

Original Research Article

Assessment of vibratory QST abnormality in diabetic patients with special correlation to duration of diabetes

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ABSTRACT

Background: Peripheral Neuropathy is one of the common microvascular complications in diabetes mellitus affecting both large and small nerve fibres. In present study we have assessed the impairment of vibration perception threshold (VPT) QST that enables evaluation of affection of large myelinated (A α and A β) fibres.

Methods: Authors used Biothesiometer in our study that served a satisfactory tool for quantitating vibratory sense. In our study 120 diabetic patients between 30 to 60 yrs age group with duration of illness ≤ 10 yrs, 10-20 years and more than 20 years were subjected to Vibratory QST by instrument (Vibrotherm Dx) at several specific points of feet.

Results: The result observed is, 73.2% (n=22) diabetics with clinical neuropathy show impairment of vibration sense, while 60% of diabetic patients without clinical neuropathy also show impairment of vibration sense. Result suggests involvement of nerve fibres in a subclinical stage in diabetic patients. Relation between vibratory QST and duration of diabetes is also established, Chi-square trend test is done and it shows there is positive trend with duration of diabetes and it is statistically significant $p \leq 0.001$.

Conclusions: This study suggests that Vibratory QST should be carried out in every diabetic patient irrespective of clinical neuropathy and duration of diabetes, for early detection, progression & institution of therapy.

Keywords: Diabetic peripheral neuropathy, QST, Vibration perception threshold

INTRODUCTION

Diabetes is a chronic progressive disorder with increasing worldwide prevalence and is of much concerned because of its devastating complications. Between this, nervous system is most frequently affected.¹ Diabetes affects both large and small myelinated fibres and unmyelinated nerve fibres as well.² Clinical symptom varies widely in peripheral neuropathy due to diabetes.

In majority of cases sensory symptoms predominate and abnormality may be in proprioceptive or exteroceptive sensory system.³ Vibratory QST have added much to early diagnosis of

peripheral neuropathy. Previous study showed that in mild to moderate diabetic neuropathy, the Biothesiometer VPT serves excellent reliability and serves as an appropriate screening tool.⁴ Likely hood of neuropathy must be tested with superficial pain sensation testing or vibratory testing.⁵ Vibratory QST evaluates affection of peripheral nerve in a quantifiable manner.⁶ However contradictory report regarding Vibratory QST testing in peripheral neuropathy has been reported. One study stated that in diabetes patients without clinical evidence of neuropathy there were no correlations between vibratory threshold and thermal threshold.⁷ VPT testing in diabetic neuropathy had done by many authors.^{8,9} But very few reports have been documented in our country.

Therefore, this study is done to evaluate if Vibratory QST testing can be applied in our country for early diagnosis of diabetic peripheral neuropathy. The use of Biothesiometer has served a satisfactory tool for quantifying vibratory sense.⁹

More over one study showed, very recently Biothesiometer QST study is being used for diagnosis of neuropathy especially of small and large fibre, which increases the sensitivity of detecting neuropathy from 30-90% or more.¹⁰

METHODS

The studies on Vibratory QST were conducted in Department of Medicine, K P C Medical College, Kolkata with help of instrument (Neuropathy Analyser - Vibrotherm Dx) (vibration and thermal perception threshold detector).

In this study we have taken average of 6 specific points in both feet:

- Great toe
- 1st metatarsal
- 3rd metatarsal
- 5th metatarsal
- Instep
- Heel

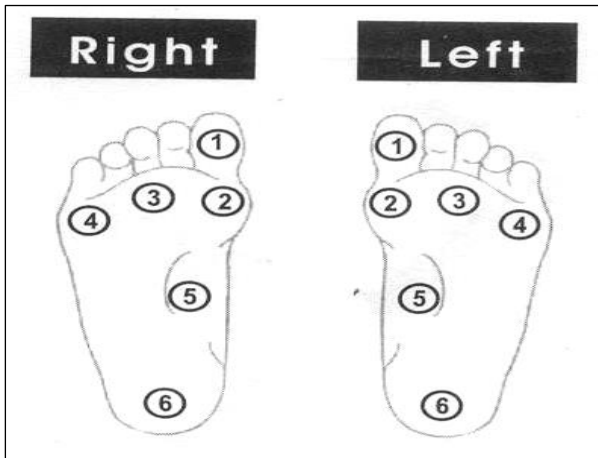


Figure 1: Six specific points of both feet for VPT.

Procedure - first probe was applied to patient’s hand to explain the feel of vibration clearly. Then patient is asked to concentrate on feet and tell as soon as he starts feeling the vibration and value is noted. Quantification of vibratory sense was detected in 120 diabetic patients of which 60 had clinical neuropathy and 60 had no clinical neuropathy. During recording, the voltage was increased from 0 to 50 volts. The instrument specific normative data found after studying 100 controls are as follows: -

Normal - upto 15 volt / Grade I - 16 to 25Volt / Grade II - >25 volt.

Inclusion criteria

- Mentally alert and conscious subjects with full knowledge about the matter participated in the study.
- Among 120 subjects of T2DM were included who were diagnosed at least two years back and with or without ongoing treatment of which 60 had clinical neuropathy and 60 had no clinical neuropathy.

Exclusion criteria

- Patients with other comorbidities like cancer, cirrhosis of liver, multi organ failure, and chronic kidney disease etc. were excluded from the study,
- Those below 30 years of age and above 70 years of age,
- Pregnant women were not included in the study,
- T1 DM patient.

Statistics

Chi-square test has been applied between the parameters.

RESULTS

The observation of results as in Table 1 showed that, among the diabetic patients with clinical neuropathy 73.2% had abnormal VPT and, 26.6% and 46.6% shows grade I and grade II severity respectively, whereas, 26.6% show normal VPT. Interestingly even in diabetic patient without clinical neuropathy, 60% show grade I severity with VPT testing.

So, maximum patients with clinical neuropathy show grade II severity with vibration perception threshold.

Table 1: Frequency distribution of grades of raised VPT.

Severity of grades of VPT	Clinical neuropathy		No clinical neuropathy	
Normal	16	26.6%	24	40%
Grade I	16	26.6%	36	60%
Grade II	28	46.6%	0	0

Table 2: Frequency distribution of abnormal and normal Vibratory QST in clinical and subclinical cases.

Grade of VPT	Clinical symptom	Subclinical	Total
Normal	16	24	40
Abnormal	44	36	80
Total	60	60	120

Table 3: Relation between duration of diabetes and QST.

Duration of DM/ QST	< 10 years	10 - 20 years	> 20 years	Total
QST (Normal)	36	4	0	40
QST (Abnormal)	5 (6.25%)	33 (41.25%)	42 (52.5%)	80 (100%)
Total	41	37	42	120

It is observed from the table 2 that 24 (40%) patients having no clinical neuropathy belong to normal grade of VPT against 16 (26.6%) patients having clinical neuropathy. 16 patients (26.6 %) with clinical neuropathy develop grade I VPT, while 36 (60%) patients with no clinical neuropathy also have grade I severity. Whereas, 24 (46.6%) patients with clinical neuropathy were identified as grade II sufferer and no patient of grade II abnormality seen in subclinical neuropathy. Taking into consideration of 2 groups of patient with normal and abnormal severity, chi square test is done. It is observed that chi-square = 1.2 ($P > 0.05$) i.e., there is no significant difference between the symptomatic and asymptomatic cases.

In this study, we found that 80 cases of Vibratory QST abnormality is distributed as 6.25%, 41.25%, 52.5% when duration of diabetes is less than 10 years, 10 to 20 years and more than 20 years respectively (Table 3). Chi-square trend test has been done and it shows that there is a positive trend with duration of diabetes and it is statistically significant with ($p < 0.001$).

DISCUSSION

Most of the clinical neuropathic patients showed abnormal VPT either grade I or grade II, but 16 patients out of 60 do not have any abnormal VPT. In present study the result show diverse values of Vibratory QST testing. Reason may be that VPT testing is more of subjective in nature. Similar findings have also been reported.⁶ Among the diabetic neuropathic patients, 28 had grade II abnormality and 16 had grade I abnormality. The reason for different grades of neuropathy may be due to variable duration of illness. The observation of Vibratory QST testing in diabetic patients without clinical neuropathy showed grade I severity in 60% patients.

It means that certainly there is affection of nerve fibres in subclinical state without any symptoms. Therefore, Vibratory QST testing to find out the probability of developing neuropathy should assess every subclinical cases of neuropathy in diabetes. Van Deusen RW et al, stated that in mild to moderate diabetic neuropathy the biothesiometer Vibratory QST serves excellent reliability and serves as an appropriate screening tool.⁴ Therefore, it is better to have therapy should be instituted in these subclinical cases of neuropathy on the basis of Vibratory QST abnormality to prevent disease

progression along with glycemic control. This study demonstrates that Vibratory QST should assess all cases of diabetic patients irrespective of clinical symptoms of neuropathy for early diagnosis and treatment. Further analysis shows 11.3% (5/41) with duration less than 10 years, 90.24% (37/41) of 10-20 years and 100% (42/42) of more than 20 years had abnormal Vibratory QST. Statistically there is a positive trend with duration of diabetes and Vibratory QST abnormality (Table 3). So, it is obvious that Vibratory QST is more sensitive for all stages of DM and more so in early and median duration cases.

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