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CLINICAL STUDY

The Quality of Hemodialysis in Patients with Mental Retardation

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Background. Mentally retarded renal failure patients receiving hemodialysis (HD) comprise a small group of HD patients. There was no previous study describing how to manage these patients during HD and if they could achieve adequate dialysis quality. *Methods.* We reported seven cases of mentally retarded patients with renal failure among 1224 patients receiving hemodialysis. Demographic and medical data were obtained from chart reviews and hospital information system. Parameters for dialysis quality were calculated. *Results.* These mentally retarded patients ranged from 19 to 34 years of age (mean: 27.5 ± 5.0 year-old), with six females and one male. The HD duration ranged from 24 to 84 months (mean: 54.6 ± 27.2 months). The most common problem the medical stuff would encounter when they care mentally retarded dialysis patients is the maintenance of a smooth HD process due to the non-cooperation of these patients. Physical restriction or sedative agents such as diazepam, alprazolam, or chloral hydrate were prescribed in these patients for their irritability during HD session. All seven patients had good family support and care. The dialysis adequacy and nutritional parameters of these patients all met the guidelines suggested by the National Kidney Foundation Dialysis Outcome Quality Initiative (K/DOQI). *Conclusion.* Mentally retarded uremic patients can have good dialysis quality.

Keywords mental retardation, hemodialysis, K/DOQI, tranquilizer

INTRODUCTION

Mentally retarded patients with renal failure receiving HD comprise a group of patients rarely encountered. Because of their unexpected behavior and irritability during HD, medical staff including nephrologists and nurses and the patients' caregivers should pay more attention and be more patient to these patients. The quality of the HD of these patients is unpredictable. There was no previous study describing how to manage these patients during HD and if they could achieve adequate dialysis, as suggested by the K/DOQI[1–3] guidelines. We conducted the first study to demonstrate how to work with mentally retarded patients during HD and whether they could have good dialysis quality.

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PATIENTS AND METHODS

In our study and observation period from October 1, 2006, to April 30, 2007, there were seven mentally retarded patients with renal failure receiving HD among 1224 patients (0.57%) in five hemodialysis centers in our medical center. All seven of these patients receive thrice weekly hemodialysis with four-hour duration for each dialysis session. Blood biochemical data such as total cholesterol and blood hemoglobin (Hb) were checked monthly. The types of vascular access for HD were recorded. Demographic and medical data were obtained from chart reviews and hospital information system. Kt/V of these patients was calculated with the formula developed by Garred et al.[4]

Statistical Analysis

Values are expressed as mean ± SD. Analyses were performed with SPSS for Windows version 12.0 (SPSS, Chicago, Illinois, USA).

RESULTS

There were six females and one male included in this study. The average age was 27.5 ± 5.0 years. The causes of

mental retardation for these seven patients were as follows: two with Down syndrome, three with cerebral palsy, one with tuberous sclerosis, and one with unknown etiology. The mean HD duration was 54.6±27.2 months. The numbers of family care-givers during the HD session were 1.5±0.5 persons. The types of vascular access for HD were either permanent catheter or native arteriovenous fistula (AVF). The average ultrafiltration (UF) amount was 2.3±0.3% of their dry weight (DW). The other demographic data of these patients is shown in Table 1. Sedative agents such as diazepam, alprazolam, and chloral hydrate were used in four of these seven patients to calm down the irritable and uncooperative patients during HD session. Their dosage and administration routes are presented in Table 2. Physical restriction was performed in three patients for their unintentional movement of their hands where the AVFs were built during HD. All seven patients reached the recommendations suggested by K/DOQI guidelines in Kt/V, urea reduction rate (URR), net protein catabolic rate (nPCR), serum albumin level, serum total cholesterol level, and serum triglyceride level (see Table 3). However, not all of them had Hb> 11 g/dL. The mean Hb was 9.8±0.3 g/dL. The mean serum ferritin level was 325±245 ng/mL. As with other HD patients, the serum calcium level was difficult to control within its range, but the serum phosphate level was in the range recommended by K/DOQI guidelines.

Table 1
Demographic data

Sex (% female)	85.7
Age (years)	27.5 ± 5.0
Mean duration of HD (months)	54.6 ± 27.2
DW (kg)	52.3 ± 21.7
Mean systolic blood pressure during HD (mmHg)	121.5 ± 15.5
Number of family care-givers during HD (persons)	1.5 ± 0.5
Vascular access (persons)	AVF: 4; permanent catheter: 3
Procedures let the HD session smooth (persons)	Physical restriction: 3; Sedative agents: 4
UF (% of DW)	2.3 ± 0.3

Table 2
Dosage and administration routes of sedative agents

	Dosage per dialysis session	Administration route	Numbers of patients
Diazepam	10mg	Intravenous	1
Alprazolam	1mg	Oral	1
Chloral hydrate	250mg	Oral	2

Table 3
Clinical data of the six cases and parameters recommended by K/DOQI guidelines

	Patients	K/DOQI	
		Minimally adequate dose	Target dose
Kt/V	1.67 ± 0.34	1.2	1.4
URR (%)	78.8 ± 6.6	65	70
nPCR (g/day/kg body weight)	1.75 ± 0.37	1.2	
Hemoglobin (g/dL)	9.8 ± 0.3	11 or greater	
Albumin (g/dL)	4.0 ± 0.1	4.0	
Total cholesterol (mg/dL)	128.8 ± 64.4	Treatment if non-HDL cholesterol >130mg/dL	
Triglyceride (mg/dL)	157.8 ± 27.7	Treatment if TG >500mg/dL	
iPTH (pg/mL)	119.2 ± 11.2	150–300	
Ca (mg/dL)	10.12 ± 0.88	8.4–9.5	
P (mg/dL)	4.23 ± 1.33	3.5–5.5	

Abbreviation: iPTH, intact parathyroid hormone.

DISCUSSION

The main causes of mental retardation, such as chromosome aberrations and genetic syndromes, are likely to be associated with congenital renal anomalies that lead to end-stage renal disease (ESRD) in the clinical course.[5] The burden of severely handicapped children, especially those with ESRD, on caregivers is great. Thus, treatment for ESRD in the handicapped has become important. The health-related quality of life (HRQOL) of dialysis patient family caregivers is worse than that of the population of the same age and gender,[6] and the HRQOL might be even worse for the mentally retarded HD patient family caregivers. All seven of these patients had good family support, which could be a major etiology of their positive dialysis quality.

During the HD session, the irritability and uncooperative behavior of these patients are the major problems the medical stuff encountered, and could be harmful to the patients themselves. We prescribed diazepam and lorazepam for two of these cases during the HD session to calm them down or let them fall asleep. Under such medication, they could tolerate the whole HD procedure and achieved most of the HD quality recommended by K/DOQI guidelines. Diazepam is a drug commonly used for sedation. The onset of action is 1–5 minutes for intravenous administration and 15–30 minutes for intramuscular administration. The duration of the diazepam's main pharmacological effects is 15 minutes to 1 hour for both routes

of administration. Diazepam is metabolized in the liver via the cytochrome P450 enzyme system. Most of the drug is metabolized; very little diazepam is excreted unchanged. In humans, the protein binding of diazepam is around 98.5%. Its primary metabolites are excreted in the urine. The study by Ochs et al.[7] found that steady-state concentrations of unbound diazepam and its active metabolite were similar between HD patients and controlled group. Jones[8] also found that intravenous diazepam may be used in anephric patients with a response and safety comparable to that reported in patients with normal renal function. Therefore, it is a safe way to prescribe diazepam for irritable mentally retarded patients during HD session. However, Schmith[9] reported that patients receiving dialysis showed enhanced sensitivity to some psychomotor and memory effect of alprazolam. We should pay attention to these aspects for the dialysis patients taking this drug. Our present study demonstrated that diazepam and alprazolam are safe and effective in controlling the irritability of mentally retarded patients during HD session.

Two of these patients were tranquilized with chloral hydrate. In therapeutic dosage for insomnia, chloral hydrate is effective within sixty minutes. It is metabolized within four minutes into trichloroethanol by erythrocytes and plasma esterases and many hours later into trichloroacetic acid. Higher doses can depress respiration and blood pressure. An overdose is marked by confusion, convulsions, nausea, vomiting, severe drowsiness, slow and irregular breathing, cardiac arrhythmia, and weakness. It may also cause liver damage.[10] In our patients, there was no abnormality of the monthly examined liver function tests. Therefore, chloral hydrate is also an effective and safe medication as a tranquilizer in mentally retarded HD patients. The liquid form of chloral hydrate and oral route use made this medicine easily administered to patients.

Physical restriction is an alternative for medical stuff to keep the HD process smooth for the mentally retarded patients; however, this method will need two or more care-givers to cope with the fighting from patients. Two family members are frequently required to care these patients during HD. Resistance from the patients may sometimes cause problems such as vascular access bleeding due to a dislodgment of the needles or interruption of HD procedure.

Most of the parameters of these patients met the K/DOQI guidelines. One of the reasons is that all of them had good family support, which could make sure that these patients can receive regular HD without dropout. Good family support also guarantees a good nutrition and fluid control. The mean UF of these patients was less than 5% of their DW, and the mean serum albumin was 4.0±0.1 g/dL. Good compliance of phosphate-binder use can keep their serum phosphate levels in an acceptable range. Age may be another reason for their adequate dialysis. The mean age of these patients was 27.5±5.0 years, which was much lower than the mean age of the general HD population. The only parameter that did not meet the K/DOQI guidelines was the Hb level. One of the reasons was that the dosage of erythropoietin (EPO) may not be adequate. The route of EPO administration was via intravenous injection in all seven patients. As we know that the bioavailability following subcutaneous administration is higher than that of intravenous dosing. Occasional blood loss due to the dislodgement of the needles caused by the patients' fighting movement during HD is another reason of anemia.

In conclusion, in the present study, we reported that mentally retarded patients with ESRD could have adequate HD quality, which could be achieved by appropriate tranquilizers such as diazepam, alprazolam, and chloral hydrate for their irritability during the HD session and good family support.

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