Comparative Study of Haemodialysis and Peritoneal Dialysis

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Summary

The efficacy of haemodialysis and peritoneal dialysis was studied in 30 patients. Blood urea, serum creatinine, serum electrolytes and hydrogen ion concentration were used as parameters. Fifteen patients were haemodialysed while the remaining fifteen underwent peritoneal dialysis. Though the series is relatively small for any conclusions, it never-the-less strongly suggests that haemodialysis is superior to peritoneal dialysis in ameliorating the metabolic and biochemical derangements of acute as well as chronic renal failure.

Introduction

Haemodialysis and peritoneal dialysis are well established procedures of managing acute as well as chronic renal failure. Each method has its merits and limitations. Financial consideration, availability of equipment and technical personnel and clinical evaluation of the patient as a whole determine the choice of one method or the other. The present paper was intended to evaluate the efficacy of the two methods.

Material and Methods

Thirty patients suffering from acute or acute-on-chronic renal failure were shifted to the Intensive Care Unit of Lady Reading Hospital, Peshawar, from the medical and surgical wards of this hospital. They were randomly allocated 15 patients each to either haemodialysis or peritoneal dialysis group. Patients with contraindication to either procedure were excluded from the study. Lack of access to a suitable blood vessel, recent laparotomy, cardiovascular instability and contraindication to systemic anticoagulation were considered grounds for exclusion.

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Haemodialysis

Haemodialysis was carried out for 4 hours with the hollow-fibre dailyser of one square meter effective surface area. Blood flow was commenced at a rate of 50–100 ml per minute, gradually increased to 200 ml per minute by the end of first hour and then maintained at that rate till the end of procedure. The dialysate flow rate was raised from the initial 200 ml/minute to 500 ml/minute by the end of first hour. A bolus of heparin (5000 units) was mixed with the priming solution. Another 2500 units were injected into the arterial line every hour. The same commercial dialysis solution with the following composition was used in all cases of haemodialysis :–

Sodium	134	mEq/L
Potassium	2.6	mEq/L
Calcium	2.5	mEq/L
Magnesium	1.5	mEq/L
Chloride	104	mEq/L
Acetate	36.6	mEq/L
Dextrose Anhydrous	2500	mg/L

Peritonial Dialysis

A hard, sterile PVC catheter of 6mm diameter was placed in the peritoneal cavity with strict aseptic care and secured with a purse-string suture. The dialysis was carried out for 20 hours in two 10 hours sessions with a break for 4 hours. The initial 10 hours exchange volume was kept at 1000ml and the dialysate was left in the peritoneal cavity for 15 minutes to equilibrate thus achieving a flow rate of 2L/hour. In the next session, the exchange volume was increased to 2000ml and the solution was left in the peritoneal cavity for 30 minutes. Heparin (500 units/L) and Ampiclox 250mg/L were added to the dialysate.

Peritoneal solution with the following composition was used :–

Each 1,000ml contain :–

Sodium Chloride	5.650g
Calcium Chloride	0.294g
Magnesium Chloride	0.153g

Sodium Lactate	4.880g
pH	4.5 ~ 7.5
Glucose	15.000g

Electrolyte composition :–

Sodium	140 mEq/L
Calcium	4.0 mEq/L
Magnesium	1.5 mEq/L
Chloride	102.0 mEq/L
Lactate	43.5 mEq/L
Glucose	15 g/L

Discussion

The pre– and post–dialysis results of peritoneal dialysis and haemodialysis were compared statistically at various levels of significance. In case of peritoneal dialysis, only blood urea gave significant difference at 1% level of significance. No significant changes occurred in serum creatinine, serum sodium, serum potassium and pH at 5% level of significance. In cases of haemodialysis, blood urea, serum creatinine and serum potassium gave statistically significant difference at 0.1% level of significance. No significant changes occurred in the concentrations of serum sodium and pH at 5% level of significance. (Table I to IV).

Hence comparing the results of the two methods, one can conclude that haemodialysis is the more reliable method in getting significant results.

A by-product of this study was the average for the concentrations of blood urea and serum creatinine at which the adult patients of the Province develop "uraemic" symptoms. In this series, symptoms developed when the blood urea reached 263±75.71mg/100ml and/or when the serum creatinine rose to 12±5.04 mg/100 ml.

Conclusion

Though the series is relatively small for any conclusions, it never-the-less strongly suggests that haemodialysis is superior to peritoneal dialysis in ameliorating the metabolic and biochemical derangements of acute as well as chronic renal failure. It is recommended that further evaluation of the two modes of dialysis be persued in a large series of patients.

HAEMODIALYSIS

TABLE I. Pre-dialysis and Post-dialysis parameters

S. No.	Admission Number	Age	Sex	Blood Urea (mg%)		S. Creatinine (mg%)		S. Na.[1] (mEq/L)		S.K.[2] (mEq/L)		pH	
				Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1.	468/3	35	M	250	105	13.5	7.5	124	134	5.6	4.5	7.38	7.37
2.	509/45	30	F	265	180	13.8	9.3	117	129	5.2	3.9	7.28	7.40
3.	537/17	40	M	194	80	8.5	5.5	132	136	4.0	4.0	7.24	7.32
4.	646/10	25	M	270	110	20.0	9.0	128	140	5.3	3.6	7.20	7.38
5.	666/30	55	M	160	50	12.1	4.0	130	132	5.7	4.3	7.08	7.36
6.	134/13	40	F	398	205	26.0	16.0	121	130	5.0	3.4	7.07	7.36
7.	55/11	30	M	260	200	9.0	5.8	117	136	3.9	3.3	7.21	7.30
8.	42/42	30	M	290	95	11.9	4.7	128	140	4.8	3.8	7.10	7.44
9.	103/44	38	F	180	100	6.0	3.8	128	140	3.6	4.0	7.33	7.38
10.	113/54	18	M	284	160	12.0	9.0	125	134	4.2	3.4	7.04	7.46
11.	493/28	20	F	285	148	11.2	5.0	132	132	5.4	4.6	7.24	7.34
12.	193/21	44	F	320	200	15.4	6.9	128	136	5.1	4.5	7.01	7.29
13.	630/49	50	M	255	130	17.6	8.8	130	136	4.8	4.0	7.33	7.44
14.	131/10	30	M	190	75	11.3	5.6	126	130	5.7	4.2	7.11	7.38
15.	221/49	48	M	200	110	8.8	4.8	132	134	4.5	4.0	7.30	7.36

[1] S. Na = Serum sodium, [2] S.K. = Serum potassium

PERITONEAL DIALYSIS

TABLE II. Pre–dialysis and Post–dialysis parameters

S. No.	Admission Number	Age	Sex	Blood Urea (mg%)		S. Creatinine (mg%)		S. Na. (mEq/L)		S.K. (mEq/L)		pH	
				Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1.	150/29	32	M	170	70	15.0	5.4	128	142	5.1	4.6	7.04	7.28
2.	383/43	12	M	170	130	10.5	9.5	130	134	4.3	3.3	7.11	7.34
3.	568/48	30	F	150	100	7.6	4.8	131	132	5.3	4.8	7.23	7.33
4.	392/52	25	F	200	30	5.8	3.5	141	135	3.4	3.3	7.08	7.31
5.	592/12	25	M	400	300	17.5	10.5	120	137	5.6	3.9	7.21	7.27
6.	9/9	50	M	400	265	18.0	12.7	130	134	5.2	4.8	7.05	7.30
7.	51/51	35	F	340	180	8.0	5.0	128	129	5.8	5.0	7.12	7.28
8.	87/28	40	M	321	168	12.1	4.4	127	130	3.8	3.8	7.18	7.24
9.	109/50	45	M	359	200	22.0	10.6	133	136	4.2	4.0	7.05	7.33
10.	151/30	45	M	280	170	4.5	3.4	136	132	5.5	4.2	7.20	7.29
11.	509/45	30	F	345	180	14.6	7.8	121	130	5.6	5.2	7.25	7.31
12.	572/52	28	F	200	98	6.4	3.6	134	134	4.8	4.6	7.03	7.22
13.	621/40	30	M	195	85	6.8	4.3	130	132	4.6	4.0	7.22	7.33
14.	118/59	60	M	180	110	5.8	3.1	124	128	3.9	3.4	7.21	7 28
15.	232/60	28	M	385	155	8.3	3.8	122	128	5.4	4.8	7.23	7.26

TABLE III.

STATISTICAL ANALYSIS

HAEMODIALYSIS (N = 15)

Parameters	Pre–dialysis		Post–dialysis		t	P
	Mean ±	S.D.	Mean ±	S.D.		
Blood Urea	253.00 ±	59.78	129.00 ±	47.89	4.49	< 0.001
Serum Creatinine	13.14 ±	4.88	7.1 ±	3.01	2.99	> 0.001
Serum Sodium	126.53 ±	4.79	134.60 ±	3.49	—3.81	> 0.05
Serum Potassium	4.85 ±	0.66	4.00 ±	0.40	3.15	> 0.001
pH	7.19 ±	0.11	7.40 ±	0.05	—5.12	> 0.05

TABLE IV.

STATISTICAL ANALYSIS

PERITONEAL DIALYSIS (N = 15)

Parameters	Pre–dialysis		Post–dialysis		t	P
	Mean ±	S.D.	Mean ±	S.D.		
Blood Urea	273.00 ±	91.65	149.4 ±	69.76	2.98	< 0.01
Serum Creatinine	10.86 ±	5.20	6.16 ±	3.07	1.61	< 0.05
Serum Sodium	129.00 ±	5.57	132.87 ±	3.65	—6.83	> 0.05
Serum Potassium	4.83 ±	0.73	4.25 ±	0.61	1.66	< 0.05
pH	7.15 ±	0.078	7.29 ±	0.034	—4.88	> 0.05

References

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