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The frequency of polyneuropathy according to dialysis type and its effect on quality of life in chronic renal failure

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Abstract

*Objective:*This study aimed to evaluate patients with chronic renal failure who underwent peritoneal dialysis (PD) or hemodialysis (HD). We examined the association of dialysis type on the frequency of polyneuropathy and quality of life in these patients.*Methods:* A total of 61 patients, 41 of whom were PD and 20 HD patients, were included in the study. Neuropathy were evaluated with the Neuropathy Symptom Score (NSS), and quality of life was evaluated with the Short Form -36 (SF-36). Electrophysiological examinations of all patients were performed.Chi-square test and Independent Samples t-test were used for comparisons between groups. A p value of <0.05 was considered statistically significant.*Results:* There was no statistically significant difference between the groups in terms of NSS values (p>0.05). In the evaluation of SF-36 parameters the values were significantly better in the HD group (p<0.05). In the electrophysiological examination, polyneuropathy was detected in 60% of the PD group vs 30% of the HD group.
Conclusion: In patients with chronic kidney disease on dialysis treatment; HD appeared to have less neuropathy and better quality of life.

Keywords: Neuropathy, chronic kidney disease, dialysis, quality of life

INTRODUCTION

Neurological complications are seen commonly in patients with chronic kidney disease. The most common neurological complications are uremic polyneuropathy, autonomic neuropathy, and a range of mononeuropathies.[1] Although the clinical presentation of uremic neuropathy is broad and non-specific, it is important to detect early changes to prevent progression and achieve a better clinical outcomes.[2]

In patients with chronic kidney disease, there may be difficulties in the activities of daily living. The main reasons for this are deficiencies caused by the disease and those associated with neuropathy. Uremic neuropathy, which is associated with chronic renal failure (CRF) is one of the most important causes of disability both in patients undergoing peritoneal dialysis (PD) and hemodialysis (HD).[3,4] Uremic neuropathy is an under-recognized complication in the dialysis population, even though it represents a significant problem resulting in pain and deteriorating quality of life.[5]

Thus, clinicians should pay more attention to nerve involvement and thereby attempt to improve the quality of life for these patients.[6] If the patient has diabetes mellitus, the neuropathy rates are higher, andthe quality of life more affected.[7,8]

The aim of this study was to evaluate the quality of lifeand the frequency of neuropathy in patients undergoing HD and PD for CRF.

METHODS

The study included a total of 61 patients diagnosed with CRF comprising 41 receiving PD and 20 HD, who were referred to the electrophysiological unit for neuropathy evaluation by the Physical Therapy and Rehabilitation Clinic. Informed consent was obtained from the patients. Data acquired include the demographic data, systemic and locomotor examinations and routine blood tests. Pain severity was evaluated with a visual analog scale (VAS). Muscle pain, muscle weakness, muscle atrophy, fatigue, tremor, muscle cramps, paresthesia and burning pain, and the presence of deformity

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were noted. Neuropathy was evaluated with the Neuropathy Symptom Score (NSS) and the quality of life with the Short Form -36 (SF-36).Patients with co-existing diseases including diabetes that could lead to disturbances in nerve conduction were excluded from the study.

Neuropathic symptoms of the patients were evaluated with the Neuropathy Symptom Score (NSS). The NSS is used to quantify the patient's symptoms. The neuropathic symptoms are scored as 1 if present and 0 if absent. Muscle weakness, sensory symptoms and autonomic symptoms are included in the scale, and an NSS value of ≥1 is deemed pathological.[4]

The quality of life was evaluated with the SF-36, which consisted of 36 items in eight sub-dimensions evaluating different areas of health: physical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vital energy (VE), social function (SF), role emotional (RE), and mental health (MH). Each domain is transformed into a 0 to 100 range on the assumption that each question carries equal weight. The lower score indicates more disability, and higher score indicates a more favorable quality of life. A score of zero is equivalent to maximum disability and a score of 100 is equivalent to no disability. Average subdomain score was calculated by dividing total subdomain scores with a total numbers of item of that subdomain. Two component summary scores were also determined, they were physical component summary score (PCS = PF + RP + P + GH) and mental component summary score (MCS = E + SF + RE + EW).[8]

The electrophysiological evaluations of the patients were conducted in the electrophysiological unit of our clinic. Nerve conduction studies (NCS) were performed with a routine polyneuropathy protocol and an entrapment neuropathy protocol.[9] We used the Nihon Kohden 920 for the nerve conduction studies. The median, ulnar, peroneal, and tibial motor nerves and the median, ulnar, and sural sensory nerves were evaluated using standard conduction techniques. Polyneuropathy (PNP) was diagnosed and graded based on the American Association of Electrodiagnostic Medicine criteria and the reference values from the study by Oh *et al*.[9]

Approval for the study was granted by the Ethics Committee of Ankara Training and Research Hospital. Informed consent for the procedures and participation in the study was obtained from all the patients.

Statistical analysis

Data obtained in the study were analyzed statistically using SPSS for Windows software. Descriptive statistics were stated as mean±standard deviation values, or number (n) and percentage (%). The Chi-square test and the Independent Samples t-test were used in the comparisons between groups. In non-parametric evaluations and evaluations of the relationships between EMG diagnoses and dialysis group the Chi-square test was applied. The Independent Samples t-test was used in parametric evaluations. A value of $p<0.05$ was accepted as statistically significant.

RESULTS

Evaluation was made of 61 patients, 41 receiving PD and 20, HD. The PD patients had a mean age of 42 years and mean dialysis duration of 50 months, and the HD patients had a mean age of 48 years and mean dialysis duration of 35 months. The demographic data and clinical characteristics of the patients according to dialysis type are shown in Table 1. No difference was found between the HD and PD groups in respect of gender, muscle pain, muscle weakness, fatigue, muscle atrophy, hand tremors, cramp, paresthesia and burning pain ($p>0.05$). The laboratory values of our patients according to the dialysis type are shown in Table 2.

In the evaluation of the SF-36 parameters according to the type of dialysis, the GH, SF, BP, MH, and VE values were statistically significantly better in the HD group ($p<0.05$). No significant relationship was determined between the other parameters between the two groups ($p>0.05$) (Table 3).

The distribution of NCS diagnoses according to dialysis type is shown in Table 4. In the PD group, approximately 20% of the cases had normal NCS, polyneuropathy of varying degrees was found in 60%, and carpal tunnel syndrome (CTS) and/or ulnar entrapment neuropathy in 20%.

In the HD group, normal NCS results was seen in 60%, polyneuropathy in 30% and CTS in 10%. There were significantly more abnormal NCS in the PD group with higher rate of polyneuropathy vs the HD group.

DISCUSSION

In this study, no significant difference was found between the HD and PD groups in terms of neuropathic symptom scores and clinical characteristics. The HD group scored better on some of the parameters of daily life activities

Table 1: Demographic and clinical characteristics of HD and PD patients

	HD (n=20)	PD (n=41)	p value
Age(years), mean±SD	48.70±20.48	42.00±10.98	0.173 or **(>0.05)**
Male (gender) n	10	20	0.945
Duration of dialysis (months) mean±SD	35.10±23.31	50.34±42.35	0.080
NSS	2.20±3.55	1.98±1.73	0.786
VAS (0-10)	2.20±3.01	3.29±2.63	0.148
Muscle pain (n)	4	16	0.160
Muscle weakness (n)	6	9	0.537
Fatigue (n)	14	34	0.321
Muscle atrophy (n)	4	8	0.964
Hand tremor (n)	8	20	0.591
Cramp (n)	18	28	0.089
Paresthesia (n)	8	18	0.989
Burning pain (n)	2	7	0.704
Deformity (n)	2	3	0.072

HD: Hemodialysis patient, PD: Peritoneal dialysis patient, NSS: Neuropathy Symptom Score, VAS: visual analog scale

Table 2: Laboratory parameters in the PD and HD patients

	HD	PD	p
Urea mg/dl	113,66±28,57	105,47±28,10	0.311
Creatinine mg/dl	8,89±2,88	8,92±2,82	0.965
PTH pg/ml	446,61±307,36	572,33±461,14	0.321
Alkaline phosphatase U/L	144,44±56,99	141,74±156,73	0.944
Calcium mg/dl	8,96±0,99	8,82±0,73	0.547
Phosphorus mg/dl	3,47±0,90	4,73±1,19	**<0.001**
Uric acid mg/dl	5,58±1,12	5,42±1,17	0.620
Vitamin B12pg/ml	410,33±137,07	372,73±173,58	0.424
Ferritin ng/ml	690,23±408,79	479,60±274,06	**0.024**

PTH: Parathyroid hormone, PD: Peritoneal dialysis, HD: Hemodialysis

Table 3: SF- 36 results in HD and PD patients

SF-36	HD (20)	PD (41)	P
Physical Health			
Physical functioning	61,00±24,69	65,48±20,08	0.446
Role physical	50,00 ±45,64	33,53±36,91	0.132
Bodily pain	83,37±31,10	68,12±27,03	**0.051**
General health	62,50±26,79	35,51±22,96	**<0.001**
Mental Health			
Vitality	65,10±19,80	45,60±20,16	**0.010**
Social functioning	82,14±29,15	61,40±28,46	**0.010**
Role emotional	56,66±31,63	42,27±41,52	0.135
Mental health	77,20±24,80	61,87±21,15	**0.014**

HD: Hemodialysis patient, PD: Peritoneal dialysis patient, SF-36 :Short form-36

Table 4: Electrophysiological diagnosis according to the type of dialysis

	HD (n=20)	HD (n=41)	p value
Normal (n)	12	8	
PNP (n)	6	24	**0.05**
Sensorimotor axonal PNP	2	7	
Mild SM axonal PNP	12	6	
On UE, significant scattered demyelinating axonal sensorimotor PNP	2	6	
Sensory-weighted SM axonal PNP		2	
Mild sensory PNP		2	
On LE, significant sensory PNP		1	
CTS	2	5	
Ulnar CNP		2	
CTS+ Ulnar CNP		1	

PNP: Polyneuropathy, SM: Sensorimotor, CTS: Carpal tunnel syndrome, UP: upper extremity, CNP: Compression neuropathy, LE: lower extremity

evaluated with the SF-36. NCS showed a higher frequency of polyneuropathy and isolated entrapment neuropathy in the PD group.

Contrary to the findings of this study, it has been reported that PD patients received significantly better scores from the SF-36 test than HD patients.[12,13] Therefore, given that there was no significant difference between the HD and PD groups in demographic and clinical characteristics, the contrary findings of this study may be attributed to the fact that the HD patients regularly go to the hospital in Turkey and thus has more regular medical follow up , which may have resulted in better care. However, adaptation to chronic disease is a physical, physiological, and social process. In this context, although there was no significant difference between the groups in demographic characteristics, the differences in personal adjustment may have affected the outcome. There are studies showing that musculoskeletal and psychological problems associated with metabolic and neurological disorders are common in PD patients.[14]

Another parameter evaluated in this study was the rate of patients with polyneuropathy, which was 60% in the PD and 30% in the HD groups. In the literature, subclinical peripheral neuropathy has been reported in HD patients, and early electrophysiological examination is recommended.[15] In addition, several studies reported a significant relationship between residual kidney function and peripheral neuropathy in patients with chronic kidney disease.[1,3,5]

Generally speaking, neuropathy is a common complication in patients with CRF and is often associated with diabetes. Classical diabetic polyneuropathy shows a distal symmetrical pattern and typically involves the lower extremities.[16,17] Diabetic patients were excluded from this study to avoid the confounding effect of diabetes

Carpal tunnel syndrome (CTS) is a mononeuropathy frequently seen in patients with CRF. In this study, CTS was detected electrophysiologically in 12.5% of the PD and 10% of the HD patients. The higher rate of patients with polyneuropathy and CTS in the PD group than in the HD group was attributed to the longer dialysis durations in PD group compared to the HD group. Many studies reported a correlation between the frequency of neuropathy and the duration of dialysis.[3,8,12,16] In line with the findings of this study, we concur with Bicknell *et al*. who stated that nerve dysfunction is independent of shunt time and osteodystrophy and recommended frequent nerve conduction studies from the onset of dialysis in order to detect CTS early and prevent irreversible nerve damage.[17,18] The frequency of peripheral neuropathy in chronic kidney disease patients is decreasing with the developments of dialysis treatment. However, in view of subclinical disease, monitoring of peripheral nerve function with NCS in uremic patients on chronic dialysis is encouraged.[19-24]

CRF treatment modalities, i.e., HD, PD, and kidney transplants, have distinct advantages and disadvantages one over the another.[25-36] HD remains the most common (80%)form of treatment in almost all countries, followed by PD and

kidney transplants. Initiation of long-term dialysis treatment in CRF improves survival. On the other hand, successful kidney transplantation may more effectively improve the quality of life.[11,13]

HD group scored significantly better in mental and social functions, general health perception, and vitality parameters of SF-36 than the PD group. This finding might be attributed to HD's higher efficacy and functional adequacy than PD, resulting in better quality of life.[24-28]

However, contrary to our findings, a meta-analysis study reported that the PD group scored better in several parameters of SF-36 than the HD group and that the difference between the two groups for patients who were not at the stage of kidney transplantation, in physical function and emotional status parameters.[13]

SF-36 is one of the general assessment tools used to evaluate daily life activities.[37] Kidney Disease Quality of Life (KDQOL), on the other hand, is a disease-specific quality of life assessment tool. Therefore, it may have been better to use KDQOL instead of SF-36 to assess the quality of life in this study. Previous studies have shown that dialysis patients have a worse health-related quality of life (HRQoL) than the general population.[33,34] However, there is still no consensus on a scale that can be used as a standard for assessing the quality of life in these patients. Many studies have compared HRQoL in PD and HD patients, but the results are conflicting.[34,35-37] The difference in the results was attributed to factors such as different health systems and treatment modalities, differences in income and education level, sample size, cultural differences, and psychological problems.[38,39]

In conclusion, treatment of chronic kidney diseases by e PD and HD may be associated with different frequencies of neuropathy which may is associated with different QOL of patients.

DISCLOSURE

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