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Short Communication

A New Electrodiagnostic Procedure for Measuring Sensory Nerve Conduction across the Carpal Tunnel

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ABSTRACT

Stimulation with pad electrodes of sensory nerves in the palm of the hand and recording the response from the median nerve close to the wrist using conventional surface electrodes in controls gave nerve potentials usually about 100 μV after a latency of about 1.2 (initial deflection) to 1.6 (peak) ms. The latency of the peak tended to increase significantly in cases of carpal tunnel syndrome. This new method is simple to apply and will probably increase the diagnostic accuracy appreciably. It is suggested that it be used in parallel with the conventional procedures until more experience has been gained.

INTRODUCTION

The conventional way of determining the conduction in the sensory division of the median nerve consists of stimulation of digital nerves in one of the first three fingers and recording the evoked response over the nerve trunk in the forearm, close to the wrist. This technique has been reviewed by Smorto et al. (2) who also compiled various normal values. Further references can be found in ref. (1).

It is known that in the carpal tunnel syndrome (CTS), sensory conduction often is a more sensitive indicator of the state of the nerve than is the motor response. However, the sensory conduction from digits to wrist was normal or borderline in 25% of 117 patients with CTS (1). There was an increasing yield by also recording from needles inserted close to the common volar nerves and subtracting the distal (digit to palm) latency (1). It is not surprising that the palm to wrist segment is the most sensitive parameter. In the present study this observation was tested and confirmed to be of value.

METHODS

The EMG apparatus used was a MEDELEC MS 6. The skin was prepared by rubbing it with ether. Conventional surface electrodes of felt (8 mm 'cushions' 25 mm apart) soaked in 0.9% saline were used for stimulation and recording, as indicated in Fig. 1*A*. The recording electrode was secured by a band, as was the ground; the stimulating electrode was hand held. The stimulus had a duration of 0.1 ms and an amplitude of about 90 V; the rate was 2 or 5 per s. The time delays were determined to the nearest 0.05 ms using the built-in strobe. Eleven normal subjects (17 hands) 25–43 years of age were tested. The same procedure was also applied in a small number of patients with signs of median nerve entrapment at the wrist.

RESULTS AND CONCLUSIONS

An evoked sensory response in the order of 100 μV could easily be obtained in the normal hands. Stimulation at the palm caused less discomfort than equivalent stimulation of the digits. On the average, the response started after 1.20 ms (0.95–1.55, S.D. 0.14). The peak of the response had an average latency of 1.61 ms (1.45–1.85, S.D. 0.14). If the stimulus polarity was changed, the response was smaller, with an additional delay of about 0.35 ms, indicating a source of error requiring careful checking. If the stimulating electrode was held too close to the thenar eminence, a motor response appeared which started after the sensory wave or during its falling phase.

In two of three hands with a pronounced CTS (i.e. with a distal motor conduction of about 7 ms) it was possible to record a 10–15 μV sensory wave with the peak at 4–4.5 ms. In cases with slight or

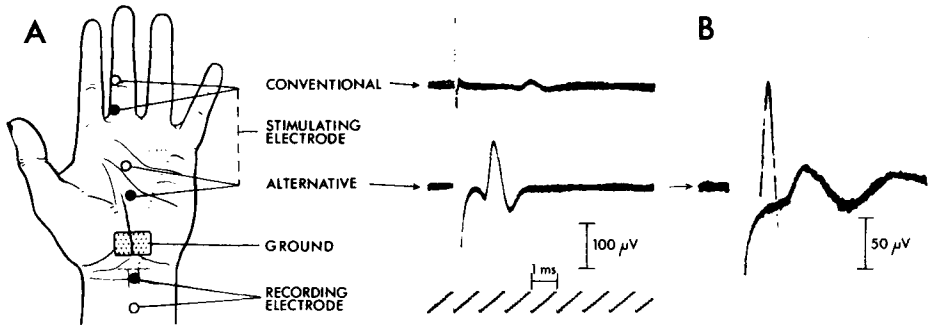

Fig. 1. Illustration of the alternative method for diagnosis of CTS. (*A*) the responses in a normal hand, peak delays of about 3.0 ms from digit and 1.7 ms from the palm. The cathode of the stimulating electrode is black. (*B*) the response in a hand with CTS (40-year-old woman). The conventional sensory latency could not be determined without an averaging procedure (it was slightly abnormal). Palm to wrist latency about 3.0 ms. Sweep speed as in *A*. For comparison, a normal response is superimposed (1.5 ms, 115 μV). Each recording consists of 5–8 superimposed traces.

moderate symptoms (eight hands) the amplitude was reduced and the peak latency increased (Fig. 1*B*). Thus, it ranged from 2.0–3.3 ms with an average of 2.5 (S.D. 0.46). The conventional sensory latency was within normal limits in those cases which included two hands which were considered unaffected by the patients. These findings show that this new method is sensitive and that peak values above 2.0 ms can preliminarily be considered pathological ($\bar{X}$+3 S.D.=2.03). Abnormal findings have been found not only in CTS but also in polyneuropathy.

The method presented apparently represents an improved diagnostic procedure for CTS. It is desirable, however, that it be used in parallel with the conventional measurements until additional experience has been gained.

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