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Original Article

Peripheral Nerve Dysfunction in Chronic Kidney Disease

G Rathnakumar[1], Jyothis P Jose[2], Heber Anandan[3]

[1]Associate Professor, Department of Medicine, Tirunelveli Medical College and Hospital, Tirunelveli, Tamil Nadu, India, [2]Junior Resident, Department of Medicine, Tirunelveli Medical College and Hospital, Tirunelveli, Tamil Nadu, India, Senior Clinical Scientist, [3]Department of Clinical Research, Dr. Agarwal's Healthcare Limited, Chennai, Tamil Nadu, India

Abstract

Introduction: Peripheral nerve dysfunction is a recognized complication of chronic kidney disease (CKD). The study mainly focuses the incidence, clinical manifestation, and severity of peripheral nerve dysfunction in patient with CKD admitted in our hospital.

Aim: The aims of our study are to evaluate the incidence of overt neuropathy and subclinical neuropathy in CKD patients and to evaluate the clinical manifestations of peripheral nerve dysfunction.

Methods: The study was conducted at the medical wards of Tirunelveli Medical College. Patients with proved clinical, biochemical parameters in favor of CKD, and all patients included in this study were not on dialysis.

Results: Of 74 patients assessed, 48 patients proved to have peripheral nerve dysfunction by electrodiagnostic study and the number of patients affected with peripheral nerve dysfunction is increasing when the duration is increasing (more than 5 years).

Conclusion: Distal symmetrical predominantly sensory motor neuropathy is the most common type of peripheral neuropathy observed in patients with CKD. Loss of ankle reflex and vibratory sensory loss are the most common clinical signs of peripheral neuropathy in patients with CKD. There is predilection for male in the incidence of peripheral neuropathy in CKD when the creatinine clearance was below 15 ml/mt.

Key words: Ankle reflex, Chronic kidney disease, Peripheral neuropathy, Sensory-motor neuropathy

INTRODUCTION

Peripheral nerve dysfunction is a recognized complication of chronic kidney disease (CKD). Most of the time, patients who are having features of peripheral nerve dysfunction would not come out with complaints of it unless it is specifically asked or looked for. At present, the medical treatment for kidney disease is improving and patient's long-term survival is improving.[1] Peritoneal dialysis, hemodialysis, and transplantation have revolution the prognosis of CKD in recent periods. As patient's lifespan is prolonged due to recent improvement in the treatment of CKD, it is essential to know about the complication that can occur in patient surviving for long period with CKD, of which peripheral nerve dysfunction is one of the recognizable and treatable complication of CKD.[2] The etiology of CKD is varying in nature, but the clinical symptoms and signs are of the same. The study mainly focuses the incidence, clinical manifestation, and severity of peripheral nerve dysfunction in patient with CKD admitted in our hospital. Neuropathy occurs in at least 65% of patients who are about to begin dialysis for CKD and is perhaps the most common neurological consequence of chronic uremia. It is a distal, symmetrical, mixed sensory-motor polyneuropathy affecting the lower limbs to a greater extent than the upper limbs. The rate of progression, severity, prominence of motor or sensory sings, and prevalence of dysesthesia are quite variable. Males are developing neuropathy with an incidence several fold greater than females; this difference is unexplained.[3] Individual serological and biochemical

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Corresponding Author: Dr. Jyothis P Jose, Department of Medicine, Tirunelveli Medical College and Hospital, Tirunelveli, Tamil Nadu, India. Phone: +91-9567034720. E-mail:jyothispjose@gmail.com

abnormalities (calcium, magnesium, phosphate, urea, and creatinine) are not correlated well with this or any other neurological manifestation of the uremic state. The chronicity and severity of kidney disease appear to be the important cause to the development of neuropathy. The observation that uremic neuropathy improves with hemodialysis has led most observers to conclude that neuropathy result from the accumulation of a dialyzable metabolite. Due to the varying nutritional status of uremic patients, the possibility that vitamin deficiency is a mechanism of neuropathy should be considered.[4-6] Massive doses of vitamins administered both orally and parenterally have failed to influence clearly the course of neuropathy in informal trails. An inhibitory effect of uremic toxins on endoplasmic flow of transmitters or other essential neural nutrients is another possibility.[7]

Aim

The aim of this study is to evaluate the incidence of overt neuropathy and subclinical neuropathy in CKD patients and to evaluate the clinical manifestations of peripheral nerve dysfunction in CKD patients.

MATERIALS AND METHODS

The prospective observational study was conducted at the medical wards of Tirunelveli Medical College Hospital, Tirunelveli. Patients with proved clinical and biochemical parameters in favor of CKD are included in the study. Inclusion criteria: Patients with CKD not on dialysis, serum creatinine more than 2 mg%, and creatinine clearance <40 ml/mt were included in the study. Exclusion criteria: Patients with other recognizable risk factors for peripheral neuropathy are excluded from the study. After selecting the patients with reference to inclusion and exclusion criteria, the presence of peripheral nerve dysfunction is assessed in them clinically by means of motor and sensory symptoms and sings.

RESULTS

A number of patients affected with CKD were 74. Of 74 patients assessed, 48 patients proved to have peripheral nerve dysfunction by the electrodiagnostic study.

From Table 1, it is learnt that the number of patients affected with peripheral nerve dysfunction is increasing when the duration is increasing (more than 5 years).

48 patients had evidence of peripheral neuropathy by the electrodiagnostic study. 25 patients revealed sensory motor neuropathy, 12 patients had sensory neuropathy, and 11 patients had motor neuropathy [Table 2]. From Table 3, it is observed that the most common type of neuropathy in chronic disease patients is distal sensory motor neuropathy.

A number of patients affected with peripheral neuropathy by the electrodiagnostic study were 48. Of these 48, only 14 patients showed clinical evidence of peripheral neuropathy. Of these 14 patients had both motor and sensory symptoms in the form of loss of ankle jerk and defective vibration sense, 2 patients had numbness both lower limbs, and 1 patient had distal muscle weakness of lower limbs.

72% of males and 66% of females were affected when the creatinine clearance was <15 ml/mt. 20% of males and 25% of females were affected when the creatinine clearance was 15–29 ml/mt. Males were affected more when the creatinine <15 ml/mt. Both sexes were affected equally when the creatinine

Table 1: Distribution of peripheral nerve dysfunction in CKD patients versus duration of disease

Duration of CKD (year)	Total number of patients	No patients with peripheral nerve dysfunction (%)
<1	11	4 (36)
1–3	21	11 (52)
3–5	22	16 (73)
>5	20	17 (85)
Total	74	48

CKD: Chronic kidney disease

Table 2: Distribution of patients affected with percentage with reference to overt and subclinical neuropathy

Overt neuropathy	Subclinical neuropathy	Total
14 (19%)	34 (46%)	48 (65%)

Table 3: Distribution of patients affected with percentage with reference to the type of peripheral neuropathy

Sensory-motor	Sensory	Motor	Total
25 (34%)	12 (16%)	11 (15%)	48 (65%)

Table 4: Distribution of male and female patients affected with reference to creatinine clearance

Creatinine clearance ml/mt	Male (%)	Female (%)
<15	72	66
26-29	20	25
30-59	8	8
Total	100	100

clearance between 30 and 59 ml/mt. From Table 4, it is observed that 72% of males and 66% of females with creatinine below 15 ml/mt showed evidence of peripheral neuropathy.

DISCUSSION

Peripheral neuropathy is a recognized complication of renal failure. These complications can potentially affect both the central and peripheral nervous systems. Common neurological complications in CKD include stroke, cognitive dysfunction, encephalopathy, peripheral, and autonomic neuropathies. These conditions have a significant impact not only on patient morbidity but also on mortality risk through a variety of mechanisms. Understanding the pathophysiological mechanisms of these conditions can provide insights into effective management strategies for neurological complications. This review describes clinical management of neurological complications in CKD with reference to the contributing physiological and pathological derangements.[8] Among the 74 patients, 48 patients showed evidence of peripheral nerve dysfunction either clinically or electrophysiological. 36 male patients showed features of peripheral nerve dysfunction and 12 female patients had evidence of peripheral nerve dysfunction. The duration of CKD varied from 3 months to 7 years. Kumar *et al.* discussed nerve condition study in relation to duration and severity and CKD. They found that reduced suggestive of neuropathy but delayed F-waves and H-reflex are also suggestive of neuropathy.[9] The common type of peripheral neuropathy observed in this study was distal symmetrical sensory-motor peripheral neuropathy, and incidence of this type of sensory-motor neuropathy was 34%. The incidence of sensory neuropathy was 16% and motor neuropathy was 15%. The other types of neuropathy mononeuropathy, truncal neuropathies, and cranial neuropathies are not registered in our clinical study. 65% of study population was suffering from CKD with peripheral nerve dysfunction. The peripheral nerves dysfunction was more prevalent in elder age (>65 years) subjects when compared to subjects with age <65 years.[10] Moreover, the results shown that the rate of prevalence of peripheral nerves dysfunction was observed higher in subjects with longer duration of CKD.

CONCLUSION

The incidence of peripheral neuropathy is 65% in patients suffering from CKD. Distal symmetrical predominantly sensory motor neuropathy is the most common type of peripheral neuropathy observed in patients with CKD. Loss of ankle reflex and vibratory sensory loss are the most common clinical signs of peripheral neuropathy in patients with CKD. There is a predilection for male in the incidence of peripheral neuropathy in CKD when the creatinine clearance was below 15 ml/mt. The incidence of subclinical neuropathy was about 46% and overt neuropathy is 19%. The incidence of peripheral neuropathy is having linear correlation with severity and duration of renal failure.

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