FREQUENCY OF PERIPHERAL POLYNEUROPATHY IN A COHORT OF DIABETIC PATIENTS HAVING SYMPTOMS OF POLYNEUROPATHY USING ELECTRODIAGNOSTIC PROCEDURE

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ABSTRACT

Objective: To determine the frequency of peripheral polyneuropathy in patients having diabetes mellitus with symptoms of polyneuropathy using electrodiagnostic procedure.

Study design: Observational descriptive study

Place and duration of study: Armed Forces Institute of Rehabilitation Medicine (AFIRM), Rawalpindi. June 2008 to June 2009 (one year)

Patients and Methods: Sixty three patients of diabetes mellitus having symptoms of peripheral polyneuropathy fulfilling the inclusion criteria were sampled by purposive sampling. Informed consent was taken. Their demographic data and common symptoms were recorded. All patients underwent Electrodiagnostic procedures for the presence or absence of polyneuropathy, using nerve conduction studies by recording amplitudes, velocities and latencies of minimal two (sural, peroneal) and maximum six nerves. Electromyography was performed only in patients with abnormalities in nerve conduction findings or conditions other than polyneuropathy. Frequencies as percentages were calculated for the presence or absence of polyneuropathy, type of polyneuropathy, associated symptoms and other related diagnosis (if any).

Results: There were thirty three males (52.4%) and thirty female (47.6%). Forty one (65%) patients had confirmed polyneuropathy on electrodiagnosis, out of which forty patients (97.6%) had axonal polyneuropathy, only one patient (2.4%) had demyelinating polyneuropathy. Twenty two had no polyneuropathy (35%), out of which 65% had other diagnosis like Carpal Tunnel Syndrome (CTS), Radiculopathy and other Compression neuropathies.

Conclusion: Majority of symptomatic diabetic patients actually had polyneuropathy. Electrodiagnostic studies are a sensitive tool for early detection of peripheral polyneuropathy, its types and extent.

Keywords: Diabetes mellitus, Electrodiagnostics, Polyneuropathy.

INTRODUCTION

Diabetic neuropathy is recognized as the most frequent neurological complication of diabetes mellitus[1] and is manifest mainly on the peripheral nervous system. It is responsible for substantial morbidity and impaired quality of life[2]. It is the commonest form of neuropathy in the developed world[3]. It occur secondary to metabolic disturbance and is related to duration of diabetes and degree of metabolic control[4]. It includes several neuropathic syndromes including focal and symmetrical neuropathies, by far the commonest of which is distal symmetrical neuropathy[5]. Correlates of diabetic neuropathy include increasing age, increasing duration of diabetes, poor glycemic control, retinopathy, albuminuria, and vascular risk factors[6]

Pain is the most distressing symptom of neuropathy and is the main factor that prompts the patient to seek medical advice[7]. The two main clinical consequences, foot ulceration sometimes leading to amputation and painful neuropathy, are associated with much patient morbidity and mortality[8]. It has a clinical prevalence of 60% and problematic peripheral neuropathy occurs in about 20%[9] of the patients. The prevalence of neuropathy in type 2 diabetics has been found to be about 40% in some areas of Pakistan[10]. Most patients present with a combination of sensory and motor symptoms and signs in the feet which may spread proximally in the legs, hands and arms. Symptomatic diabetic sensorimotor polyneuropathy is considered progressive and irreversible[11].

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There are many methods for detecting and monitoring diabetic Polyneuropathy. The includes clinical examination, clinical screening devices[12] like Semmes Weinstien monofilament, graduated Rydel Seiffer tuning fork and neuropen. Established paradigms like neuropathic symptom score (NSS), quantitative sensory testing (QST) [13] and autonomic function testing are also used. Electrodiagnostic studies are a useful method for diagnosis and nerve conduction studies (NCS) are generally considered to be the most sensitive and reproducible[14]. Electrophysiological studies can be used to confirm the presence of polyneuropathy, to assess the severity and the pattern, to determine whether motor, sensory or a combination of fibers are involved and most importantly to assess whether the underlying pathology is axonal loss or demyelination[13].

This study was carried out to establish the frequency of polyneuropathy in diabetic patients by detecting it early from the symptoms and confirming it through electrodiagnostic studies. It determined that electrodiagnosis in early diagnosis of diabetic peripheral polyneuropathy in patients with symptoms of polyneuropathy and helped to rule out other associated conditions and causes of polyneuropathy thereby early initiation of treatment helping in better outcome, and prevention of early complicatons.

PATIENTS AND METHODS

This descriptive study was conducted at the department of electrodiagnostics, Armed Forces Institute of Rehabilitation Medicine (AFIRM) Rawalpindi from June 2008 to June 2009. Approval of the hospital ethical committee was obtained. Sixty three cases of diabetes mellitus with symptoms of polyneuropathy were taken from AFIRM OPD/indoor patients. All the patients were selected by purposive sampling and based on inclusion criteria i.e patients of both sexes with age less than 60 years and having diabetes mellitus with symptoms of polyneuropathy. All asymptomatic diabetic patients, autoimmune diseases, infections and other diseases known to cause neuropathy were excluded. Careful history was taken about demographic information and relevant complaints regarding symptoms of neuropathy. In addition duration of diabetes, presence or absence of polyneuropathy, type of polyneuropathy and other diagnosis were also calculated.

The nerve conduction study was conducted after taking informed consent and explaining the procedure to the patient. Electrodiagnostic studies were done at room temperature 25Ċ, with MEDTRONIC, KP 3.0 ® model 2003 using surface electrodes.

Nerve conduction study protocol followed was as under:

1) Nerve conduction studies were carried out initially for sural sensory and common peroneal motor nerve in one of the lower limbs, being the most sensitive and if found normal other nerves and Electromyography were not done further.

2) In cases where any abnormality suggestive of polyneuropathy was detected i.e smaller or absent CMAP, reduced velocities and prolonged DML then contra lateral tibial motor, one median motor and one ulnar, both motor and sensory were done and further evaluation for polyneuropathy was sought in these nerves.

3) F wave was recorded for common peroneal nerve bilaterally.

4) Electromyography (EMG) was only done in selected muscles in patients with nerve conduction findings suggestive of a polyneuropathy. EMG parameters included observation for amplitude, morphology, involuntary activity, recruitment and interference pattern.

5) In all the recorded nerves, amplitudes, latencies and velocities were assessed.

6) Based on their standard numerical value they were assigned for presence or absence of polyneuropathy and it was labeled as outcome. Symptoms of the patients, duration of diabetes, type of polyneuropathy and any other associated diagnosis were also recorded.

Statistical Analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 12. Frequencies as percentages were calculated for qualitative variables i.e diagnosis and symptoms of polyneuropathy.

RESULTS

Sixty three patients underwent electrodiagnostic studies based on symptoms of polyneuropathy. There were 33 (52.4%) males and 30 (47.6%) female. Mean age was 49.8 years. The most common age group (61.9%) was between 50-60 years. Duration of diabetes mellitus was between 1-10 years in majority of the patients, shown in figure 2. Among the sampled 63 symptomatic patients 41 (67%) had confirmed polyneuropathy. Axonal polyneuropathy was the most frequent (33.3%) as shown in figure 1. Twenty two (34.9%) patients had normal study on electrodiagnosis (Figure 1). Among the diagnosed polyneuropathy patients there were 28 males (68.3%) and 13 females (31.7%).

Neurological conditions other than polyneuropathy diagnosed on electrodiagnostic studies included carpal tunnel syndrome in 7 patients; L5 radiculopathy, S1 radiculopathy, combined L5 S1 radiculopathy and bilateral median neuropathy at wrist in one patient each. Numbness alone was the most frequent symptom (16 patients), followed by pain (4 patients), weakness and combination of numbness and tingling, and numbness and pain, 6 patient each. Combination of multiple symptoms including numbness, weakness, burning, tingling and leg cramps was present in 8 patients as shown in table.

DISCUSSION

Diabetic neuropathy is one of the common outcomes of the diabetes and is a subject of ongoing research in order for the better understanding of the disease and better management and prevention. There are multiple methods for detecting and monitoring diabetic polyneuropathy including clinical examination, clinical screening devices[12] like Semmes Weinstien monofilament, graduated Rydel Seiffer tuning fork and Neuropen. Established paradigms like neuropathic symptom score (NSS), quantitative sensory testing (QST)[13]and autonomic function testing are also used. Electrodiagnostic studies are a useful method for diagnosis and nerve conduction studies (NCS) are generally considered to be the most sensitive and reproducible[14]. In conjunction with the information obtained from the neurological history and examination, electrophysiology can be used to assist in isolating a specific diagnosis. Electrophysiological studies can be used to confirm the presence of polyneuropathy, to assess the severity and the pattern, to determine whether motor, sensory or a combination of fibers are involved and most importantly to assess whether the underlying pathology is axonal loss or demyelination[15]. Electrodiagnosis helps to exclude other common causes like polyradiculopathy or focal mononeuropathies.

When electrodiagnostic studies were carried out in diabetic patients 67% had confirmed polyneuropathy and numbness, pain and weakness were the commonest symptoms. The most common type was axonal

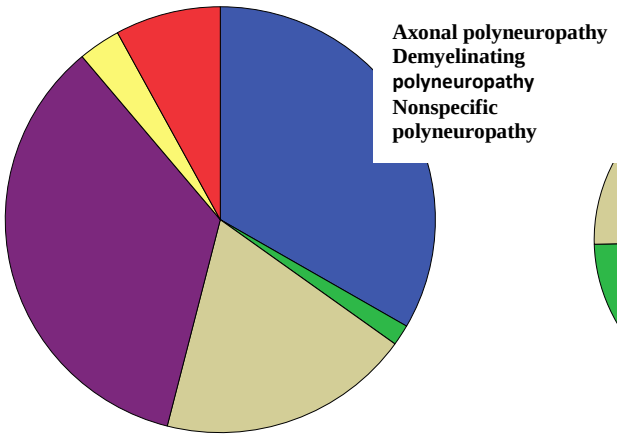

Figure 1: Electrodiagnostic diagnosis (n=63)

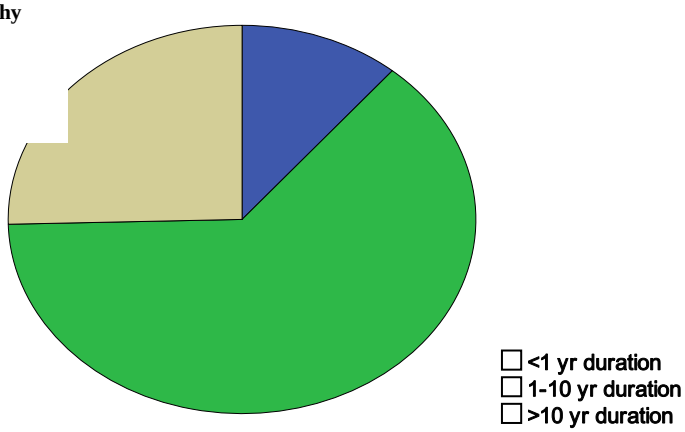

Figure 2: Duration of diabetes mellitus (n=63)

Table 1: symptoms of polyneuropathy (n=63)

	Frequency	Percent
Numbness	16	25.4
Weakness	6	9.5
Pain	4	6.3
Tingling sensation	1	1.6
Burning sensation	1	1.6
Leg cramps	3	4.8
Numbness and weakness	5	7.9
Numbness and pain	6	9.5
Numbness and tingling	6	9.5
Numbness+weaknes+pain	7	11.1
Numbness+weakness+burning+tingling+leg cramps	8	12.7

polyneuropathy, and the common associated diagnosis were carpal tunnel syndrome, radiculopathy and other compression neuropathy.

Similar results have been obtained by most of the studies. In Pakistan Niazi et al[16] evaluated diabetic polyneuropathy by doing electrodiagnostic study in 41 patients in 2001 and found that 34 out of 41 patients had confirmed polyneuropathy. They suggested that electrodiagnostic studies can diagnose diabetic polyneuropathy even before clinical manifestation. In our study 42 out of 63 patients had polyneuropathy.

Another local study carried out by Asad A et al[17] in 2007 compared nerve conduction studies with diabetic neuropathy symptom score and diabetic neuropathy examination score in type II diabetes for detection of sensorimotor polyneuropathy. They found that although the diabetic neuropathy symptom score and diabetic neuropathy examination score together can help in prompt clinical evaluation of diabetic polyneuropathy, electrodiagnosis was a more sensitive test and can help diagnose subclinical cases as well.

Dyck et al[18] in their study, "The Rochester Diabetic Neuropathy Study" found that 66% of the patients with type I and 59% of the patients with type II diabetes mellitus had some type of neuropathy. These study results are comparable with our study in which 67% of the sampled diabetic patients had polyneuropathy confirmed on electrodiagnosis. In the same study diabetic polyneuropathy was the commonest form of neuropathy followed by compression neuropathy of median nerve at wrist (carpel tunnel syndrome). Electrophysiological evidence of median neuropathy at the wrist was found in 22% of type I and 29% of type II diabetes mellitus. This is also comparable to our study in which the second most common neuropathy was carpal tunnel syndrome and 11.6% patients had confirmed carpal tunnel syndrome on electrodiagnosis.

Partenan J et al[19] in a study on 133 patients with newly diagnosed IDDM followed for up to 10 years, showed that nerve conduction velocity diminished in six nerves evaluated. The maximum deficit was recorded in sural and peroneal nerve. Our study also calculated the electrodiagnostic variables for the same nerves and sural was found to be the most consistently absent in the polyneuropathy followed by peroneal nerve with diminished velocity and amplitude, though the velocity and amplitude variables of the electrodiagnostic procedure were not directly part of the study and were only taken to prove either the presence or absence of polyneuropathy.

European Diabetes (EURODIAB) prospective study[20] demonstrated that nearly 25% of type I diabetes patients enrolled developed neuropathic pain symptoms over a period of seven years. In our study pain was the second most common symptom of patients having confirmed polyneuropathy.

In Early Diabetes Intervention Trial (EDIT)[21], out of 414 patients with mild diabetic neuropathy, 23% had median neuropathy at the wrist and in Rochester Diabetic Neuropathy Cohort electrophysiological evidence of median neuropathy at wrist was found in 22% of the type I diabetes patients and 29% of type II diabetes patients. Both of these studies relate to our study in terms that carpal tunnel syndrome was the commonest diagnosis among the patients found normal for polyneuropathy.

Dyck et al[22] showed that Diabetic lumbosacral radiculoplexopathy occurs in approximately 1% of diabetic patients. In our study out of 63 diabetic patients, 3 had

lumbosacral radiculopathy, which shows relatively higher frequency in our study.

Aaron I et al[23] found out that upon electrodiagnosis of diabetic patients Distal Motor Latency (DML) and F Wave Latency (FWL) were prolonged relative to control cohort and Compound Motor Action Potential (CMAP) was reduced. The FWL and CMAP had the highest abnormality rates. Among patients with clinically significant symptoms, 40% did not have Diabetic Polyneuropathy (DPN) on nerve conduction, and in asymptomatic patients, 45% had DPN on nerve conduction. This is comparable to our study in 37 % of clinically symptomatic patients did not have polyneuropathy and that DML, FWL were consistently prolonged in the recorded nerves of patients having DPN.

CONCLUSION

Majority of diabetic patients having symptoms of polyneuropathy actually have polyneuropathy. Pain and numbness are the most common symptoms of polyneuropathy. Electrodiagnosis is a sensitive tool for the diagnosis and early detection of diabetic polyneuropathy. It helps to localize the entrapment neuropathies and segregating axonal from demyelinating polyneuropathies. Routine electrodiagnosis studies should be carried out in diabetic patients on yearly basis.

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