Compression of the Deep Palmar Branch of the Ulnar Nerve: A Case Report
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Compression of the Deep Palmar Branch of the Ulnar Nerve
A Case Report
RAYMOND E. HOQUE

Key Words: Electromyography, Nerve conduction studies, Physical therapy, Ulnar nerve.

Physical therapists frequently are called on to evaluate and treat persons who have disturbances of hand function. These disturbances may be presented as muscle atrophy, deformities, motor dysfunction, altered sensation, and vasomotor, secretory, and trophic changes. When the cause of these disturbances is thought to be a peripheral nerve injury, electrophysiological testing procedures are important to help delineate the problem. These procedures assist in determining the site and degree of injury as well as the extent of motor recovery associated with nerve regeneration. They aid in distinguishing or corroborating nerve injuries, submaximal effort, innervation anomalies, diseases, or other injuries of the lower motor neuron.

This case report is presented to illustrate the importance of using EMG and nerve conduction studies in the evaluation of a possible ulnar nerve lesion in the hand. To avoid premature, clinical conclusions of ulnar nerve injury, I developed an evaluation plan based on EMG to study several muscles and nerve sites. Disturbances of structures in the hand that are innervated by the ulnar nerve may result from several causes: 1) motor neuron disease; 2) nerve root compression; 3) disease of peripheral nerve; 4) mechanical abnormalities as a result of a disease process; 5) entrapment of the interdigital nerve branch to the fifth digit; or 6) entrapment of the ulnar nerve in the cubital tunnel or within, proximal to, or distal to Guyon’s canal. When a nerve problem has been identified and surgery is performed, a postsurgical electrophysiological test assists in evaluating the success of the surgery.

HISTORY AND PHYSICAL FINDINGS
A 28-year-old man with weakness of the right hand was referred to our electrophysiology laboratory for evaluation. In his patient history, he stated that his weakness had begun one month earlier. He had worked in his current occupation as an installer of plate glass for three years. In his job, he frequently had to cradle the bottom of the glass in the palm of his right hand while lifting and inserting the glass into place. He indicated that the weakness did not occur after any one incident. He stated that he had no pain.

The evaluation revealed no sensory loss, but he had some tenderness in the palm when deep pressure was applied. No deformities were present. A manual muscle test revealed a manual muscle test grade of Good fourth dorsal interosseous. All other interossei muscles, the third and fourth lumbrical muscles, and the adductor pollicis muscles were graded Fair. Other hand muscles were graded Good (+). The remaining muscles of the upper extremities, neck, and trunk were graded Normal. I found no movement disorders other than those in the hand.

Initial presurgical and subsequent postsurgical nerve conduction studies were done according to accepted techniques. The results of the initial nerve conduction studies are summarized in Table 1. The amplitudes and durations of the evoked compound muscle action potentials were within normal limits according to the limits established by published reports, but the terminal latency of the right ulnar nerve to the first dorsal interosseous muscle was greater than its contralateral counterpart. Kimura indicated that this latency may be prolonged in ulnar nerve injury when compared with the unaffected side. The difference between the ipsilateral distal latencies of the ulnar nerve to the first dorsal interosseous and abductor digiti minimi muscles was 2.2 msec. This difference was greater than the range of 1.2 msec ± 0.48 msec, which Bhala and Goodgold reported as normal.

The results of an initial EMG examination using a monopolar intramuscular electrode are in Table 2. Abnormalities were found in the adductor pollicis and all but the fourth interossei muscles. The insertion activity in these muscles was prolonged, with moderate amounts of positive sharp waves. Spontaneous fibrillation potentials were observed. The interference pattern was reduced during maximum voluntary effort. All other muscles demonstrated motor unit potentials of normal amplitude, duration, and shape. They showed a full interference pattern during maximum voluntary effort. No fasciculation potentials were recorded from any muscle. I was interested to learn that no EMG abnormalities were found in the fourth dorsal interosseus muscles. This could be interpreted as nerve innervation anomaly; however, it is not possible to make a specific statement at this time.

The results of the evaluation indicated a lesion of the deep palmar branch of the ulnar nerve distal to where it gives off branches to the hypothenar muscles. The results and impression were sent to the referring surgeon. He established a preoperative diagnosis of “compression of the ulnar nerve, deep motor branch of the right hand.” Surgery was performed as soon as possible, 18 days after the evaluation. The ulnar nerve was explored in Guyon’s canal and in the palm of the hand. The nerve had developed some hyperemia in the canal. The conclusion at surgery was that the patient had compression of the...
deep branch of the ulnar nerve. Decompression of the nerve was performed.

RESULTS AFTER SURGERY

The patient returned to light duty 3 days after surgery but was instructed not to use his right hand. He was referred to our laboratory for a postsurgical follow-up evaluation 22 days after surgery. At this evaluation, the muscle test revealed that all muscles previously graded as Fair were now graded as Good (Tabs. 1, 2). The terminal distal latency of the ulnar nerve to the first dorsal interosseous muscle had decreased. The ipsilateral difference of 2.2 msec had decreased to a normal value of 1.1 msec. Tests showed a full interference pattern during maximum voluntary effort in one muscle and a slightly reduced interference pattern in three muscles. Because all patterns indicated improvement, the reduced pattern was not considered clinically significant for the postsurgical test. I found no fibrillation potentials or positive sharp waves. The patient stated that his hand felt stronger but not quite as strong as before the occurrence of the problem. There was slight atrophy of the interossei muscles. He was instructed in hand strengthening home exercises and proper body mechanics of lifting. He was reminded to wear protective gloves while working and was advised he could use his hand during work as much as he wished.

When interviewed 20 days after the instructions, the patient believed that his hand was almost as strong as before the injury. Subsequent interviews indicated that the patient had experienced some "cramping" in his right hand for a few days on two occasions during the first year. No further occurrences were reported. The patient was last interviewed four years after surgery. He stated he had a strong hand with no problems. He had continued to work as an installer of plate glass. He had implemented proper body mechanics and always wore protective gloves.

The postsurgical study for this case report showed the presence of no fibrillation potentials or positive sharp waves. A clinician could ask why the abnormalities disappeared within a seemingly short period of time. A definite answer is impossible; however, some comments are in order. Nerve recovery is subject to many unpredictable factors such as the severity of damage, site and nature of the lesion, state of peripheral tissues, duration of denervation, and the advancement of functional recovery along the nerve fiber at a progressively diminishing rate. Most of these factors are impossible to evaluate with certainty in any given case. The reason and mechanisms of electrophysiological changes that occur in any given nerve injury and in recovery from such injury are also not known. Ludin said that the EMG findings after clinical recovery depend on the type of lesion and the extent of the damage. Spinner stated that regeneration of axonotmesis lesions occurs at a more rapid rate than other types of nerve injury. He affirmed that few compression injuries can be defined with certainty. He believed that most injuries are often a mixture of first, second, third, and fourth degree lesions. He reported that prompt recovery can follow surgical decompression; his experience with partial lesions has been rewarding. The person reported in this case study had a partial lesion and timely decompression.

Depending on the specific pathology and anatomy of this person, the distance of regeneration required for reestablishing nerve continuity could have been favorable enough to permit regeneration

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Presurgical Right</th>
<th>Presurgical Left</th>
<th>Postsurgical Right</th>
<th>Postsurgical Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulnar Distal motor latency to the first dorsal interosseous</td>
<td>4.0 msec</td>
<td>3.1 msec</td>
<td>3.0 msec</td>
<td>3.0 msec</td>
</tr>
<tr>
<td>Distal motor latency to the abductor digiti minimi</td>
<td>1.8 msec</td>
<td>1.9 msec</td>
<td>1.9 msec</td>
<td>...</td>
</tr>
<tr>
<td>Motor nerve conduction velocity in the forearm</td>
<td>57 m/sec</td>
<td>...</td>
<td>61 m/sec</td>
<td>...</td>
</tr>
<tr>
<td>Motor nerve conduction velocity across the elbow</td>
<td>56 m/sec</td>
<td>...</td>
<td>60 m/sec</td>
<td>...</td>
</tr>
</tbody>
</table>

| Median Distal motor latency to the abductor pollicis brevis | 3.0 msec | ... | ... | ... |
| Motor nerve conduction velocity in the forearm | 63 m/sec | ... | ... | ... |

Table 2 Presurgical and Postsurgical Results of Electromyography Examinations

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Positive Sharp Waves</th>
<th>Fibrillation Potentials</th>
<th>Motor Unit Action Potentials</th>
<th>Positive Sharp Waves</th>
<th>Fibrillation Potentials</th>
<th>Motor Unit Action Potentials</th>
</tr>
</thead>
<tbody>
<tr>
<td>First dorsal interosseous</td>
<td>+++</td>
<td>+</td>
<td>+++</td>
<td>0</td>
<td>0</td>
<td>+++</td>
</tr>
<tr>
<td>Second dorsal interosseous</td>
<td>+++</td>
<td>+</td>
<td>+++</td>
<td>0</td>
<td>0</td>
<td>+++</td>
</tr>
<tr>
<td>Fourth dorsal interosseous</td>
<td>0</td>
<td>0</td>
<td>++++</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>First palmar interosseous</td>
<td>+++</td>
<td>+</td>
<td>+++</td>
<td>0</td>
<td>0</td>
<td>+++</td>
</tr>
<tr>
<td>Adductor pollicis</td>
<td>+++</td>
<td>+</td>
<td>+++</td>
<td>0</td>
<td>0</td>
<td>+++</td>
</tr>
<tr>
<td>Flexor carpi ulnaris</td>
<td>0</td>
<td>0</td>
<td>++++</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Abductor pollicis brevis</td>
<td>0</td>
<td>0</td>
<td>++++</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

Key: ++++, maximum; +++, many; ++, much; +, slight; 0, none; ... not tested.

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to occur between the two test sessions; yet, the published distances of specific nerves to muscles can be considered only as guidelines. Sunderland reported possible variations in the rates of regeneration of different nerve fibers; the speed of growth in some fibers varies from 1.0 to 4.5 mm a day.1<br><br>**REFERENCES**


**SUMMARY**

This case report demonstrated the use of EMG and nerve conduction studies to assist in delineating the site of the injury of an ulnar nerve lesion in the hand and to show nerve recovery after decompressive surgery.
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