Dynamic F-Wave Study Aids in Diagnosis of Neurogenic Thoracic Outlet Syndrome
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Abstract
Neurogenic thoracic outlet syndrome (TOS) is a clinical symptom complex that results from recurrent mechanical compression of the brachial plexus in the region between the base of the neck and the armpit. Its diagnosis may, at times, be elusive due to the lack of sensitivity or inconsistency in the laboratory evaluations. Upper extremity neurodiagnostic studies, such as nerve conduction studies, electromyography, and somatosensory evoked potentials, are of limited value in making an early diagnosis of TOS. Herein, we report measurements of the mean latency difference in dynamic F-wave studies helps in the early diagnosis of TOS.

Patients and electrophysiologic studies
Seven subjects [37.7±17.3 year-old, mean±SD, range 18 to 62y, female/Male=6/1] with a clinically provisional diagnosis of TOS were studied [Table 1]. All had chronic symptoms [27.3±31.1 months, range from 5 to 96] including paresthesias or weakness involving one upper extremity. All had at least one positive on provocative [Adson, Wright and costoclavicular] maneuvers but negative on Spurling’s. Neuroimaging studies excluded the presence of a cervical rib or radiculopathy. NCS was performed on median and ulnar motor and sensory nerves; and on radial, medial and lateral antebrachial sensory nerves. Needle EMG was performed on muscles including deltoid, biceps, triceps, first dorsal interposes, abductor pollicis brevis, and flexor carpi ulnaris.

Dynamic F-wave study was performed on patients lying supine with the arms placed in two positions: 1) The relaxed position in which the arms were placed at the side, parallel to the length of the torso; and 2) The stressed position in which the arms were flexed and raised so that the humerus was parallel to the length of the head. The minimal, mean, and maximal latencies, chrono dispersion and amplitudes were recorded. Simultaneously, real-time changes of skin temperature were monitored and recorded. Within two minutes of the arm placed in the stressed position all subjects complained of paresthesias, and/or “swollen” feeling involving the fingers, hand, or forearm which resolved within 30 seconds after returning the arm to the relaxed position. The data were obtained by averaging the mean latencies of the F-waves from a pool of 2 – 3 trials, in which each consisted of 15 recordings provoked by consecutive super-maximal stimulation. The mean latency difference [MLD] following the dynamic study was obtained by subtraction of the latency recorded at the relaxed position from those recorded at the stressed position [MLD=Latency[stressed]–Latency[relaxed]].

Results and Discussion
In all but 2 subjects who possessed carpal tunnel syndrome,
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Table 1: Demographic data and electrodiagnostic findings.

<table>
<thead>
<tr>
<th>Age/Sex</th>
<th>Symptoms</th>
<th>Duration</th>
<th>NCS</th>
<th>EMG</th>
<th>L-Ulnar/L</th>
<th>L-Ulnar/Str</th>
<th>R-Ulnar/L</th>
<th>R-Ulnar/Str</th>
<th>L-Median/L</th>
<th>L-Median/Str</th>
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<th>R-Median/Str</th>
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<td>5</td>
<td>NL</td>
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<td>2354</td>
<td>23.16</td>
<td>2388</td>
<td>22.33</td>
<td>23.5</td>
<td>22.63</td>
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<td>2422</td>
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</table>

*Age: 37.7±17.3 yrs

| Cutoffs (CI: 99%) | 1.89 ms | 2.09 ms |

*Mean±SD

F: female; M: male; ys: years; mos: months; ms: milliseconds; NCS: nerve conduction study; EMG: electromyography.
L: left; R: right; NL: normal; Rlx: relaxed/neutral position of the arm; Str: stressed/hyperextension of the arm;
MLD: mean latency difference; MLD=Latency [C8-T1nc] - Latency [C8nc]; b/l: bilateral; CTS: carpal tunnel syndrome; nc: neurogenic changes; C7, C7, C8, T1: myotomes; ND: not done; CI: confidence level.

A study in a large number of patients with TOS may be needed to validate the findings. Additionally, normative MLD values may be established individually from individual electrodiagnostic laboratories.

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References


