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PERITONEAL DIALYSIS USING IMPROVISED PD CATHETER AND SELF-CONSTITUTED DIALYSIS SOLUTION

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ABSTRACT

Objectives and Study: Acute renal failure is a potentially reversible condition if the appropriate intervention is instituted in a timely manner. In developing countries, however, many children die from ARF largely due to lack of facilities for dialysis. But peritoneal dialysis (PD) is a simple procedure that only requires the instillation into the peritoneum of solution containing the appropriate substances in their right concentrations. In this report, I share my experience of performing acute PD using improvised PD catheter and self-constituted PD solution.

Methods: A 1-year old girl was referred to our hospital after failing to pass urine for 1 week despite fluid and diuretic challenge. She had been admitted with fever, decreased urine output and startling attack.

On arrival, an in-situ urinary catheter only had scanty, concentrated urine limited to catheter lumen.

Acute PD was performed using size 12 thoracic trocar catheter and self-constituted PD fluid.

Results: For 31 days on admission, urine output remained $< 0.15\text{ml/kg/hr}$. The PD functioned effectively over the 31-day period with significant improvement in the biochemical parameters.

Conclusion: Acute PD can still be performed in areas where traditional PD catheters and solutions are not available.

Introduction

Acute renal failure (ARF), now referred to as acute kidney injury, remains a significant contributor to morbidity and mortality of ill infants and children worldwide.¹ Renal replacement therapy (RRT) such as dialysis has been a known life-saving intervention in such situations for many years.² Whilst nephrologists in well resourced countries battle with the choice of modality of RRT to use in cases of ARF,³ their counterparts in resource-constrained areas are often helpless due to the lack of resources for such interventions. The result is that many children in need of this therapy are left to die. But peritoneal dialysis (PD) is simple and relatively cheap procedure that can be performed easily even in areas where standard PD catheters and solutions are not available. PD involves the instillation of solution of appropriate constituents and osmotic concentration into the peritoneal cavity to allow for solute and water removal by diffusion, osmosis and convection. Historically, PD

has been the primary RRT modality in paediatric care though many well-resourced countries now have the option of other newer modalities.³ This, notwithstanding, PD continues to be used extensively in many resource-constraint countries.^{4,5}

In this article, I share my experience of how an acute PD was carried out successfully using improvised catheter and self-constituted PD solution in a place where RRT for children does not exist.

Case

A 1-year old girl was referred to our hospital on account of anuria for 1 week. She had been admitted with fever, decreased urine output and startling attack.

On arrival, an in-situ urinary catheter only had scanty, concentrated urine limited to catheter lumen.

Physical findings on examination:

Puffy face and pedal oedema. Weight -9 kg, Height -75 cm, temperature -37⁰C, Pale (PCV -18%), Random blood sugar -9.8 mmol/l

CVS:

BP-90/50mmhg (both systolic and diastolic < 90th centile for age, height and sex), pulse -128 bpm, CRT-< 2 sec, heart sounds I & II present and normal, no added heart sounds.

Chest:

RR-28 cycles per min, good air-entry, clear lung fields on auscultation

Abdomen:

Full, soft, non-tender, no organomegaly, no ascites, urinary bladder not palpable.

CNS:

Conscious but lethargic, Blantyre coma score -5/5, No meningism, normal tone power and reflexes

Baseline labs

Hb-5.1g/dl, WBC-25.4 x 10⁹/l (neutrophil 39%, lymphocyte 44.3%, monocyte 12.6%, basophil 3.5%, eosinophil 0.6%), Platelet-241 x 10⁹/l, Reticulocyte count 3.3%, No malaria parasites seen.

Blood film comment: microcytic hypochromic red cells with occasional fragments. Clumps of platelets but adequate number.

Blood urea >40mmol/l, creatinine 895 µmol/l, calcium 2,0mmol/l, magnesium >2.5mmol/l, PO4 2.97mmol/l, Na 132, K 6.4, Cl 107 mmol/l, total protein 42.1g/l. PH 7.2, SBC 8.1, BE -19.

Abdominal ultrasound showed enlarged kidneys with reduced corticomedullary differentiation. Hyperechoic cortices with hypoechoic pyramids. No hydronephrosis. Bladder underfilled.

On account of anuric ARF, PD was instituted using size 12 thoracic trocar catheter (Figure 1) and self-constituted PD fluid. Table1.

Haemotransfusion of packed red cells -180mls-was given once positive ultrafiltrate was registered

Table 1: 2.5% PD solution formula –self-constituted (modified from Red Cross hospital’s protocol, S/Africa)

Ingredient	5% dextrose	0.9% NaCl	8.4% NaHCO ₃	10% Ca gluconate	20% NaCl	Heparin	Cefotaxime
Amount in 1-litre dialysis solution	500ml	500mls	40mls	7.5mls	8mls	1000 U	125mg



Figure 1: Improvised equipments and solution used in the procedure (left). PD set up (right).

Results

For 31 days, the patient remained anuric (urine output < 0.15ml/kg/hr). The improvised PD functioned effectively with marked improvement in the clinical and biochemical parameters. Table 2.

Table 2: Serum chemistry flow chart of patient.

Day on PD	Urea mmol/l	Creatinine μ mol/l	Na+ mmol/l	K+ mmol/l	Cl- mmol/l	Ca ++ mmol/l	Mg++ mmol/l	PO4- mmol/l	Blood gas	Urine output /24hrs
0 (pre-dialysis)	>40	895	132	6.4	107	2.0	>2.5	2.9	PH 7.2 SBC 8.1 BE -19	0 ml
14	16.6	361	132	4.7	98	1.7	0.5	2.9	-	10 in 48hrs
31	14.6	133	124	5.1	96	1.6	0.8	1.9	pH 7.4 SBC 19.4 BE -4	10 mls

Discussion

Peritoneal dialysis as a form of RRT was first reported in 1949 as a manual procedure without the use of sophisticated equipments and standard PD solutions.⁶ Since then, the procedure has seen many more innovations including variety of PD catheters and solutions, as well as automation. For many resource-constraint countries, however, the procedure is still lacking, six decades along history, due to lack of expertise and resources. Thus, the case under discussion is a reminiscence of the 1949 procedure. This challenge, notwithstanding, the improvised PD used in this case study worked very well. The improved biochemical parameters (Table 1) in this

child who had anuria for 1 month attest to the effectiveness of this improvised PD. It reinforces the fact that PD can be performed in areas where standard PD catheters and solutions are not available. Though infection is a major complication of PD generally, and particularly for such improvised PD, diligence to aseptic technique and handling of all exchanges ensured that no peritonitis was recorded in this patient over the entire 1-month duration of the procedure. The management of this patient in an ICU setting with relatively aseptic milieu, and where high level asepsis is practised, could account in part for the non-occurrence of peritonitis. The addition of prophylactic antibiotics to the self-constituted PD fluid might also be a contributing factor.

Conclusion

Where standard PD catheters and solutions are not available, acute PD could still be performed with sheer ingenuity to save children with acute renal failure.

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