

Case Study 18

For convenience values outside the normal range are **bolded**. Normal values for the specified patient are stated below the tables.

History: 60 year-old man with a history of left hand weakness and more recent onset of right foot drop. Initial symptoms started at least two years ago. The foot drop started a couple of months ago. Exam reveals normal symmetric reflexes in all limbs with fasciculations in left hand and weakness of left intrinsic hand muscles, left abductor pollicis brevis and right tibialis anterior muscle. EMG was requested to evaluate for motor neuron disease versus motor neuropathy.

Temperatures:

Right wrist: 33°C

Left wrist: 33°C

Right leg: 32.5°C

Left leg: 32.5°C

**Motor Nerve Conduction:**

Nerve and Site	Segment	Distance	Latency	Amplitude	Conduction Velocity
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**Left Median** Rec: APB

Wrist	Abductor pollicis brevis-Wrist	60 mm	3.3 ms	11.24 mV	
Elbow	Wrist-Elbow	260 mm	8.2 ms	10.70 mV	53.0 m/s
Upper arm	Elbow-Upper arm	125 mm	12.0 ms	8.80 mV	<b>32.8 m/s</b>
Erb's point	Upper arm-Erb's point	280 mm	<b>NR</b>	<b>NR</b>	

**Left Ulnar** Rec: ADM

Wrist	ADM-Wrist	60 mm	3.1 ms	10.46 mV	
Below elbow	Wrist-Below elbow	255 mm	7.5 ms	9.35 mV	57.9 m/s
Above elbow	Below elbow-Above elbow	100 mm	9.5 ms	9.19 mV	50.0 m/s
Upper arm	Above elbow-Upper arm	150 mm	<b>NR</b>	<b>NR</b>	

**Left Ulnar** Rec: ADM

P8	8 cm prox elbow		9.4 ms	9.08 mV	
P10	10 cm prox elbow		11.3 ms	<b>1.77 mV</b>	
P12	12 cm prox elbow		13.1 ms	<b>1.47 mV</b>	
P14	14 cm prox elbow		<b>NR</b>	<b>NR</b>	

**Left Ulnar** Rec: FDI

Wrist	1st dorsal interosseous-Wrist		3.5 ms	14.30 mV	
Below elbow	Wrist-Below elbow	250 mm	7.9 ms	12.01 mV	56.8 m/s
Above elbow	Below elbow-Above elbow	100 mm	10.0 ms	11.47 mV	47.6 m/s
AE + 2cm Prox	Below elbow-AE + 4cm Prox	145 mm	11.6 ms	<b>3.36 mV</b>	<b>27.8 m/s</b>
AE + 4cm Prox			13.1 ms	<b>3.15 mV</b>	
AE + 6cm Prox			15.9 ms	<b>1.30 mV</b>	
AE + 8 cm Prox			<b>NR</b>	<b>NR</b>	

**Left Radial** Rec: EDC

Lateral brachium	EDC-Lateral brachium		2.7 ms	3.75 mV	
Spiral groove	Lateral brachium-Spiral groove	110 mm	4.6 ms	3.64 mV	57.8 m/s
Axilla	Spiral groove-Axilla	155 mm	7.6 ms	2.81 mV	51.6 m/s

**Left Peroneal** Rec: EDB

Ankle	Extensor digitorum brevis-Ankle	90 mm	5.3 ms	11.63 mV	
Fibula (head)	Ankle-Fibula (head)	290 mm	12.1 ms	9.71 mV	42.2 m/s
Popliteal fossa	Fibula (head)-Popliteal fossa	140 mm	14.9 ms	9.31 mV	51.0 m/s

**Left Tibial** Rec: AH

Ankle	Abductor hallucis-Ankle	100 mm	6.6 ms	13.20 mV	
Popliteal fossa	Ankle-Popliteal fossa	420 mm	13.9 ms	<b>2.72 mV</b>	57.5 m/s

**Right Peroneal** Rec: EDB

Ankle	Extensor digitorum brevis-Ankle	90 mm	5.8 ms	6.63 mV	
Fibula (head)	Ankle-Fibula (head)	340 mm	12.2 ms	6.51 mV	53.1 m/s
Popliteal fossa	Fibula (head)-Popliteal fossa	110 mm	15.9 ms	6.33 mV	<b>29.7 m/s</b>

**Right Peroneal** Rec: TA

Fibula (head)	Tibialis anterior-Popliteal fossa		2.9 ms	9.71 mV	
Popliteal fossa	Fibula (head)-Popliteal fossa	110 mm	5.9 ms	9.52 mV	<b>36.6 m/s</b>

**Right Tibial**

Rec: AH

Ankle	Abductor hallucis-Ankle	100 mm	6.6 ms	14.11 mV	
Popliteal fossa	Ankle-Popliteal fossa	445 mm	17.3 ms	10.40 mV	41.5 m/s

**Right Median**

Rec: APB

Wrist	Abductor pollicis brevis-Wrist	60 mm	3.3 ms	9.49 mV	
Elbow	Wrist-Elbow	270 mm	9.2 ms	4.73 mV	45.7 m/s
Axilla	Elbow-Axilla	120 mm	12.7 ms	<b>1.62 mV</b>	<b>34.2 m/s</b>

**Right Ulnar**

Rec: APB

Wrist	ADM-Wrist	60 mm	2.5 ms	10.82 mV	
Below elbow	Wrist-Below elbow	240 mm	6.6 ms	10.47 mV	58.5 m/s
Above elbow	Below elbow-Above elbow	100 mm	7.9 ms	9.54 mV	76.9 m/s
Upper Arm	Above elbow-Upper Arm	80 mm	10.8 ms	7.77 mV	<b>27.5 m/s</b>
Axilla	Upper Arm-Axilla	20 mm	11.9 ms	<b>1.33 mV</b>	<b>18.1 m/s</b>

**F-Wave Studies**

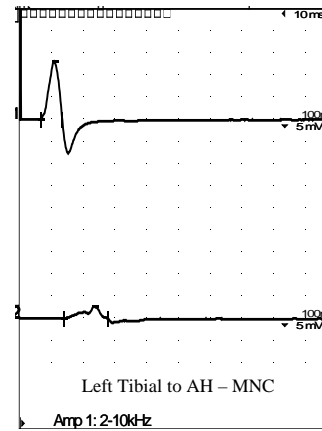
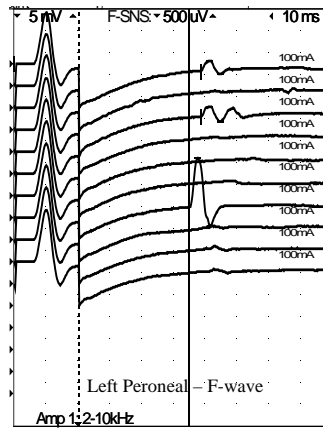
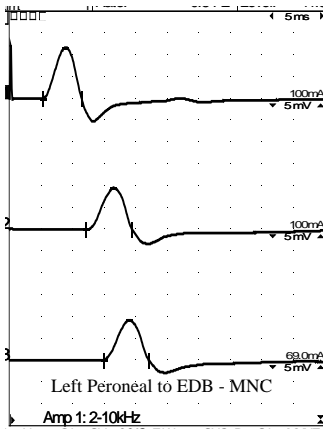
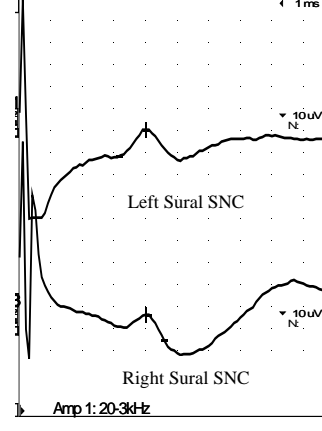
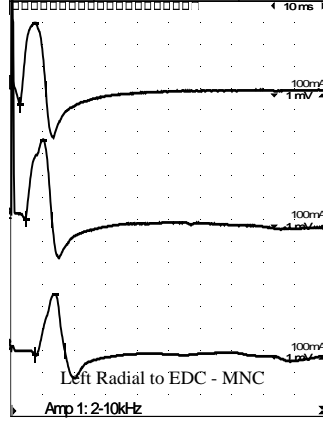
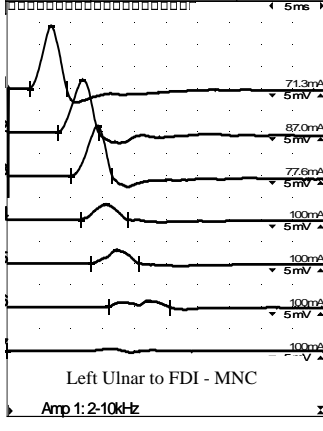
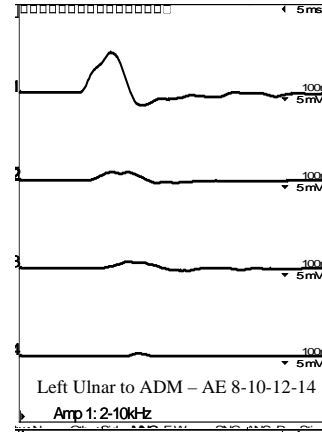
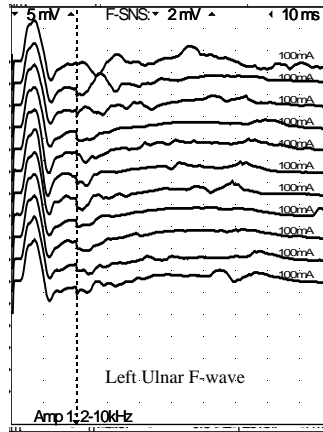
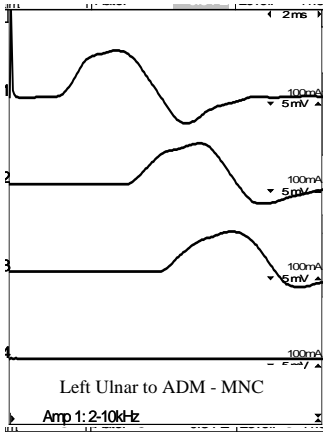
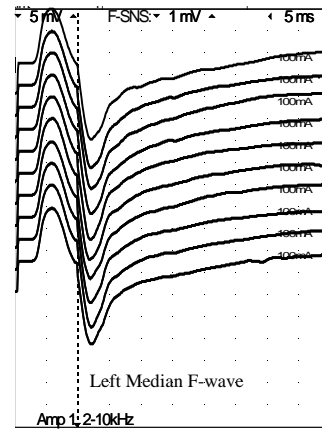
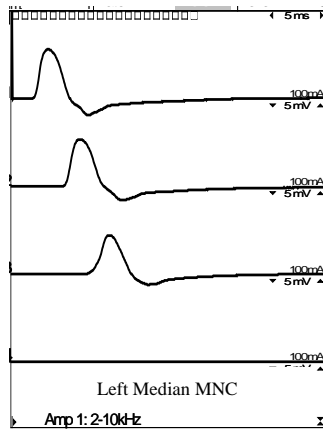
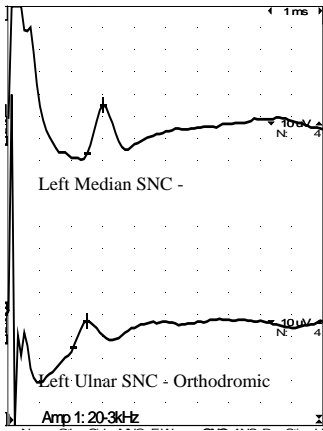
Nerve	M-Latency	F-Latency
Left Median	3.3 ms	NR
Left Ulnar	3.1 ms	NR
Left Peroneal	5.3 ms	55.4 ms
Left Tibial	6.6 ms	<b>85.0 ms</b>
Right Tibial	7.1 ms	<b>68.3 ms</b>
Right Median	3.3 ms	NR
Right Ulnar	1.9 ms	<b>57.0 ms</b>

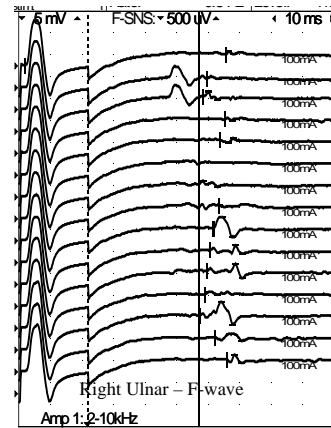
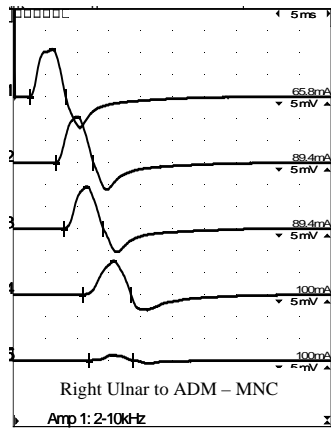
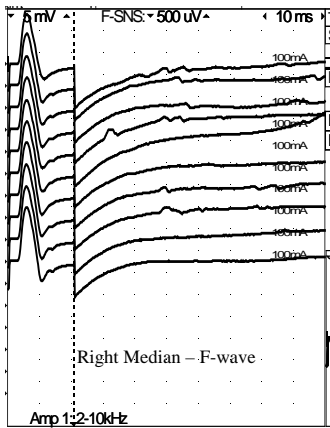
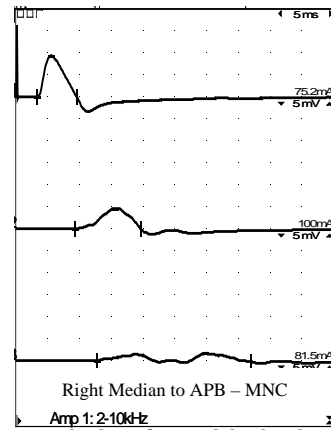
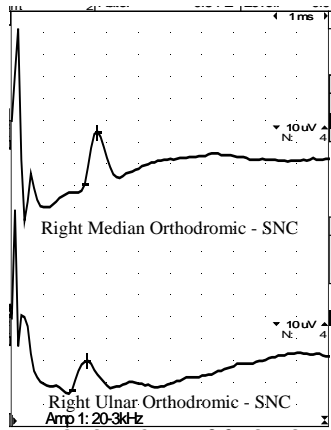
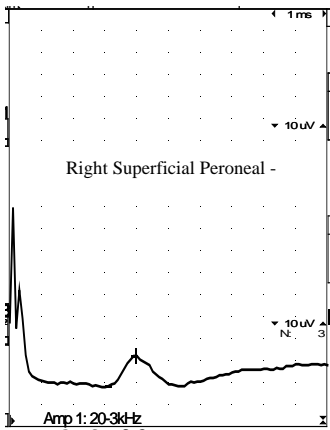
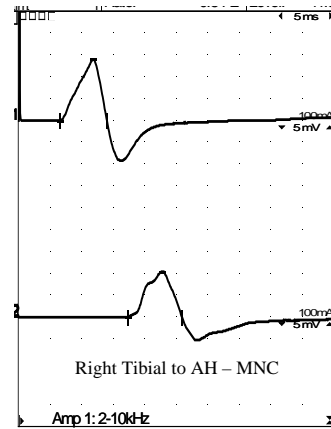
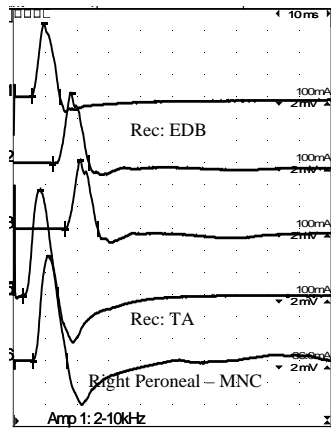
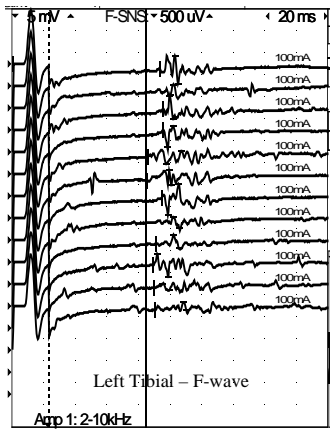
**Sensory Nerve Conduction:**

Nerve and Site	Segment	Distance	Amplitude	Peak Latency
<b>Left Median</b> Rec: Wrist				
Digit II (index finger)	Wrist-Digit II (index finger)	130 mm	22.4 $\mu$ V	3.0 ms
<b>Left Ulnar</b> Rec: Wrist				
Digit V (little finger)	Wrist-Digit V (little finger)	110 mm	11.7 $\mu$ V	2.5 ms
<b>Left Sural</b> Rec: Ankle				
Lower leg	Lateral malleolus-Lower leg	140 mm	12.2 $\mu$ V	4.0 ms
<b>Right Sural</b> Rec: Ankle				
Lower leg	Lateral malleolus-Lower leg	140 mm	11.3 $\mu$ V	4.0 ms
<b>Right Superficial Peroneal</b> Rec: Dorsum of Foot				
Lower leg	Ankle-Lower leg	140 mm	13.7 $\mu$ V	4.0 ms
<b>Right Median</b> Rec: Wrist				
Digit II (index finger)	Wrist-Digit II (index finger)	130 mm	23.7 $\mu$ V	2.7 ms
<b>Right Ulnar</b> Rec: Wrist				
Digit V (little finger)	Wrist-Digit V (little finger)	110 mm	13.2 $\mu$ V	2.4 ms

Normal values:

Median MNC DML:  $\leq 4.2$ , Amp:  $\geq 4$ , CV  $\geq 49$ Ulnar MNC DML:  $\leq 3.8$ , Amp:  $\geq 6$ , CV  $\geq 49$ ,CV across elbow may slow  $\leq 10$ Peroneal MNC DML:  $\leq 6.6$ , Amp: 2, CV: 43CV across Fib head may slow  $\leq 10$ Tibial MNC DML:  $\leq 6.6$ , Amp: 2, CV: 43Median SNC Peak Lat:  $\leq 3.2$ , Amp:  $\geq 12$ Ulnar SNC Peak Lat:  $\leq 2.8$ , Amp:  $\geq 10$ Palmar diff  $\leq 0.4$ Radial SNC Peak Lat:  $\leq 2.7$ , Amp:  $\geq 15$ MABC SNC Peak Lat:  $\leq 2.7$ , Amp:  $\geq 10$ LABC SNC Peak Lat:  $\leq 2.7$ , Amp:  $\geq 12$ Sural SNC Peak Lat:  $\leq 4.2$ , Amp:  $\geq 5$ Super. Peroneal SNC Peak Lat:  $\leq 4.2$ , Amp:  $\geq 5$





What is your conclusion?

How do you differentiate this from CIDP?

How do you differentiate this from ALS?

## NERVE CONDUCTION STUDIES:

1. Motor conduction studies of the left median nerve revealed normal distal amplitude, latency, and conduction velocity in the forearm. Segmental slowing was seen in the left upper arm and there was no response with stimulation at Erb's point. Left ulnar nerve study with recording from the abductor digiti minimi revealed normal distal amplitude, latency, and conduction velocity in the forearm and across the elbow. No left ulnar motor nerve response was seen with stimulation in the upper arm, and thus inching study was performed. There was conduction block between the stimulation sites that were 8 and 10 cm proximal to the olecranon. The left ulnar nerve over the first dorsal interosseous showed normal amplitude with normal latency and velocity in the forearm and across the elbow. There was segmental slowing in the upper arm and upon inching conduction block was demonstrated in the upper arm as outlined in the table. The left radial nerve was normal and no block was demonstrated with proximal stimulation. The left peroneal nerve was normal. The left tibial nerve showed normal latency and amplitude with segmental drop in amplitude upon stimulation at the knee. This was present even with maximal stimulus intensity. The right peroneal nerve showed normal amplitude (57% of the amplitude of the left side) with marked slowing of velocity across the knee when recording over the extensor digitorum brevis. The right peroneal nerve showed slightly reduced velocity across the fibular head when recording over the anterior tibialis muscle. The right tibial nerve was normal and no segmental amplitude drop was seen with proximal stimulation. The right median nerve showed normal amplitude and distal latency with partial conduction block upon stimulation at the forearm. There was associated slowing of conduction velocity in the upper arm segment. The right ulnar nerve over the abductor digiti minimi showed normal amplitude and latency with normal velocities in the forearm and elbow segments. There was conduction block and slowing in the proximal ulnar nerve segments. Left median, left ulnar and right median F-waves were non-responsive. The left tibial, right tibial and right ulnar F-wave latencies were prolonged. The left peroneal F-wave latency was normal.
2. Sensory nerve conduction studies of the left median, left ulnar, left sural, right sural, right superficial peroneal, right median and right ulnar nerves were normal and symmetric on side to side comparison.

## CLINICAL CORRELATION:

This is an abnormal study. There is electrical evidence to suggest the presence of an acquired, multifocal demyelinating process affecting multiple motor nerves. Sensory nerves are entirely spared and the needle exam indicates predominantly demyelinating changes with minimal axonal loss. The areas of partial and complete conduction block are limited to proximal segments of the motor nerves and were therefore not detected on the previously performed routine nerve conduction studies. The findings on today's study are consistent with the diagnosis of multifocal motor neuropathy with conduction block. Testing for GM1-antibodies and treatment with immunoglobulin should be considered if clinically indicated. Clinical correlation is recommended.