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Hemodialysis in a Child with Pyelonephritis and Nephrolithiasis

by

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Introduction

The principles of dialysis were first described by Abel, Rowntree and Turner in 1912 and are still applicable at present. Kolff in 1943 provided the first rotating drum dialyzer. According to Fine et al. (1968), hemodialysis has become acceptable as preparation of renal homotransplantation in chronic renal failure.

In 1963 Walker and associates reported a successful hemodialysis in a 7-month-old baby with nephrotic syndrome. Mauer et al. in 1973 reported a prolonged hemodialysis in a baby with a body weight of 4 kg, starting at the neonatal period as a preparation of a subsequent successful renal transplantation.

Several events of hemodialysis among adults have been published in Indonesia; this report might be the first done in a child.

Case report

Swd., an 11-year-old Indonesian boy was admitted to the Pediatric Department of the Dr. Sutomo General Hospital, Surabaya, on April 30, 1973, with the history of swelling of the face since three months, back pain, oliguria, pyuria, sometimes fever and cough.

He was the sixth child of a family with 8 children. On admission his body weight was 17,6 kg, the temperature was 37° C, the pulse rate was 100/minute, and his blood pressure was 120/100, the respiratory rate was 40/minute; edema on his face was clearly present. Lungs and heart were normal, the liver and spleen were not palpable.

Urinalysis revealed albuminuria, many leucocytes, few erythrocytes per high power field, leucocyte casts and tubular epithelial cells.

The supra pubic aspirated urine culture revealed Paracolon bacilli of more than 100.000 per mm³ of urine. Blood analysis showed hemoglobine of 13 gm%, WBC of 8200 per mm³, blood sedimentation rate 54 — 86 within 1 — 2 hours, BUN of 42,5 mg per 100 ml, serum creatinine of 2,78 mg per 100 ml, a cholesterol level of 228,2 mg per 100 ml, a total serum protein of 7,56 gm%, albumin 3,13 gm% and globuline 4,4 gm%. The serum electrolytes were analysed for K 3,22 mEq/L, Na 127,7 mEq/L, Cl = 100 mEq/L.

The abdominal plain photo and intravenous pyelogram showed a nephrolithiasis duplex (fig. 1); both kidneys did not function at all and were of more than normal size. A small ureter stone on the right side and a 2 × 1½ cm stone in the bladder were visible.

The patient was referred to the Surgical Department where he underwent surgery and was subsequently discharged on demand of the parents. On July 21, 1973, the boy came again with the same complaints of oliguria, pyuria, sometimes hematuria and abdominal pain. Two days before readmission he had nausea and vomiting. He looked very sick, pale and was soporic with episodes of excit-

ement. Edema was absent but hematemesis occurred. The temperature was 38.5° C, the pulse rate 104/minute and the blood pressure was unmeasurable. Pus was present on the post operative wound which remained open. Blood examination showed a hemoglobine concentration of 7 gm%, a leucocyte count of 22.000 per mm³. Urinalysis could not be done due to anuria in the first 4 days of admission.

On admission infusion of glucose 10 % and Penicillin Procaine 600.000 U were administered followed by blood transfusion on the next day. The blood pressure became normal, i.e. 110/80, but the boy remained unconscious. The BUN was 115 mg per 100 ml, the serum creatinine 16,7 mg per 100 ml, the serum electrolytes were for CO₂ 16,0 mM/L, Na 83,3 mEq/L, K 5,80 mEq/L and Cl 60 mEq/L. The present diagnosis was nephrolithiasis with pyelonephritis resulting in renal failure. It was then decided to perform hemodialysis with the following method:

Shunting was done on the left saphenous vein and left superficial femoral arteria. Disposable Coil Kidney from Travenol Laboratory was used according to Kolff principles.

The dialysing fluid consisted of:



FIG. 1 : *Abdominal plain photo showed a Nephrolithiasis duplex in both kidneys, an ureter stone on the right and a 2 × 1½ cm stone in the urinary bladder.*

A. Component	/100L	Na+	K+	Mg++	Ca++	Cl-	HCO ₃
NaCl	570 =	97	—	—	—	97	—
NaHCO ₃	300 =	36	—	—	—	—	36
KCl	30 =	—	4	—	—	4	—
CaCl ₂	28 =	—	—	—	5	5	—
MgCl ₂	7,5 =	—	—	1,5	—	1,5	—
Total		133	4	1,5	5	107,5	36

B. Glucose of 400 mg% was added, and lactic acid was given to adjust the pH to approximately 7.4.

To maintain the pH during dialysis, 90% of oxygen with 10% of CO₂ was conducted through the fluid to bubbles.

The heparin used consisted of 10 mg/100 ml applied in the cannula,

and 100 USP units per kg of body weight were given at the beginning of the hemodialysis.

For priming 3 units (250 ml per unit) of fresh blood in disposable plastic bags with a speed of 30 - 40 ml/minute were administered.

The hemodialysis lasted 3 hours and 25 minutes (see table 1).

TABEL 1: The recording during the hemodialysis

Time	Blood pressure	Symptoms
10.30 (start) a.m.	unmeasurable	irritable (inalert)
10.50 "	115/90	tremor
10.55 "	115/90	restless/excited (5 mg Valium injection was administered)
11.26 "	105/85 speed = 30/min.	
11.47 "	95/80	
12.10 "	120/—	
12.15 "	110/— speed = 40/min.	
13.10 "	120/—	
13.55 (finish) "	115/—	patient became alert, no tremor
14.15 (back in the ward)	120/85	pulse rate = 132/min pulse rate = 132/min

The next day after hemodialysis the patient's condition improved, he could chat with his mother; the blood pressure was 105/80 but there was still oliguria (100 - 200 ml/24 hours) and pyuria. 500 mg Penbri-tin was administered intramuscularly, divided in 3 doses combined with Kantrex 15 mg per kg body weight, divided in 2 doses; these antibiotics were given since the day of hemodia-lysis for 7 consecutive days.

Two days after hemodialysis the cannula was removed. The hemoglo-

bine concentration became 12 gm% and the child's condition improved considerably. However, on the sixth day after hemodialysis the general condition worsened: hematemesis, melaena occurred and the blood pres-sure went down to 100/70. Blood transfusion was instituted to correct the anemia.

Four days later the boy fell in a coma, anuria became evident, but a second hemodialysis was refused by the parents who took the boy home.

TABEL 2 : Laboratory data predialysis, during dialysis and postdialysis

	Pre dialysis	during dialysis		post dialysis	
		2¼ hrs	3¼ hrs	6th day	9th day
BUN (mg%)	115	104	36,2	115	160
Creatinine (mg%)	16,7	3,2	1,73	5,71	3,84
CO ₂ (mM/L)	16,0	13,6	15,4		6,8
K (mEq/L)	5,8	4,55	3,56		
Na "	83,8	132,3	134,2		
Cl "	30	80	90		
P "		5,7	2,5		
Ca "		13,4	13,4		55
Proteins (serum):					9,5
Total (gm%)				5,1	6,6
Albumin "				2,36	
Globulin "				2,74	
Cholesterol (mg%)				176,9	4,45
					2,15

Discussion

Clinical symptoms such as sopor, acidosis, uncontrolled movements, hematemesis, anuria and laboratory findings of a high BUN, hyponatremia, elevation of potassium content

and increased creatinine concentration, confirmed that the patient was in a severe uremic stage.

According to the literature, chronic renal failure occurs when the number of effective nephrons are re-

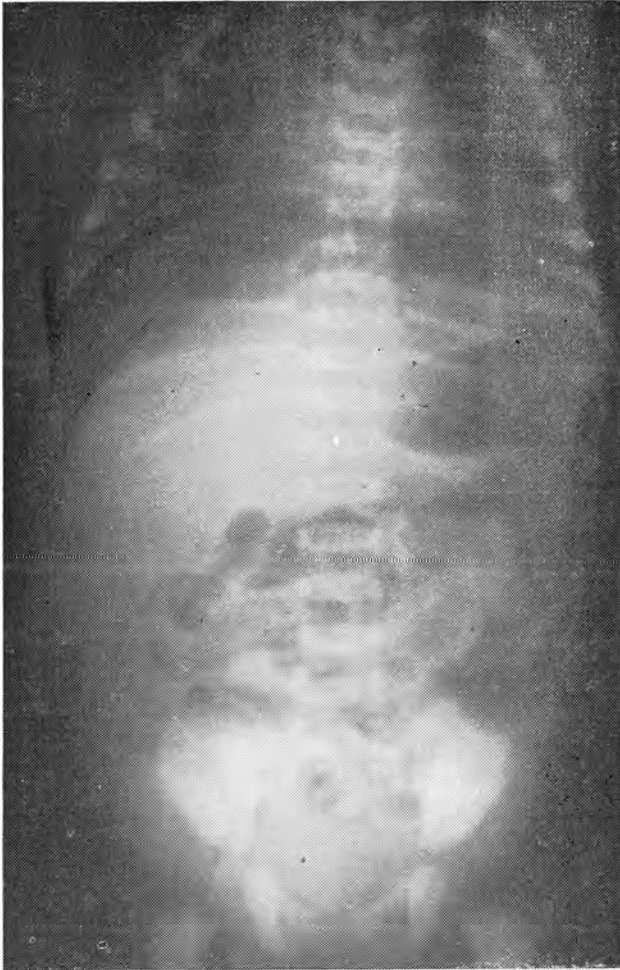


FIG. 1 : *X-photo of the abdomen (upright position) showed the presence of free air in the abdominal cavity.*



FIG. 2 : *X-photo of the abdomen (lateral decubitus position) showed the presence of free air in the abdominal cavity.*

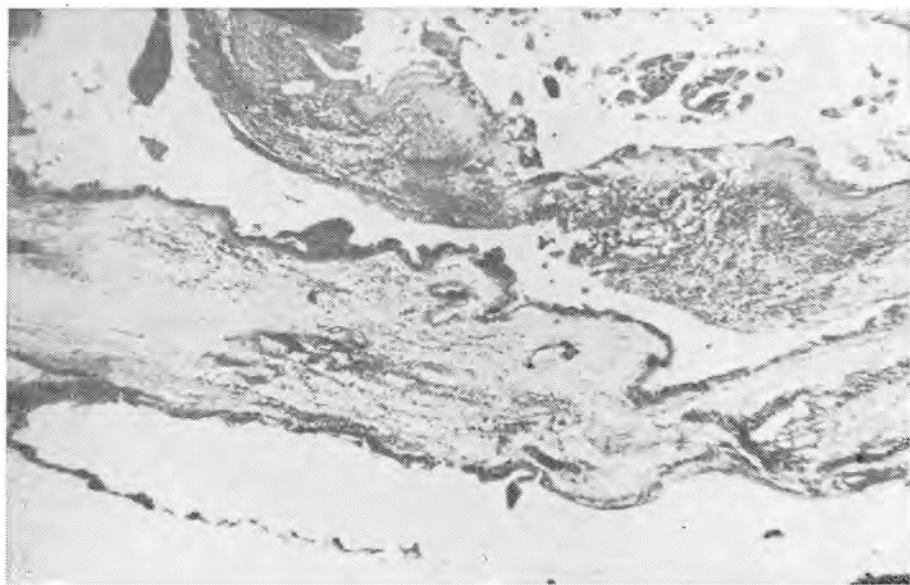
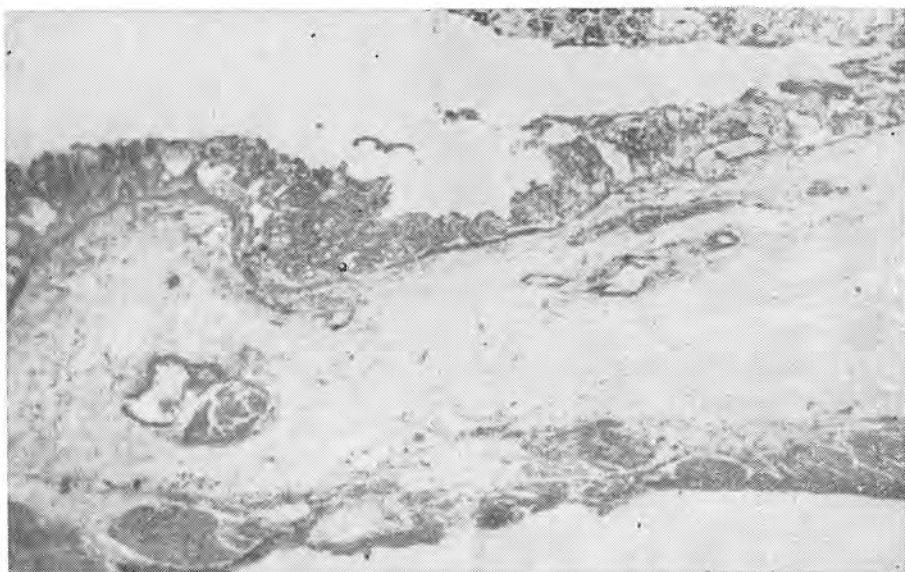


FIG. 3 & 4 : *P.A. No. 716398, H & E stain, X 35. Deficiency of muscularis of the stomach at the site of perforation.*

duced below the level required for normal function by the gradual progress of some disease process (Miller et al., 1966). In our case, recurrent pyelonephritis and chronic obstruction of the urinary tract by nephrolithiasis caused destruction of the majority of nephrons so that the remaining nephrons became hypertrophied in order to maintain the normal function. However, destruction progresses so that the final outcome is a severe chronic renal failure.

Hemodialysis was indicated in our patient to obtain a better physical condition for the next step of operation (Kolff, 1960 and Potter, 1970). Regular hemodialysis is purely palliative and is most successful in those in whom renal failure is only slowly progressive, such as in chronic pyelonephritis (Miller et al., 1966). The difficult problem in our patient is how to overcome the overwhelming infection of the recurrent pyelonephritis.

Various authors reported that the most common difficulty in the procedure was the installation of the ca-

theter through the small vessels of the children. Fine and associates (1970) suggested to use the radial artery and forearm vein in children with a body weight of more than 30 kg, the brachial artery and cephalic vein in younger children of less than 30 kg of body weight and the superficial femoral artery and saphenous vein in infants (less than 10 kg).

Minimal difficulties were encountered with the silicone rubber polytef arteriovenous cannula. We experienced the same difficulty in preparing cannulation in our patient but nevertheless the cannula could be maintained in its place for two days.

Summary

Hemodialysis as a first experience, done in an 11-year-old Indonesian boy with chronic uremia, pyelonephritis and nephrolithiasis has been reported.

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Summary

Hemodialysis as a first experience done in an 11-year-old Indonesian boy with chronic uremia, pyelonephritis and nephritis has been reported.

Acknowledgments

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