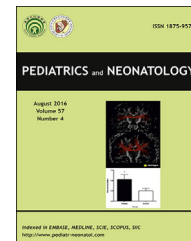


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Original Article

Acute peritoneal dialysis in neonatal intensive care unit: An 8-year experience of a referral hospital

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Key Words

acute peritoneal dialysis;
complication;
mortality;
neonatal intensive care unit;
newborn

Abstract *Background:* The aim of present study was to evaluate the indications, complications and outcomes of acute peritoneal dialysis (APD) in neonates at a referral university hospital during the previous 8 years.

Methods: This retrospective analysis included a total of 52 newborn infants who underwent APD in a neonatal intensive care unit between January 2008 and March 2016. Demographic, clinical, laboratory and microbiological data were extracted from patients' medical files.

Results: The primary causes for requiring APD were acute tubular necrosis (n = 36, 69.2%), inborn error of metabolism (n = 10, 19.2%), congenital nephrotic syndrome (n = 2, 3.9%), bilateral polycystic kidney (n = 2, 3.9%), renal agenesis (n = 1, 1.9%), and obstructive uropathy (n = 1, 1.9%). The mean duration of APD was 8.7 ± 15.87 days (range: 1–90 days). Procedural complications were mainly hyperglycemia (n = 16, 47.1%), dialysate leakage (n = 7, 20.6%), peritonitis (n = 3, 8.8%), catheter obstruction (n = 3, 8.8%), bleeding at the time of catheter insertion (n = 2, 5.9%), catheter exit site infection (n = 2, 5.9%), and bowel perforation (n = 1, 2.9%). There were 40 deaths (76.9%), mainly due to underlying causes. Ten of the 12 survivors showed full renal recovery, but mild chronic renal failure (n = 1) and proteinuria with hypertension were seen (n = 1) in each of remaining patients.

Conclusion: Peritoneal dialysis is an effective route of renal replacement therapy in the neonatal period for management of metabolic disturbances as well as renal failure. Although

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major complications of the procedure are uncommon, these patients still have a high mortality rate due to serious nature of the underlying primary causes.

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1. Introduction

Peritoneal dialysis (PD) offers a nonvascular route of renal replacement therapy for pediatric patients including newborn infants with renal failure and certain metabolic disturbances; thus, approximately half of the patients on dialysis are treated by this method.^{1–3} This process uses the patient's peritoneum as a membrane across which fluids and dissolved substances (electrolytes, urea, creatinine, glucose, osmotically active particles, and other small molecules) are exchanged from the blood. Peritoneal dialysis is used as an alternative route to hemodialysis. It has comparable risks but is a significantly less costly and easily implementable method in most countries, and its primary advantage is the ability to undertake treatment without visiting a medical facility. The primary complication of this procedure is infection due to the presence of a permanent tube in the abdomen.^{4,5} Over the years, acute PD (APD) has become an effective and increasingly popular alternative to hemodialysis in the management of critically-ill pediatric patients, including newborn infants.

A large series detailing the experience with APD in newborn patients is lacking. Therefore, the aim of present study was to evaluate the indications, complications and outcomes of APD in neonates at a referral university hospital over a period of 8 years.

2. Methods

The study included a total of 52 neonates who underwent APD between January 2008 and March 2016 in a tertiary neonatal intensive care unit (NICU) of referral university hospital. Demographic characteristics and clinical data of the patients were extracted from their medical records. The indications, complications and outcomes of APD were reviewed.

The decision for dialysis was made by both pediatric nephrologists and neonatologists. Indications for APD were classified into the following^{2–4}:

- Resistant electrolyte abnormalities such as hyperkalemia with no response to the medical treatment and usually proved by electrocardiography
- Fluid overload, edema
- Oliguria
- Persistent metabolic acidosis
- Symptoms of uremia (e.g., convulsions, hypoactivity-lethargy)
- Inborn errors of metabolism (e.g., hyperammonemia)
- Requirement for increased fluid intake to achieve adequate nutrition in a patient who has oliguria

Peritoneal dialysis catheters were placed percutaneously under sterile conditions with local anesthesia. The catheter type used was a neonatal single-cuff straight catheter (Tenckhoff). The catheters were threaded through the opening in the peritoneum and directed into the pelvis. The standard dialysate solutions with dextrose concentrations of 1.36%, 2.27% and 3.86% were used. Heparin was added to dialysis fluid at a dose of 500 U/L if any fibrin particle was seen. To avoid peritoneal leakage, dialysis was started by small exchange volumes (20 mL/kg). The volume was increased to 30–50 mL/kg if the respiratory and cardiac status of patients permitted it. Peritoneal exchanges were performed for days with 1–3 h dwell time according to the particular needs of each patient. The vital signs (temperature, pulse, respiratory rate, and blood pressure) were evaluated at the beginning and end of each exchange cycle. Effectiveness of PD was measured with the improvement of hyperkalemia, uremia, metabolic acidosis, fluid overload, or hyperammonemia.

Hyperglycemia was defined as a blood glucose level of >125 mg/dL or a plasma glucose level of >150 mg/dL.⁶ Peritonitis was suspected if patients had cloudy dialysate effluent or fever. The diagnosis of peritonitis was made by the presence of ≥ 100 white blood cell/ml, with neutrophil count exceeding 50% of total, and a positive culture of the peritoneal fluid.⁷ An exit-site leakage was considered if there was any dialysate moisture around the PD catheter. Catheter obstruction was defined as slow drainage of the dialysis fluid, the need to irrigate, or dysfunction of the catheter. In the case of any obstruction, a new peritoneal catheter was inserted.

Statistical analysis was performed using the IBM SPSS Statistics for Windows, Version 22.0. (Armonk, NY: IBM Corp.). Data were expressed as the median and interquartile range for quantitative non-parametric measures, and the mean and standard deviation for parametric data. The factors associated with mortality were analyzed using the chi-square test. A p value ≤ 0.05 was considered significant.

3. Results

During the past 8 years, of 4663 neonates admitted to the NICU, 52 (1.1%) underwent APD procedure. Of these 52 neonates, 28 (53.8%) were full-term, and 24 (46.2%) were preterm ($P > 0.05$). According to birth weight; low birth weight, very- (VLBW) and extremely low birth weight (ELBW) were present in 12, 7, and 4 babies, respectively. Of the cases, 25 (48.1%) were male, 27 (51.9%) were female ($P > 0.05$). The mean gestational age was 35.5 ± 5.18 weeks (range: 24–40 weeks), and the mean birth weight was 2430 ± 928 g (range: 580–4000 g). In general, the mean

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