Original Research Article

Diabetic neuropathies-clinical and electrophysiological profile

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Abstract

Introduction: Diabetic neuropathy is a very common but disabling microvascular complication of diabetes. It can involve the peripheral as well as the autonomic nerve functions. This study was undertaken to understand the different types of peripheral and autonomic neuropathies in diabetic patients with respect to the duration of diabetes and electrophysiological findings. **Method:** 100 patients who were proven diabetics were included in the study irrespective of the duration of diabetes. Neuropathy was assessed using clinical symptoms, signs and with the help of electrophysiological studies. **Results:** Sensory loss (80.3%) was the most common symptom noted in these patients, followed by paresthesias and giddiness. Decreased timed vibration (81.5%) was the most common sign elicited. Neuropathy had the highest prevalence in males in their sixties. Neuropathy was more common in those with diabetes for more than 5 years duration. **Conclusion:** Distal symmetrical sensory polyneuropathy was the commonest type of neuropathy in diabetes mellitus found in our study. Autonomic dysfunction in the form of postural giddiness was also found in a high proportion of patients. Higher HbA1c level and duration of diabetes significantly increased the risk of neuropathy.

Keywords:electrophysiological,profile

Introduction

Diabetes mellitus can affect multiple organ systems and can cause end organ damage due to microvascular ischemia. Neuropathy caused by diabetes can have broad presentations with involvement of peripheral, cranial, and autonomic nervous system. It can practically affect all organ systems in our body. Diabetic neuropathy can affect the small fibres and the large fibres. Patients can present with numbness, pain and paresthesia of limbs. These symptoms are more common in the feet. Sometimes weight loss can precede the development of painful neuropathy. There can be motor weakness also which is predominantly distal. Rarely some patients can develop severe loss of temperature and pain sensation leading to development of ulcers and joint disease. Common symptoms of autonomic dysfunction include posturalgiddiness, constipation,earlysatiety,post prandial bloating ,erectile dysfunction and bladder disturbances.

Diabetic neuropathy can be classified as generalized symmetrical polyneuropathies such as distal sensory or sensory motor polyneuropathy, small fibre neuropathy, autonomic neuropathy, and large fibre sensory neuropathy. Focal and asymmetrical neuropathies include cranial neuropathies, truncalneuropathies, mononeuropathies of limbs and radiculoplexopathy. Patients can also present with a combination of the above such as polyradiculoneuropathy and neuropathic cachexia. Electrodiagnostic studies usually show a primary axon loss type of polyneuropathy, more commonly affecting distal sensory fibres. Some patients can have non stimulatable nerves if the neuropathy is severe[1].

Bedside tests for autonomic dysfunction include heart rate response to deep breathing and standing, postural fall in blood pressure and blood pressure changes with sustained hand grip.

The mainstay in treatment of diabetic neuropathy is optimal glycemic control. Symptomatic treatment for neuropathic pain may be offered to these patients. For autonomic dysfunction, measures like head end elevation, increased fluid and salt intake, small frequent meals may help.

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Severe dysfunction might warrant pharmacological measures.

Diabetic neuropathy can be troublesome and can affect the quality of life of these patients. Hence it is important to screen these patients early, as a significant percentage of these patients can be asymptomatic too. We conducted this study to evaluate the various types of neuropathies in diabetic patients attending the OP and IP of Thanjavur Medical college

Aim of the study

To study the clinico-electrophysiological profile of neuropathy in diabetes mellitus.

Materials and methods

This study was conducted in department of Neurology at Thanjavur Medical College from 2019 to 2021.We included 100 cases of diabetes mellitus(DM) irrespective of the duration of disease. Study was approved by ethical committee of the college.

Inclusion criteria

1) Patients of either sex with Type 2 Diabetes mellitus as per ADA guidelines[2].

Exclusion criteria

1) Type 1 Diabetes
2) Peripheral Neuropathy due to proven other causes like vasculitis, paraneoplastic, drug/toxin exposure,autoimmune and hereditary.
3) Patients with CIDP, AIDP, Myelopathy, severe systemic illness and PVOD.

Detailed history was taken as to the symptoms based on a pretested proforma. Patients were examined and relevant clinical findings were noted by two neurologists. Patients were then made to undergo bedside nerve conduction study. Median nerve, ulnar nerve and peroneal nerves were tested for motor conduction study. Median, ulnar and sural nerve were tested for sensory conduction study. This was tested in all 4 limbs of all the patients. Autonomic nervous system dysfunction was estimated by recording heart rate variability on standing, blood pressure measurement on standing and supine, diastolic change of blood pressure was noted using sustained hand grip method.

Result

Among 100 diabetics included in study, 55 were males and 45 were females. All patients in our study except one patient had HbA1c more than 6. Majority had an HbA1c value of > 6.5(72%).76 patients were found to have evidence of neuropathy on electrophysiological studies, majority being males(48%) . Out of this, 70 were symptomatic and nerve conduction studies were abnormal in 6 asymptomatic patients. Bedside autonomic function tests were found to be abnormal in 16 patients. All patients with abnormal autonomic function tests were symptomatic, most common symptom being postural giddiness. All patients with autonomic dysfunction also had features of peripheral neuropathy. Neuropathy was noted more in the older age group. In the present study, neuropathy was seen in the age group of 60-69 years (29%).The average age in the study was 62.6 years. Diabetic neuropathy was commonly observed in patients with duration of diabetes of more than 5 years (47% with duration of 5-10 years and 29% with duration > 10 years).

Age	Diabetic neuropathy present	Diabetic neuropathy absent
>70	14	1
60-69	29	3
50-59	19	3
40-49	11	5
30-39	3	12
20-29	-	-
<20	-	-
Total	76	24
HbA1c		
>6	70	2
<6	6	22
Total	76	24
SEX		
Female	28	17
Male	48	7
Asymptomatic		
Females	2	9
Males	4	15
Total	6	24

Duration of Diabetes	Percentage
<5 years	24
5-10 years	47
>10 years	29

Numbness was the most notedsymptom (54%), followed by paresthesia in 52% and burning sensation of feet and hands in 38%.30% of the patients had cotton wool sensation of feet and 26% patients presented with all symptoms. A graded sensory loss was seen in the extremities of these patients. The most common sign elicited was impairment of timed vibration (62%), followed by impairment of touch sensation (53%) and impairment of position sense (52%). Ankle jerk was absent in around 50% of the patients.

In our study,11 patients had cranial nerve palsy (11%), 5 of them had 3rd nerve involvement and 6 had 6th nerve involvement ,2 had entrapment neuropathy.Regarding autonomic nervous system, postural giddiness was the commonestsymptom, followed by constipation in 25% and post prandial bloating in 10%. A significant number of patients (10%) also had erectile dysfunction but 80% of them were above 70 years. Abnormal sweating was seen only in 3% of patients in our study. Abnormal heart rate response to standing (16%) and postural fall in blood pressure (11%) were the most elicited signs with respect to autonomic nervous system.

Clinical features

Symptoms	
Numbness	54
Paresthesia	52
Burning Sensation	38
Cotton wool sensation	30
Postural Giddiness	50
Constipation	25
Post prandial bloating	10
Early satiety	4
Erectile Dysfunction	10
Abnormal sweating	3
Bladder disturbances	3
Ptosis (3rd nerve palsy)	5
Diplopia (6 th nerve palsy)	6
Foot drop	2
Signs	

Impairment or absence of vibration sense	62
touch sensation	53
position sense	52
pain and temperature	20
Ankle Jerk	50
HR change	16
BP fall	11
Blood pressure change to sustained hand grip	3

In our study, 76 diabetic patients were diagnosed to have neuropathy. Out of them 6 were asymptomatic and diagnosed to have neuropathy on electrophysiological study. All 76 patients (100%) had involvement of sensory fibres and 48% of the patients had both sensory and motor involvement. So, the most common neuropathy found in our patients was distal symmetrical sensory neuropathy followed by distal symmetrical motor sensory neuropathy. In the present study 62 patients had axonal degeneration alone and in 14 patients there was associated segmental demyelination.

Nerve conduction study

Types of Neuropathy	
Axonal	62
Axonal and Demyelination	14
Total	76
Distal Polyneuropathy	
Sensory fibres	72
Motor and sensory	48
Total	72

Discussion

Our study, male patients more than 60 years, with diabetes of more than 5 years duration with an HbA1c of more than 6.5 were the most affected group. This was comparable to many Indian and international studies[3,4,5]. In an Indian study by Kamalarathnam et al, most affected patients affected were more than 60 years with long standing diabetes[6]. However,in the INTERPRET-DD study, females were found to be more affected than males[7]. The most common symptom in our study was numbness followed by paresthesias where as in many international studies the most common symptom was painful paresthesia[8,9,10]. The most common sign elicited was decreased timed vibration sense, which was similar to many other studies,although a few studies showed as the most common sign[11,12,13,14]. Hence distal symmetrical sensory neuropathy was the most common type of neuropathy found in our study group. A significant number of patients (11%) also had cranial neuropathies, which was a diagnosis of exclusion. Various international studies also reported a significant prevalence of diabetic cranial neuropathy[15,16,17,18,19].

The most common symptom of autonomic system dysfunction was postural giddiness in our study and the most common sign was abnormal heart rate response to standing.Many international studies showed a similar pattern of involvement[20,21,22,23,24]. In a study conducted in China showed that postural fall in blood pressure is a very common sign in diabetic patients[25]. A significant proportion of our patients also had erectile dysfunction but most of them were in the age group of more than 70 years and here the age could be a confounding factor[26].

Electrophysiologically, axonopathy was found in most of our patients. Sensory fibres were affected more than motor fibres. Distal symmetrical sensory axonopathy was the most common pattern of neuropathy found in these patients[27,28,29]. 6 of the patients who had no symptoms of neuropathy were also detected to have neuropathy on electrophysiological study. Hence through nerve conduction study, even before the symptoms are manifest, it's possible to detect neuropathy in these patients[30,31].

Conclusion

Neuropathy is a troublesome complication of diabetes with almost all patients developing neuropathy when diabetes is long standing. It is better to prevent the development of neuropathy than treating it. Nerve conduction studies are easy to carry out, bed side studies, which are exceptionally good in detecting even subclinical neuropathy. Long standing diabetes and uncontrolled sugar levels were most incriminating. Advanced age may be a confounding factor in long standing diabetics in our study. Numbness and paresthesia were the most common symptom and decreased timed vibration was the most common sign. Distal symmetrical sensory neuropathy was the most common neuropathy in our study. We also had a few cases of entrapment neuropathies presenting as foot drop in some patients. One drawback of our study is that type 1 diabetes patients were excluded from this study. Larger scale comparative study of neuropathies in type 1 vs type 2 diabetes are underway to study in depth about this disease condition which could help in its effective prevention.

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