## Orthodromic vs. Antidromic Latencies

In their article "Nerve Conduction Studies: Orthodromic vs. Antidromic Latencies (Arch Phys Med Rehabil 1990;71:579–82), Cohn, Wertsch and associates point out that distance between the reference and active electrodes can change the configuration and thus—possibly—the latency of the evoked response. The authors quoted two of our studies[1,2] and a study by Murai and Sanderson[3] all of which indicated that there is a statistically significant difference between the orthodromic and antidromic latencies. Murai also standardized the distance between the active and reference electrodes, as did Cohn and colleagues. In our second study, we demonstrated that colder temperature also increased the difference between the antidromic and orthodromic latencies.

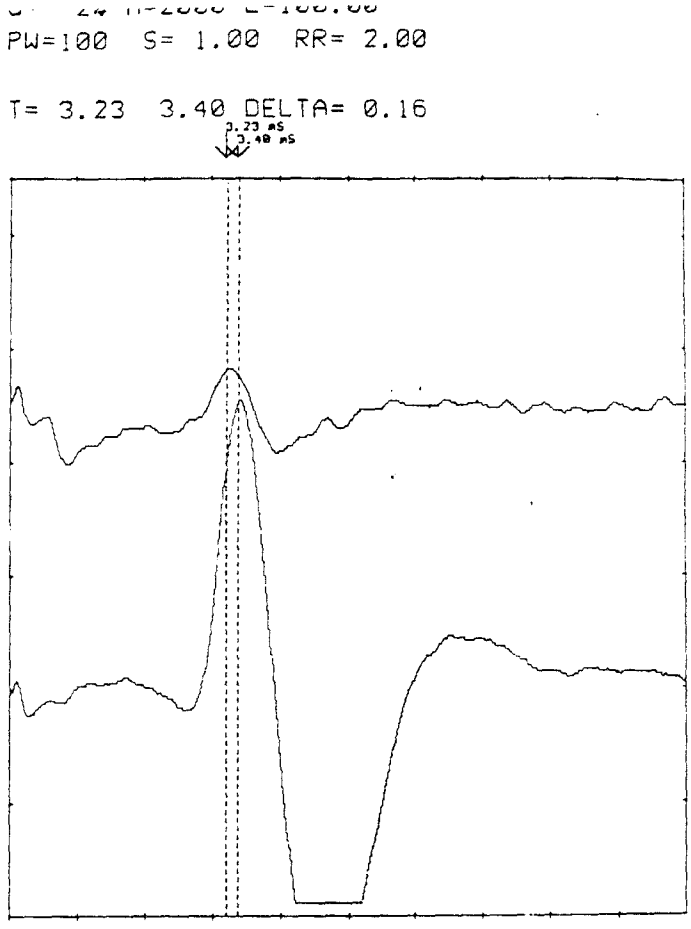
Although electrode distance can, as Cohn pointed out, affect the peak latency, this is only one of several parts of the total explanation for the differences between antidromic and orthodromic latencies.

In analyzing Cohn and colleagues' study, we see in table 1 that there was, in fact, a mean difference between the peak latencies of almost .1msec in the median nerve and .128msec in the ulnar nerve. This compares with onset latency differences of essentially zero in the median nerve, and .071 and .040 in the ulnar nerve. This indicates a greater latency difference between peak latencies than between onset latencies. The authors did not state whether the peak latency of the orthodromic or the peak latency of the antidromic was always the longer; it was the antidromic latency that was longer in both our studies and Murai's study.

Also, in our second study we demonstrated an increase in the difference between the orthodromic and antidromic latencies with cold temperatures which still requires an explanation, since even if the distances between the electrodes were not the same when performed ortho- and antidromic, the difference in the electrode distance was held constant while the temperature was altered. This temperature effect must be considered although the electrode distance difference and the changing temperature may indeed represent a confounding of two variables.

There may be several explanations for the differences between our studies. One may be the statistical methodology; in our first study we used 52 subjects using the student *t*-test for related measures. Cohn and associates used 25 subjects, which would require a larger difference between anti- and orthodromic latencies to approach statistical significance. Another possible explanation: the electrode separation did seem to cause temporal displacement of the measured peak latency. Murai noted that the anti- and orthodromic peak latency became similar at an electrode distance of 1cm. This effect was not present on the onset latency. They postulated that because of the increased amplitude of the antidromic vs. orthodromic response, the peak latency became more displaced, and hence the antidromic peak latency was always a little longer. This would help to explain the effect of cold since the amplitude of the antidromic evoked response increases much more with cooling than does the orthodromic response;[1] therefore, the displacement of the peak of the antidromic evoked response would be expected to be greater, thereby producing a larger latency. Finally, the hand temperature in Cohn's study ranged from 30° to 34°C. This would minimize the difference between the anti- and orthodromic peak latencies.

After reading Cohn's article, we performed median conduction studies on a 24-year old woman at room temperature, keeping the electrode distance constant at 4cm. Her hand temperature was 26° at the MCP joint, 17° at the base of the palm, and 28° at the wrist. There was a definite difference between the antidromic peak latency and orthodromic peak latency (fig).




The article by Cohn and associates is important in pointing out that the more standardized the techniques, the better the data obtained. However, we still make the points that if the hands are cold, the orthodromic latency will be more constant and there can still be differences between the latencies as large as 2msec or 2.5msec in individuals, depending on hand temperature. This is true even if electrode distances are kept constant.

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**References**

1. Chodoroff G, Tashjian EA, Ellenberg MR. Orthodromic vs antidromic sensory nerve latencies in healthy persons. Arch Phys Med Rehabil 1985;66:589–91.
2. Tashjian EA, Ellenberg MR, Gross N, Chodoroff G, Honet JC. Temperature effect on antidromic and orthodromic sensory nerve action potential latency and amplitude. Arch Phys Med Rehabil 1987;68:549–52.
3. Murai Y, Sanderson I. Studies of sensory conductions: Comparison of latencies of orthodromic and antidromic sensory potentials. J Neurology, Neurosurg, Psychiatry 1975;38:1187–9.