneys that are either permanently damaged as in chronic kidney failure, or need time and proper treatment to recover from other diseases of the kidney itself or pathologies that may affect the renal function as they progress. This technique uses the peritoneum ability to act as a filtering membrane, through

which the toxins, such as urea and creatinine, pass into the peritoneal cavity, being subsequently removed along with the dialysate. (Bloom and Labato, 2011)

MATERIALS AND METHODS

The research has been carried out in the Clinic of The Faculty of Veterinary Medicine Bucharest in 2014, during six months. Peritoneal dialysis was performed in 5 dogs, with ages between 5 and 15 years old, using Diaenal PD4 glucose 1.36%

Tab. 1. Peritoneal dialysis patient's data

Case number	Patient name	Gender	Weight	Breed	Age (years)	Diagnosis	Dianeal PD4 (ml)
1	JESSE	Female	5,1	Crossbreed	15	Chronic renal failure	165
2	PUFFY	Male	5,7	Pekingese	10	Chronic renal failure	175
3	BILLY	Male	4,7	Crossbreed	7,5	Chronic renal failure	155
4	ALMA	Female	8	Yorkshire Terrier	3	Acute renal failure	270
5	BLAK	Male	7,5	Bichon Maltese	5	Acute renal failure	265

W/V/13.6mg/ml produced by Baxter. A 4.5% solution should only be used when patients are fluid overloaded, and a 1.25% solution is generally adequate in normovolemic patients. (Mathews, 2006).

Standard commercial dialysate solutions are designed to remove urea, creatinine, potassium and phosphate from the plasma into the dialysate by the process of diffusion. A variety of dialysate solutions can be used with differing osmolalities on a case by case basis depending on the fluid balance of the patient. Fluid and solutes move across the peritoneum by diffusion, ultrafiltration and convection. Urea and potassium diffuse across the peritoneal membrane quickly, whereas creatinine and phosphorus take longer to equilibrate (Zabetakis et al., 1993).

The major indication for peritoneal dialysis is renal failure with oliguria or anuria. It may be indicated if the blood urea nitrogen (BUN) concentration is greater than 100 mg/dL (35 mmol/L) or the serum creatinine concentration is greater than 10 mg/dL (884 μ mol/L) and medical management has failed to elicit a positive response (Lew et al., 2005).

Before introducing the dialysate into the peritoneal cavity, the patients underwent ultrasound examination to evaluate the kidneys and to exclude other problems that would prevent this maneuver and 2 hours after administering the dialysate to measure the absorption rate.

A catheter was placed using strict aseptic technique with mild sedation and local anesthesia, because these animals with acute renal failure were generally depressed. The catheter can enter the abdomen on midline or via a paramedian approach, at the level of the umbilicus. The catheter was directed caudally and positioned in the lower pelvis. Catheter placement should be

verified by infusing, and easily retrieving, a small volume of dialysate (2-5 ml) before the catheter is secured. (Cowgill, 1995, Ash, 2003).

Patient parameters were monitored daily, including: perfusion and hydration (PCV/TP), blood pressure, heart rate, urine output, temperature, CVP; respiration (respiratory distress can occur from over distention of the abdomen or leakage of dialysate into the pleural cavity).

Three of the five dogs were diagnosed with chronic renal failure and two of them with acute renal failure. The amount of dialysate solutions used in this study is 1 liter for each 1m³ body surface. The dialysate was maintained into the peritoneum for four hours in each case and then it was drained out by gravitation through the catheter.

All five dogs were treated with IV fluids and antibiotics prior to peritoneal dialysis. Median age presentation was 8 years (range 3–15 years). At the start of peritoneal dialysis median BUN was 160 mg/dl (range 97–230) and median creatinine was 11,68 mg/dl (range 10,9–13,8), (Table 1).

Peritoneal dialysis was conducted at every two days in all cases and blood samples were taken from each twice a week to monitor the electrolytes, creatinine and urea levels.

RESULTS AND DISCUSSION

All 5 patients exhibited an important recovery after 8-14 dialysis sessions, showing that the procedure was able to maintain kidney stability, a fact proved also by the levels of metabolites involved in the clinical evolution.

Ecography performed before and after dialysis revealed that the hydration level is key point in the success of the procedure.

Tab. 2. The initial and final BUN and creatinine values of the patients submitted to peritoneal dialysis

Case number	Patient name	Initial BUN (mg/dL)	Initial Creatinine (mg/dL)	Final BUN (mg/dL)	Final Creatinine (mg/dL)	PD duration (days)	Dialyze session
1	JESSE	174	13,8	44	3,1	29	13
2	PUFFY	230	11,0	42	2,9	20	10
3	BILLY	147	10,9	35	2,3	18	9
4	ALMA	153	11,1	38	2,0	16	8
5	BLAK	97	11,6	25	2,0	16	8

The amount of peritoneal fluid drained from the patient's peritoneum is proportional with the effect of the dialysis and it depends on the patient's hydration level. In all five cases, the amount of peritoneal fluid collected after four hours by gravitation through the catheter was bigger than the amount of the dialysate introduced into the peritoneal cavity.

All five dogs were medically stable at the end of the procedure. Median duration of peritoneal

dialysis was 20 days (range 16–29 days) and the median number of the dialyze session was 9,6 (8–13 sessions). Azotemia decreased in all dogs during peritoneal dialysis. At the end of peritoneal dialysis median BUN was 36,8 mg/dl (range 25–44) and median creatinine was 2,46 mg/dl (range 2,0–3,1 mg/dl), (Table 2).

One of the most common complications is infection at the catheter insertion site. We have encountered no case of peritonitis, although in the literature (Bhatt, 2011) are cited frequent cases.

Our results are comparable to those obtained in the literature (Bhatt, 2011, Cowgill, 1995), the treatment duration was shorter in acute cases and longer in the chronic ones.

We have recorded all patient's data and all the results were inserted into charts to be able to follow the descending trend of the urea and creatinine (Fig. 1, 2).

Fig. 1. Evolution of the patient's urea following dialysis treatment. **Fig. 2.** Evolution of the patient's creatinine following dialysis treatment.

CONCLUSION

The average duration of peritoneal dialysis was 20 days (range 16–29 days) and the average number of the dialyze session was 9,6 (8–13 sessions).

At the end of peritoneal dialysis median BUN was 36,8 mg/dl (range 25–44) and median creatinine was 2,46 mg/dl (range 2,0–3,1 mg/dl).

Peritoneal dialysis is a more affordable and less invasive procedure to gradually eliminate the uremic toxins in management of acute kidney injury refractory to fluid therapy. It can offer temporary support for kidneys until the recovery of renal function is done, or when hemodialysis cannot be used as a basic treatment.

REFERENCES

1. Ash SR (2003) Chronic peritoneal dialysis catheters: overview of design, placement and removal procedures. *Semin Dial*; 16(4):323–334.
2. Bhatt RH, Suthar DN, Ukani JR (2011). Peritoneal dialysis in acute renal failure in canines: A review, *Vet. World*, 4 (11):517-521.
3. Bloom CA, Labato MA (2011). Intermittent hemodialysis for small animals. *Vet Clin North Am Small Anim Pract*. 41(1):115-33.
4. Cowgill LD (1995). Application of peritoneal dialysis and hemodialysis in the management of renal failure. In: ed. Canine and Feline Nephrology and Urology. Baltimore: Lee and Feberger.
5. Lew S, Kuleta Z and Pomianowski, A. (2005) Peritoneal dialysis in dogs and cats. *Pol J Vet Sci*.8(4):323-327.
6. Mathews KA (2006). Peritoneal Dialysis. In: *Veterinary Emergency and Critical Care Manual* 2nd ed. Guelph, Canada: Lifelearn Inc. 723–726.
7. Zabetakis PM, Krapf R, DeVita MV (1993). Determining peritoneal dialysis prescriptions by employing a patient-specific protocol. *Peritoneal Dial Int*; 13:189–193.