

Roth Technique—A New Approach for Measuring Sensory Neural Conduction in the Median and Ulnar Nerves: Suggestion from the Field

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This article describes a technique to determine orthodromic sensory neural conduction of the median and ulnar nerves. The Roth technique is an accurate, yet time-conserving, method to orthodromically measure median and ulnar nerve latency and amplitude. This technique can be an alternative method to the orthodromic ring electrode stimulation technique.

Neural conduction studies (NCSs) are used to aid in the diagnosis of several neuromuscular disorders such as entrapment neuropathies, diffuse polyneuropathies, and other diseases of the peripheral nerves.^{1–3} Two methods used for the determination

of sensory neural action potential (SNAP) amplitude and latency are the orthodromic (OD) and antidromic (AD) techniques.^{1–3} Median and ulnar sensory neural conduction of the upper extremity may be determined by stimulating the appropriate digital nerves and recording the SNAP from a more proximal site on the nerve (OD) or alternatively by stimulating the nerve proximally and recording the SNAP distally (AD).³ Sensory neural action potentials are routinely measured both orthodromically and antidromically in the upper extremities using either surface disk or ring electrodes over the digital nerve.

Several studies have indicated that mean OD and AD neural conduction values are not significantly different. Buchthal and Rosenfalck in 1966 stated that no difference in mean latency values was found between the two methods.^{4,5} Other researchers have reported that sensory OD and AD latency values were essentially the same for healthy subjects.^{1–6} Melvin et al stated that AD latency was 0.2 msec slower than OD latency; however, this difference was not significant.⁷ Amplitudes for OD and AD SNAPs were not addressed in these earlier studies, with the exception of Kimura^{2,3} and Buchthal and colleagues^{4,5} who reported that AD amplitude of the digital SNAP appeared to be greater than OD amplitude when measured in the median nerve. The larger amplitude of the SNAP when measured antidromically is due to the proximity of the digital nerves to the skin (as opposed to the nerve trunk).^{2,3} In contrast to these studies, Chodoroff et al⁹ and Tashjian et al¹⁰ have found significant differences between OD versus AD latencies and amplitudes. Because of the discrepancy between reports concerning OD and AD sensory NCSs, a study is currently being performed at the Electrodiagnostic Laboratory, Neurology Service, Brooke Army Medical Center,

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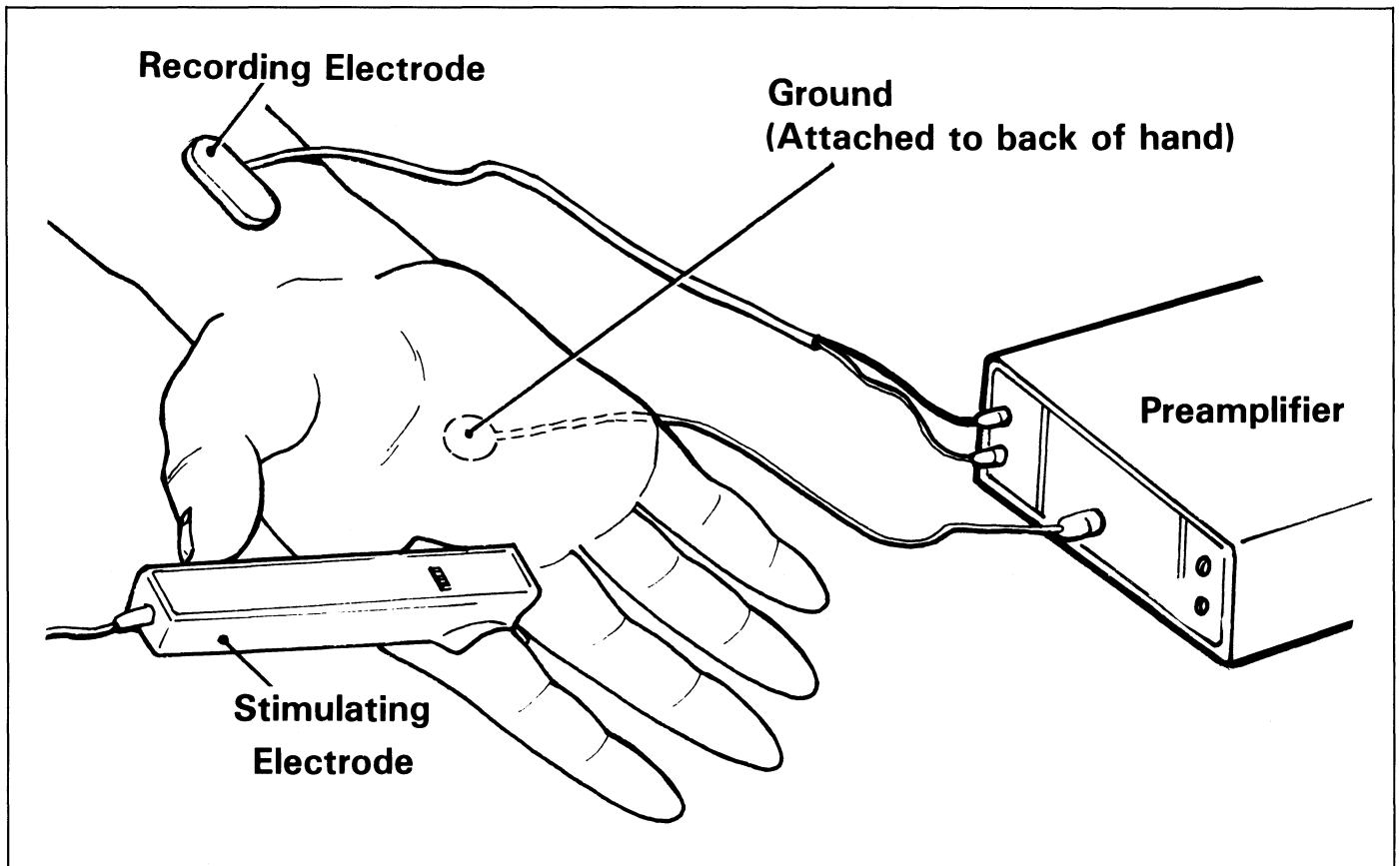


Fig. 1. Roth technique of median nerve stimulation (orthodromic).

to add new information on this subject.

Orthodromic sensory NCSs typically use stimulating surface or ring electrodes over the digital nerves with the active recording electrode placed proximally over the appropriate nerve at the wrist.^{2,3} This technique is used primarily in electrophysiology laboratories on a routine basis. There is an alternative method, however, to performing OD sensory NCSs. The Roth technique for performing OD sensory NCSs was first described in 1976 by Joel Roth (J Roth, unpublished data, 1976). To our knowledge, this innovative technique has not been reported in the literature.

The Roth technique for median sensory NCSs is performed in the following fashion. The recording electrode*

is a plastic bar with two 9-mm silver disk electrodes. The recording electrode is placed on the skin over the patient's median nerve at the wrist (Fig. 1) and secured with tape. The cathode of the recording electrode is placed distally. The stimulating probe is placed between the index and middle fingers (Figs. 1, 2). The cathode of the stimulating electrode is placed proximally. The recording bar electrode is 140 mm proximal to the space between the index and middle fingers (Fig. 1). The Roth technique does not use ring-type electrodes, thus saving time in procedure setup. The patient is asked to relax, and the electromyographer places gentle pressure on the index and middle fingers to ensure good skin contact with the stimulating probe (Fig. 2). A similar procedure can be used with testing

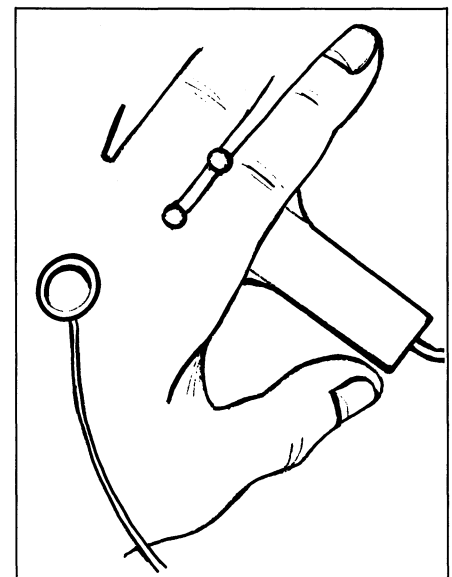


Fig. 2. Dorsal view of Roth technique of median nerve stimulation (orthodromic).

*Electrode Store, United Medical Electronics, 8906 Cadawac Rd, Houston, TX 77074.

the distal sensory latency of the ulnar nerve (Fig. 3).

The distal sensory peak latency for the median nerve is similar for both Roth and OD ring techniques when measured at 140 mm (3.2 ± 0.2 msec)¹ and 130 mm (2.9 ± 0.1 msec).¹¹ The amplitude of the SNAP for the OD ring technique is reported as 41.6 ± 25.0 μ V (at 140 mm)¹ and 20.0 ± 1.0 μ V (at 130 mm).¹¹ The amplitude of the SNAP using the Roth technique is similar when measured at 140 mm (40.3 ± 8.2 μ V) but decreased (38.4 ± 6.2 μ V) when measured at 130 mm and compared with previously reported values.¹¹ Studies are currently under way with a large sample to test the three techniques (Roth, OD ring, and AD ring) as to differences in distal sensory latency and amplitudes of the SNAP (Ayotte and colleagues, unpublished data, 1989).

Use of the Roth technique to determine OD sensory neural conduction in the median and ulnar nerves is an accurate, yet time-conserving, method when compared with the OD method using ring or surface electrodes. In addition, the Roth technique generally causes less discomfort to patients when compared with the OD ring measurement, at the same time producing a larger amplitude of the SNAP. Furthermore, when obtaining OD SNAP measurements of the median nerve, the clinical electro-neuromyographer may easily change from the Roth technique (stimulating at the fingers) to palmar stimulation (8 cm proximal to the recording cathode electrode) if digital stimulation shows a normal latency and a carpal tunnel syndrome is clinically suspected. This is an important additional step because the palm-to-wrist measurement of median nerve distal

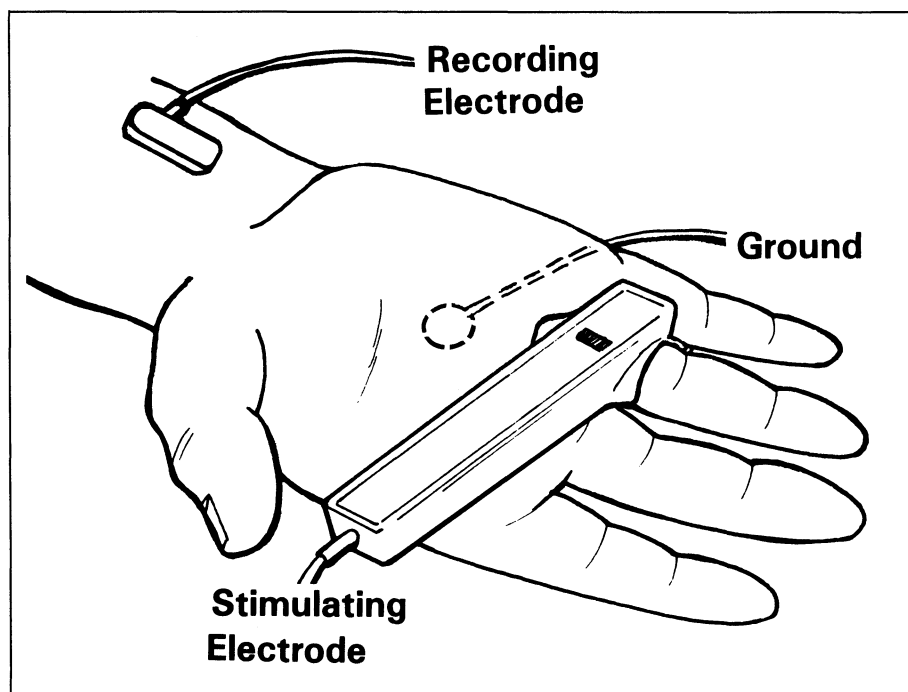


Fig. 3. Roth technique of ulnar nerve stimulation (orthodromic).

sensory latency has been shown to be a more sensitive electrodiagnostic indicator of carpal tunnel syndrome.^{11,12}

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