



June 1997 EMG Case-of-the-Month

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HISTORY

A 25-year-old man presents with numbness over the radial side of the dorsum of his right hand. Six weeks ago he was "just drinking a little beer" at an NBA basketball game when he was handcuffed by a policeman. He states he had considerable pain in the region of both wrists at that time, and the next day he noticed numbness in both hands. Within a day or two, all the pain had resolved as had the numbness in the left hand, but on the right the numbness persisted. He denies weakness.

- **Prior to continuing, please develop a differential diagnosis and list each possible diagnosis in order of likelihood.**
- **Is there any additional information regarding the clinical history that might be helpful in clarifying your differential list or changing its order of priority?**

COMMENTARY I

The diagnosis appears obvious from the history, viz. compression neuropathy of the superficial branch of the right radial nerve in the region of the wrist secondary to handcuffs. A less likely possibility is C6 radiculopathy. Without the complaint of weakness, the dorsal root would be the primary site of involvement, which could happen without recall in an inebriated individual. Still less likely, because of the absence of motor symptoms, is a lesion in the main trunk of the radial nerve or in the upper trunk or posterior cord of the brachial plexus. A lesion in the central nervous system would be extremely unlikely, but multiple sclerosis could present in this manner.

The role of electrodiagnosis lies in localizing the focal neuropathy (presumably of the superficial branch of the radial nerve), evaluating the status of the nerve and excluding other causes of the patient's symptoms.

The history to this point is probably sufficient to begin the electrodiagnostic procedure. To be more complete it would be of interest to know about possible pain in the neck and upper limb. Also, one would not be remiss in pursuing a cursory evaluation of central nervous system symptoms. Finally, to gain a broader perspective regarding the future management of the case, especially considering the circumstances surrounding the onset, a social history would be of value.

ADDITIONAL HISTORY

No additional neurologic symptoms are elicited. It is of interest to note, however, that the patient has not returned to work since the episode took place 6 weeks ago. No further relevant information is available.



- **Does this new information cause you to want to revise your differential diagnosis?**
- **On what details of the physical examination do you think you should focus at this point?**

COMMENTARY II

If the clinical problem is indeed focal neuropathy of the superficial branch of the radial nerve, there would be no motor involvement. This is consistent with the history. Also, the sensory loss is most consistent with involvement of this nerve. Could the problem be something that might cause deficits which the patient does not recognize? It is possible that subtle motor or more widespread sensory involvement has gone unrecognized, but the history does not suggest this. Thus, the new information is not sufficient to require revision of the differential diagnosis.

Since sensory impairment on the dorsum of the hand would not cause loss of hand function, and since the pain experienced initially resolved early on, it is interesting to find that the patient has not returned to work.

The physical examination should be directed toward looking for muscle weakness or reflex changes that would indicate a problem other than superficial radial neuropathy. The sensory examination should be directed toward outlining deficits in the hand that would tend to confirm such a lesion or suggest a lesion at another site.

PHYSICAL EXAMINATION

No muscle weakness is found in the upper limbs. Biceps, brachioradialis, pronator teres, and triceps reflexes are 2+ and symmetric. A well delineated cutaneous sensory deficit is present over the radial side of the dorsum of the right hand including the thumb proximal to the interphalangeal joint. There is no detectable sensory deficit involving the left hand.

- **At this point, review your differential diagnosis and revise as appropriate.**
- **Are there additional observations on physical examination that might be helpful in narrowing your differential list?**

COMMENTARY III

At this point, the diagnosis of right superficial radial neuropathy is all but confirmed. There is no need to revise the differential diagnosis, although a screening neurologic examination should be completed.

ADDITIONAL PHYSICAL EXAMINATION

No other neurologic deficits are found. Dexterity of the hands and digits is unimpaired.

- **If necessary, revise your differential diagnosis based on the additional physical findings.**
- **Design your approach to the electrophysiologic examination based on the existing data.**



COMMENTARY IV

Since there is no need to change the differential diagnosis, the electrodiagnostic examination should be designed to find the specific site of pathology in the superficial branch of the right radial nerve and, if possible, to assess the extent of the damage. The contralateral nerve should be evaluated not only for comparison, but also to determine if there is residual deficit that would be consistent with the history of a few days of left hand numbness.

Finally, a needle electrode examination should be used to screen for C6 radiculopathy, brachial plexopathy (focusing on the upper trunk and posterior cord) and radial neuropathy. If no abnormality is detected, and assuming conduction abnormalities are found in the superficial radial nerve, no conduction studies of the plexus or main trunk of the radial nerve will be needed.

ELECTROPHYSIOLOGIC DATA

ELECTROMYOGRAPHY										
N = normal incr = increased decr = decreased 0 = absent 1+ = minimal 4+ = maximal crd = complex repetitive discharge fasc = fasciculation potential myk = myokymic discharge myt = myotonic discharge nmt = neuromyotonic discharge p wave = positive sharp waves fib = fibrillation potentials recr = recruitment amp = amplitude dur = duration poly = polyphasic potentials										
R/L	MUSCLE	INSERTION		SPONTAN		VOLUNTARY				
		activ	p wave	fib	other	recr	amp	dur	poly	effort
R	paraspinals	N	0	0	-	N	N	N	N	-
R	deltoid	N	0	0	-	N	N	N	N	-
R	brachioradialis	N	0	0	-	N	N	N	N	-
R	pronator teres	N	0	0	-	N	N	N	N	-
R	ext carpi rad	N	0	0	-	N	N	N	N	-
R	ext dig common	N	0	0	-	N	N	N	N	-

SENSORY NERVE CONDUCTION									
nr = no response									
NERVE	LATENCY (ms)			AMPLITUDE (µV)			CONduc VEL (m/s)		
	R	L	Norm	R	L	Norm	R	L	Norm
radial (14cm)	-	-	-	-	-	-	-	-	-
forearm to thumb	nr	2.3	<2.8	--	9	>6	--	61	>50
radial (10cm)	-	-	-	-	-	-	-	-	-



wrist to thumb	nr	1.6	<1.9	--	14	>7	--	63	>50
radial (25cm)	-	-	-	-	-	-	-	-	-
forearm to AE	4.2	--	--	6	--	--	60	--	>50

The muscles evaluated on needle electrode examination slightly overlap but are primarily in the distribution of the C6 myotome, posterior cord and radial nerve. No abnormalities are found.

A response is recorded from a site over the radial nerve just above the elbow following stimulation of the superficial branch of the right radial nerve in the forearm. No response is detected from the distal portion of the nerve. No other nerve conduction abnormalities are found.

- **On the basis of both the clinical and electrodiagnostic evaluations, formulate your final impression. List the most likely diagnosis followed by other possibilities that are not excluded by the data. Eliminate those diagnoses not supported by the data.**

DIAGNOSTIC IMPRESSION

1. Acute compression neuropathy of the superficial branch of the right radial nerve at the wrist of 6 weeks duration secondary to handcuffs. The extent of wallerian degeneration vs. neurapraxia has not been established, but because the lesion is so distal, the prognosis for considerable return of sensation is good over the next 1-12 months. There is no impairment of hand function.
2. There is no evidence of cervical radiculopathy, brachial plexopathy or radial neuropathy.

COMMENTARY

A history of handcuffing followed by numbness in the superficial radial nerve distribution is a known syndrome discussed in medical literature. This patient's history is clear. The physical examination supports the clinical history. Conduction through the proximal forearm establishes that the superficial radial nerve is viable in and proximal to this forearm segment. No response could be recorded from the hand, thus documenting a lesion in the distal forearm. The presence of sensory conduction abnormality places the lesion distal rather than proximal to the dorsal root ganglion. Absence of electrodiagnostic abnormalities elsewhere excludes other possible sites of pathology.

The diagnosis has been established, the lesion has been localized and an estimate of the prognosis for recovery within 1-12 months has been offered. (The briefer period of 1 month relates to viable fibers with conduction block due to acute demyelination, if any; the longer period takes into account regeneration of degenerated fibers.) In cases where the reason the patient has not returned to work remains obscure, and where no function has been lost, it is well to comment on this for the record.

Nine months after the injury the patient was seen again for electrodiagnostic medicine consultation. The complaint at that time was pain in the right wrist and persistent numbness in the right hand. He had still not returned to work and he was suing the policeman who applied the handcuffs. There was no clinical indication of a neuroma. There was no



impairment of hand dexterity. The sensory deficit was less discrete than on the previous examination. The electrophysiologic data recorded at that time were as follows:

SENSORY NERVE CONDUCTION									
nr = no response									
NERVE	LATENCY (ms)			AMPLITUDE (µV)			CONDUCT VEL (m/s)		
	R	L	Norm	R	L	Norm	R	L	Norm
radial (14cm)	-	-	-	-	-	-	-	-	-
forearm to thumb	3.0	2.1	<2.8	7	9	>6	47	67	>50
radial (10cm)	-	-	-	-	-	-	-	-	-
wrist to thumb	1.7	1.5	<1.9	13	16	>7	59	67	>50
radial (10cm)	-	-	-	-	-	-	-	-	-
forearm to hand	2.4	1.5	<1.8	25	31	>22	42	67	>50

Although conduction velocity across the site of compression remains slow, the amplitude of the sensory nerve action potential on the right is now as large as on the left, thus indicating that the number of functioning axons is similar on the two sides.

Numbness of the dorsum of the right hand is not something likely to be sufficiently aggravating as to keep the patient from returning to work. However, pain might be, and a pain syndrome involving the superficial radial nerve known as cheiralgia paresthetica has been described. How debilitating this might be has apparently become a legal issue in this case.

BIBLIOGRAPHY

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