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Clinical Neurology and Neurosurgery 107 (2005) 486–490

Clinical Neurology and Neurosurgery

www.elsevier.com/locate/clineuro

Quantitative thermal sensory testing — value of testing for both cold and warm sensation detection in evaluation of small fiber neuropathy

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Received 21 July 2004; received in revised form 7 December 2004; accepted 21 December 2004

Abstract

Objective: Small fiber neuropathy is a common neurological disorder, often missed or ignored by physicians, since examination and routine nerve conduction studies are usually normal in this condition. Many methods including quantitative thermal sensory testing are currently being used for early detection of this condition, so as to enable timely investigation and treatment. This study was conducted to assess the yield of quantitative thermal sensory testing in diagnosis of small fiber neuropathy.

Material and methods: We included patients presenting with history suggestive of positive and/or negative sensory symptoms, with normal examination findings, clinically suggestive of small fiber neuropathy, with normal or minimally abnormal routine nerve conduction studies. These patients were subjected to quantitative thermal sensory testing using a Medoc TSA-II Neurosensory analyser at two sites and for two modalities. QST data were compared with those in 120 normal healthy controls.

Results: Twenty-five patients (16 males, 9 females) with mean age 46.8 ± 16.6 years (range: 21–75 years) were included in the study. The mean duration of symptoms was 1.6 ± 1.6 years (range: 3 months–6 years). Eighteen patients (72%) had abnormal thresholds in at least one modality. Thermal thresholds were normal in 7 out of the 25 patients.

Conclusion: This study demonstrates that quantitative thermal sensory testing is a fairly sensitive method for detection of small fiber neuropathy especially in patients with normal routine nerve conduction studies.

Keywords: Small fiber neuropathy; Quantitative sensory testing; Thermal

1. Introduction

Small fiber neuropathy is a disorder, characterised by preferential involvement of small myelinated as well as unmyelinated nerve fibers. It is a commonly encountered entity in general neurology practice as well as in speciality neuromuscular clinics [1]. The common presenting manifestations are positive sensory symptoms such as tingling and burning paraesthesiae, with only subtle findings on examination in the form of reduced perception of pinprick and temperature sensations over distal extremities. Symptoms usually involve distal extremities but can also be patchy or diffuse [2]. In a large number of patients with pure small fiber neuropathy, routine neurological examination may be entirely normal with no abnormality on routine nerve conduction studies [3]. The diagnosis is therefore, often missed, since physicians may ignore the symptoms of patients with normal examination and nerve conduction findings.

In recent years, much work has been done to identify reliable methods for diagnosis of this subtype of sensory neuropathy. Quantitative thermal sensory testing (QST) is one simple diagnostic method, which can be used to confirm the subtle sensory abnormality found in patients with small fiber neuropathy. This is a psychophysical test, a thermal sensory equivalent of audiometry for hearing function [4]. It is simple to perform and not time consuming. The aim of the present study was to evaluate patients with symptoms of small fiber neuropathy with QST.

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0303-8467/$ – see front matter © 2005 Published by Elsevier B.V.
doi:10.1016/j.clineuro.2004.12.016

2. Material and methods

This study was conducted over a period of 1 year, between December 2001 and November 2002, at the Clinical Neurophysiology laboratory, Department of Neurology, All India Institute of Medical Sciences, New Delhi, India.

Adult patients presenting with history suggestive of positive sensory symptoms such as burning, pricking, tingling paraesthesiae with or without an element of pain for a minimal duration of one month, with normal findings on examination, with normal or minimally abnormal routine nerve conduction studies, insufficient for diagnosis of peripheral neuropathy, formed the study group.

Exclusion criteria included age less than 18 years, any known cause of small fiber neuropathy, any associated features of a central nervous system disorder, febrile or hemodynamically unstable patients and patients with peripheral vascular disorders.

The control population was formed by normal adults, usually relatives of patients attending neurology services at our centre and hospital staff, which had been part of an earlier study by us, for determination of normative data for QST. Individuals older than 70 years or younger than 12 years, those with impaired glucose tolerance, those with history of back or neck injuries and those with family history of peripheral neuropathy, were excluded.

Initial clinical evaluation included history for confirmation of inclusion and exclusion criteria followed by general physical and neurological examination. Routine nerve conduction studies included motor conduction and F wave studies for Median, Ulnar, Common peroneal and Posterior tibial nerves and sensory conduction studies for Median, Ulnar and Sural nerves on one side in patients with symmetrical distribution of symptoms and evaluation of a third limb in patients with asymmetrical symptoms [5]. The sympathetic skin response (SSR) was also tested for in all patients [6].

QST was carried out using a Medoc TSA-II Neurosensory analyser at one or more sites, with method of *limits* [7]. Subjects were seated comfortably, on a chair in a quiet room, with ambient temperature of 24–25° C. The site used for testing the lower limb was dorsolateral border of foot and the site used in the upper limb was the hypothenar eminence. The modalities tested were cold sensation and warm sensation. Patients were instructed in detail, the nature of the test and the need to react attentively and promptly to change in temperatures. The test was performed by placing a 30 mm × 30 mm thermode over the skin of the site to be tested, and averages of four readings of threshold temperature for each sensory modality were noted. Note was also made if the modality was identified incorrectly. Based on values obtained from the control population, the mean threshold temperature ± 2 S.D. for each modality was considered as the upper (or lower) limit of normal.

Data were managed on EXCEL spreadsheets and descriptive statistical analysis was carried out. The Student's *t*-test was used for comparison of mean values and sensitivity was calculated using clinical diagnosis as gold standard.

3. Results

3.1. Clinical characteristics

Twenty-five patients (16 males, 9 females) with an average age of 46.8 ± 16.6 years (range: 21–75 years) were recruited into the study. The control population included 120 normal subjects (65 males, 55 females) with an average age of 38.7 ± 12.0 years (range: 18–72 years). All patients had presentation with positive sensory symptoms like tingling and pricking paraesthesiae. Numbness was associated over affected areas in 3 patients. Paraesthesiae were painful (including burning sensation) in 8 of these patients. Five patients had symptoms involving feet only, whereas one patient had symptoms only over hands. The remaining 19 patients had symptoms both over lower limbs and upper limbs, usually in distal distribution. The mean duration of symptoms was 1.6 ± 1.6 years (range: 3 months–6 years). None of these patients were known diabetics. One patient had history of hypothyroidism and was receiving treatment with oral thyroxine. No other patients had any other associated systemic illnesses. Neurological examination was normal in all patients (Table 1).

3.2. Nerve conduction studies

All patients had entirely normal motor conduction and F waves. Five patients had mild reduction in amplitude of Sural SNAPs. The SSR was non-elicitable in 2 patients. Nerve conduction and SSR studies were completely normal in the remaining 18 patients.

3.3. QST

Seven of the patients included had normal thresholds for both sensory modalities tested. The remaining 18 patients (72%) had abnormality in thresholds at one or both sites tested (Table 2). Only one patient had abnormality confined to the upper limb site. Thresholds were abnormal, only over the lower limb site in 10 patients. Among these 10 patients, 5 had clinical symptoms also confined to the lower limbs. Seven patients had gross abnormality in thresholds over both upper and lower limb sites.

3.4. Controls

The mean cold sensation threshold in the control group at the palmar hypothenar area was found to be 26.7 ± 1.01 and 29.01 ± 1.37 °C at the dorsolateral foot area (Fig. 1). The mean warm sensation threshold over the hand site was 35.14 ± 1.1 and 36.1 ± 1.3 °C at the foot site.