



Electromyography (EMG) and Nerve Conduction Studies (NCS)

October 06, 2021 | 2:00-3:00 p.m. ET

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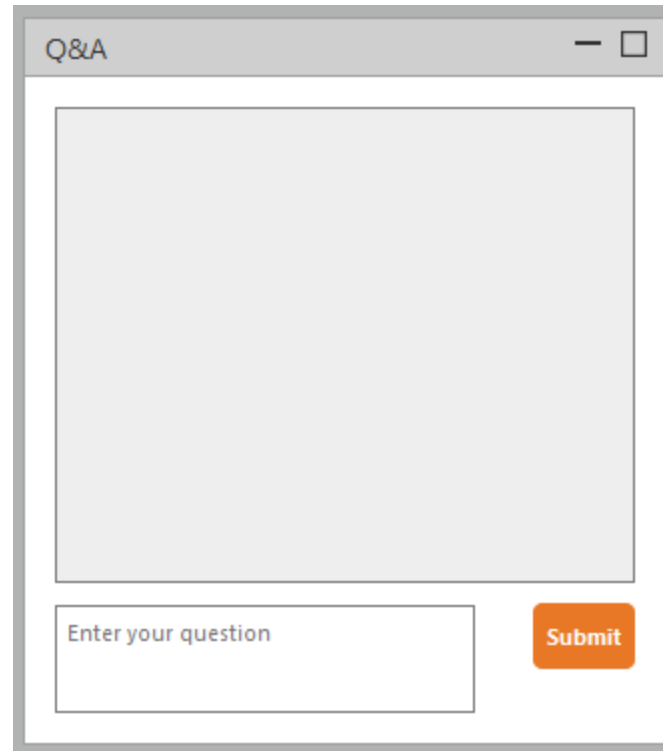
1. Attend the LIVE version of the webinar.
2. Remain logged on for the entire webinar.
3. Answer **all three** poll questions.
To submit your answers, use the Submit button on your screen or put your answer in the Q&A panel.
4. You will receive an email from the CEU Institute on our behalf **within 48 hours after the webinar**. This email will contain a link that you will use to submit for your CE credits. **You will need to complete this task within 72 hours.**

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Ask a question

Questions for speakers will be answered at the end of the presentation as time allows, or we will respond via email after the webinar.



A screenshot of a Q&A form interface. The window has a title bar with "Q&A" and standard window controls. The main area is a large, empty rectangular box for entering a question. Below this box is a smaller input field with the placeholder text "Enter your question" and an orange "Submit" button to its right.

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- Have audio problems
- Log out
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- Switch web browsers (Chrome tends to work well)
- Log off and log back in

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- 2. Remain logged in for the entire hour.** If you get kicked out of the system just log back in, we track your total time.
- 3. Submit answers to all three poll questions.** Use the Submit button on screen. If that doesn't work, submit your answer in the Q&A box.
- 4. The CEU Institute will email you roughly 24 hours after the webinar.** It contains a link to submit for your credits. Please complete this task within 72 hours.

Presentation ⌵ ⌵ ⌵

Electromyography (EMG) and Nerve Conduction Studies (NCS)

October 06, 2021 | 2:00-3:00 p.m. ET

Related Content ⌵ ⌵ ⌵

- [Resources and Troubleshooting \(opens in new window\)](#)
- [PDF of the Presentation \(opens in new window\)](#)
- [A PDF copy of the presentation and a recording of this webinar will be available on the Optum website the day after the live webinar.](#)

Q&A ⌵ ⌵ ⌵

Enter your question

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Presenter



Robert Hall, M.D.
Optum
Corporate Medical Director

Learning objectives

1. Explain the EMG/NCS examination and how it is performed.
2. Review the most common tests involved within an EMG/NCS.
3. Learn when an EMG/NCS should be obtained.
4. List conditions that can and cannot be diagnosed with an EMG/NCS.
5. Explain possible ways to determine if an injury is work-related using an EMG/NCS.
6. Describe fraud, waste, and abuse concerns around EMG/NCS and how to monitor.
7. Review sample EMG/NCS findings in common work-related injuries.

Common diagnostic tests*



TEST	TYPE OF ENERGY	EXAMPLE OF USE
X-ray	Radiation	Fracture
CT	Radiation	Tumor
MRI	Magnetic fields	Stroke
Ultrasound	Sound waves	Blood clot
EKG	Electrical signals (heart)	Heart attack
EEG	Electrical signals (brain)	Seizure
EMG/NCS	Electrical signals (nerves and muscles)	Carpal tunnel syndrome

*Not an all-inclusive list

An EMG...

Is needed for...

Test description...

Provides...

Limitations...

Performed..

Action potentials...

- Pain
- Numbness
- Paresthesias (tingling)
- Weakness
- +/- Muscle cramps

An EMG

Is needed for...

Test description...

Provides...

Limitations...

Performed..

Action potentials...

- Two-part examination
 - Electromyogram (EMG)
 - Nerve conduction study (NCS)
- Both parts of the examination are usually referred to as
 - EMG
 - EMG/NCS
 - Electrodiagnostic (Edx) study
- Assesses the health and function of nerves and muscles

An EMG

Is needed for...

Test description...

Provides information on...

Limitations...

Performed..

Action potentials...

- Has a significant nerve injury occurred?
 - Location
 - Severity
 - Evidence of healing
 - Chronicity*
 - Prognosis*
 - Causation*
- Presence of non-occupational neurologic conditions
 - Prior nerve injury
 - Neuropathy from diabetes, thyroid disease, alcohol abuse, HIV, and kidney failure
 - ALS, myopathy, and myasthenia gravis

*Characteristics may or may not be provided with the EMG and should not always be expected from the test.

An EMG

Is needed for...

Test description...

Provides...

Limitations of test...

Performed..

Action potentials...

- Practitioner dependent
- Technical challenges
 - Skin temperature
 - Obesity
 - Swelling
 - Age-related changes
- Not all nerve-related conditions may be found with EMG testing
 - Nerve compression vs. nerve injury
 - Sampling error and sensitivity
 - Small fiber neuropathy

An EMG

Is needed for...

Test description...

Provides...

Limitations...

Performed using...

Action potentials...

- Patient history
- Physical examination
- Equipment
 - Electrical stimulator
 - Wire and needle electrodes
 - Amplifier
 - Computer with report generating software

An EMG

Is needed for...

Test description...

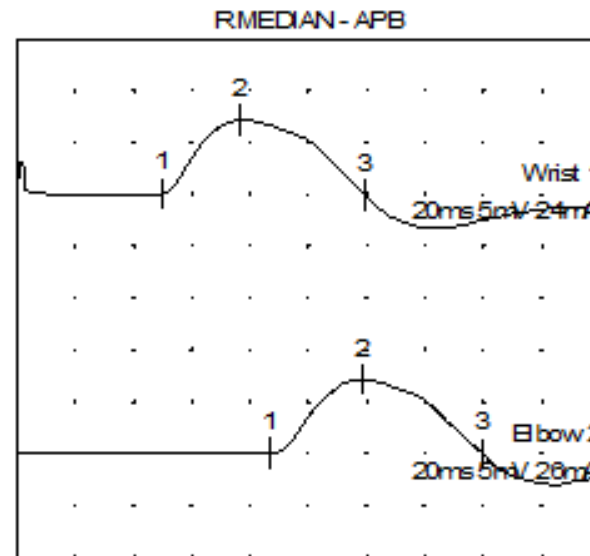
Provides...

Limitations...

Performed..

Action potentials...

- Action potential generation
- Traveling wave
- Snapshot in time (NCS)



An EMG

Is needed for...

Test description...

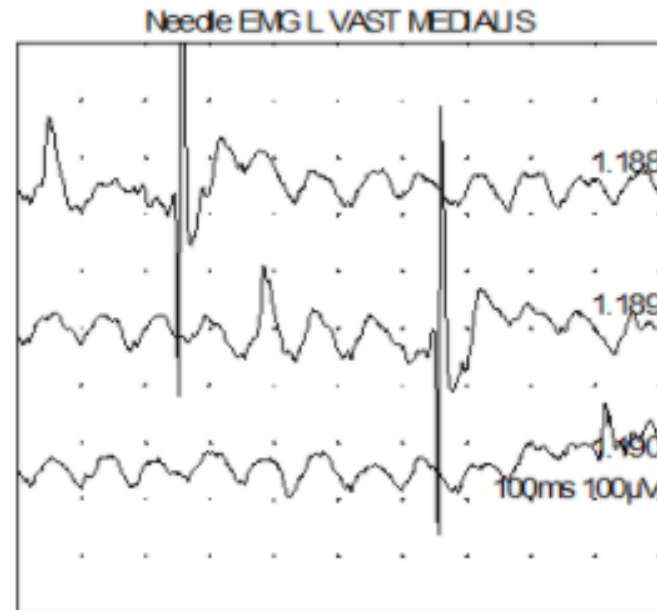
Provides...

Limitations...

Performed..

Action potentials...

- Action potential generation
- Traveling wave
- Snapshot in time (NCS)
- Real-time (EMG)



Tests performed within an EMG

- Nerve conduction studies
 - Sensory
 - Motor
 - F-wave
 - H-reflex
 - Repetitive nerve stimulation
- EMG



Tests performed within an EMG

- **Nerve conduction studies**

- **Sensory**

- **Motor**

- F-wave

- **H-reflex**

- Repetitive nerve stimulation

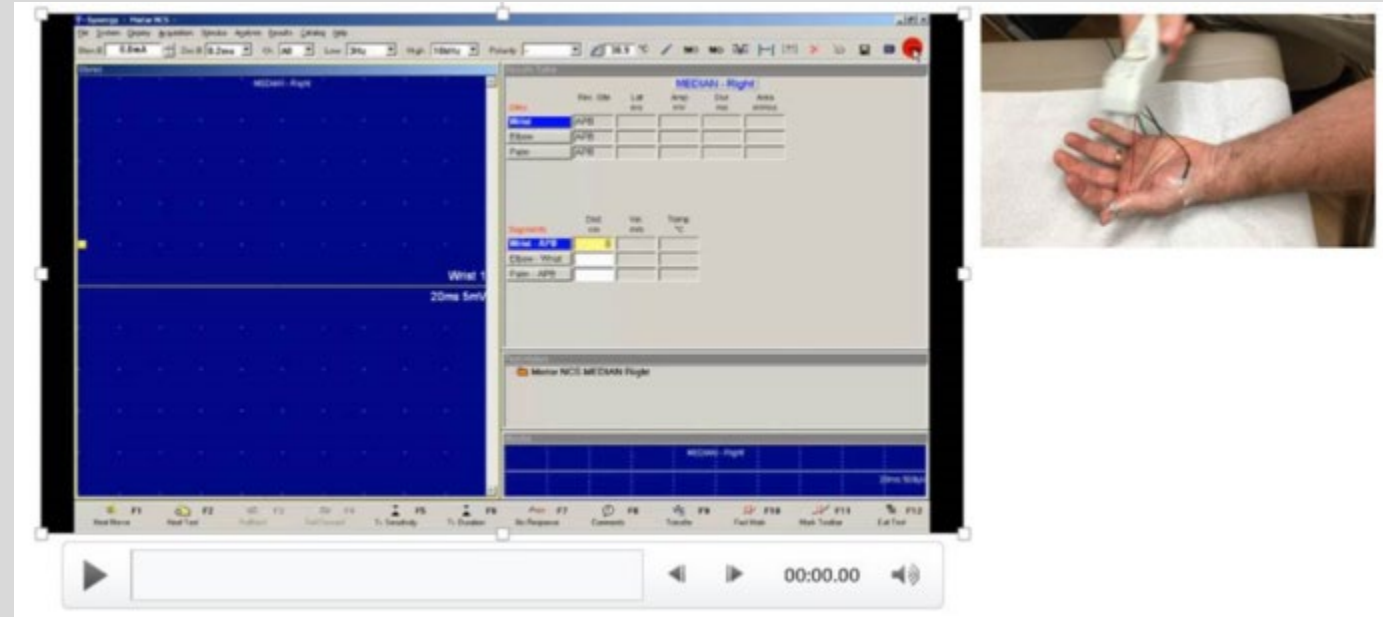
- **EMG**



Video of: Nerve Conduction Study



Video of: Nerve Conduction Study with screen output



Poll #1

- You must answer **all three poll questions** to qualify for CE credit.
- If you cannot see the poll question, **it will be read aloud multiple times.**

To submit your poll question answer:

Use the Submit button on your screen



Example poll question?

A. Option 1

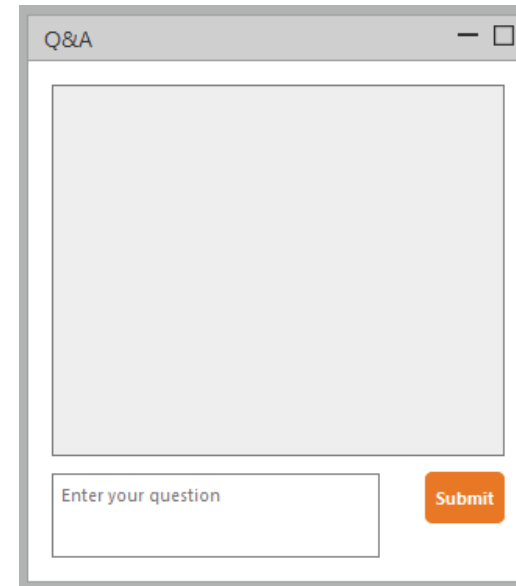
B. Option 2

C. Option 3

Submit

OR

Send your answer in the Q&A panel



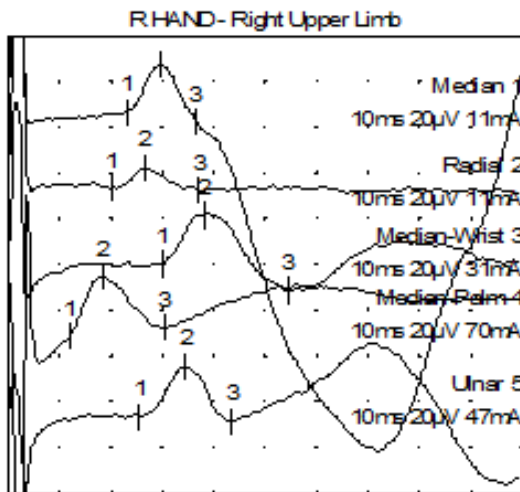
Q&A

Enter your question

Submit

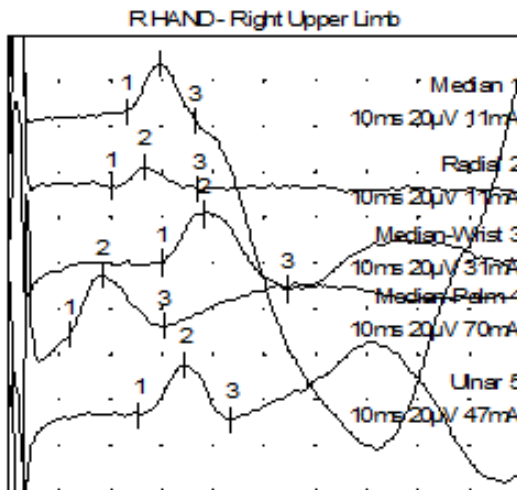
Sample nerve conduction study - normal

Nerve / Sites	Rec. Site	Peak Lat ms	NP Amp μ V	Distance cm	Velocity m/s
R HAND - Right Upper Limb					
Median	Dig I	3.0	20.9	10	43.5
Radial	Dig I	2.7	8.9	10	50.0
Median-Wrist	Dig 3	3.8	21.7	14	46.7
Median-Palm	Dig 3	1.9	26.5	6	50.0
Ulnar	Dig 5	3.5	21.8	14	54.9



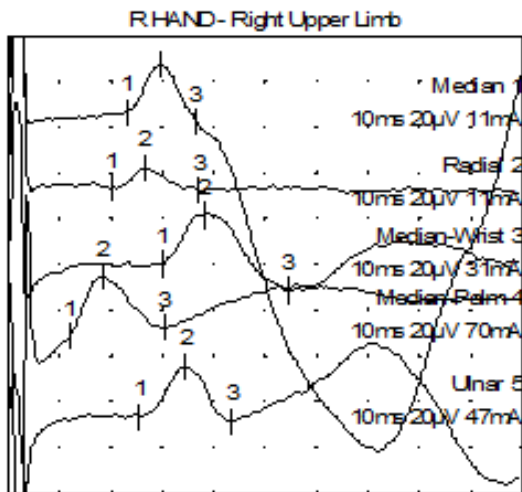
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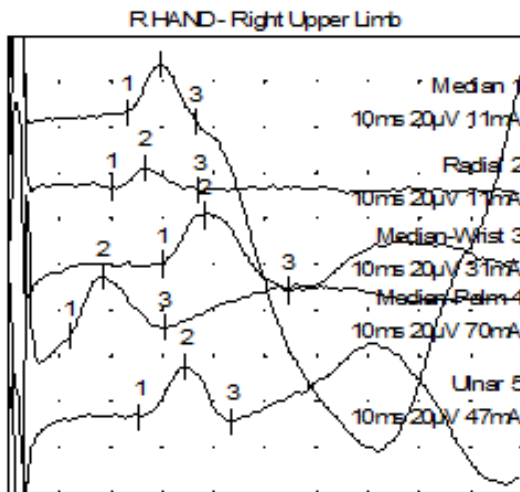
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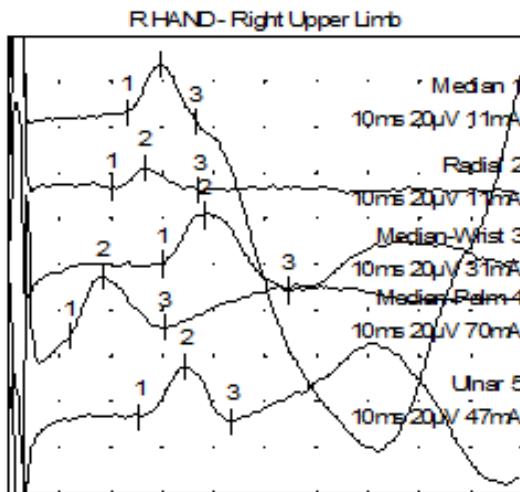
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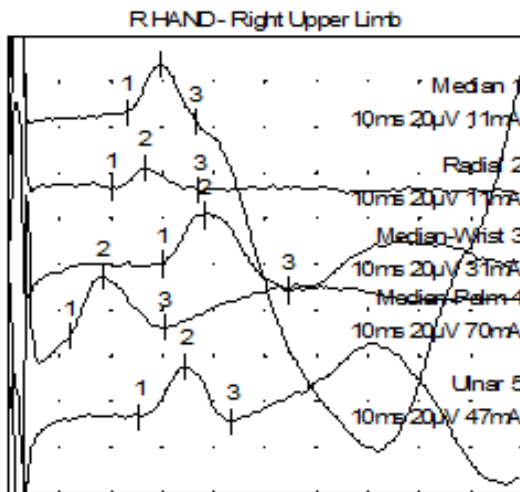
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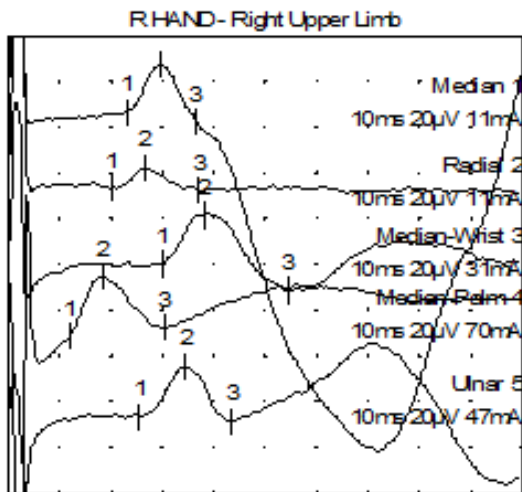
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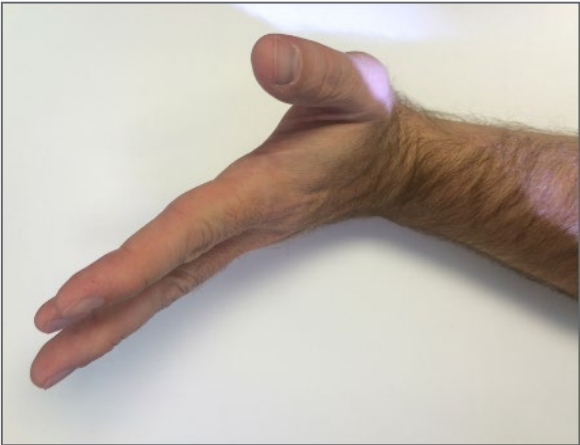
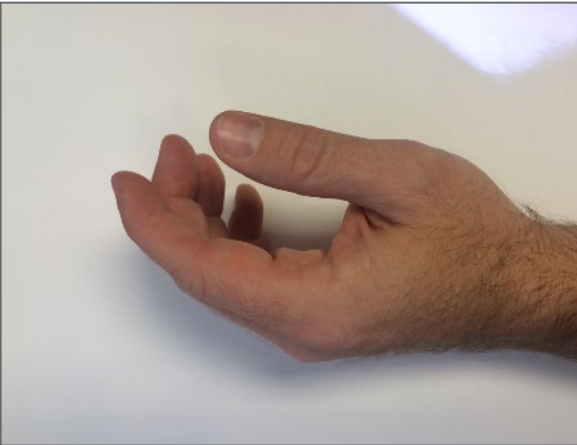
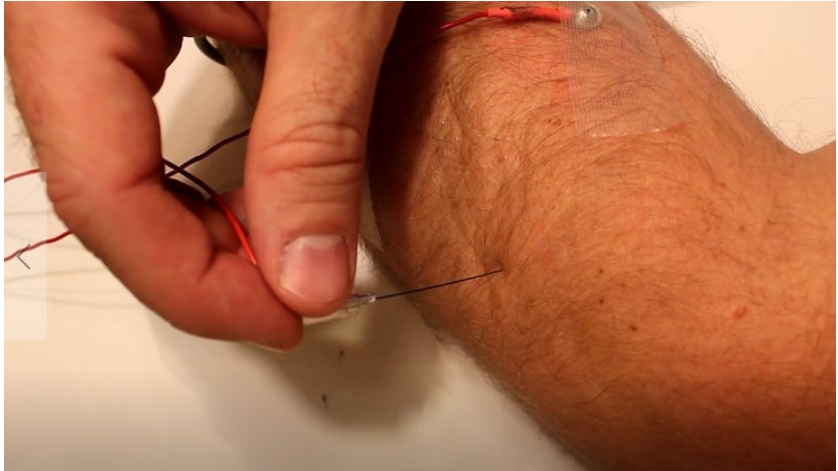


Sample nerve conduction study - normal

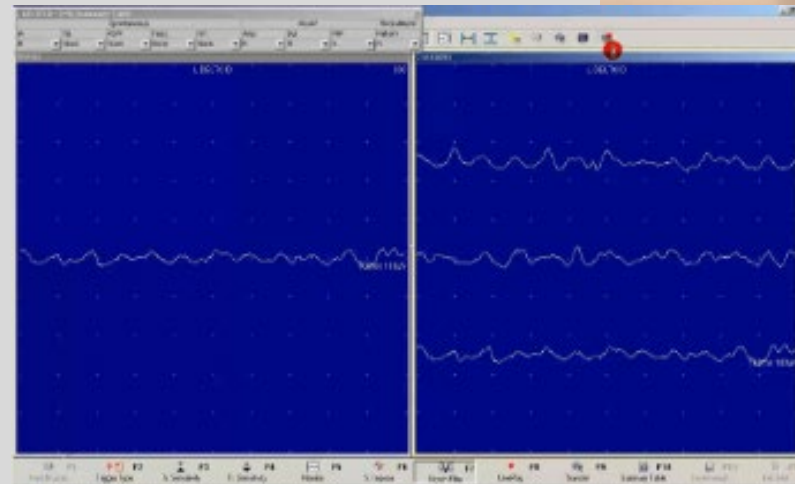
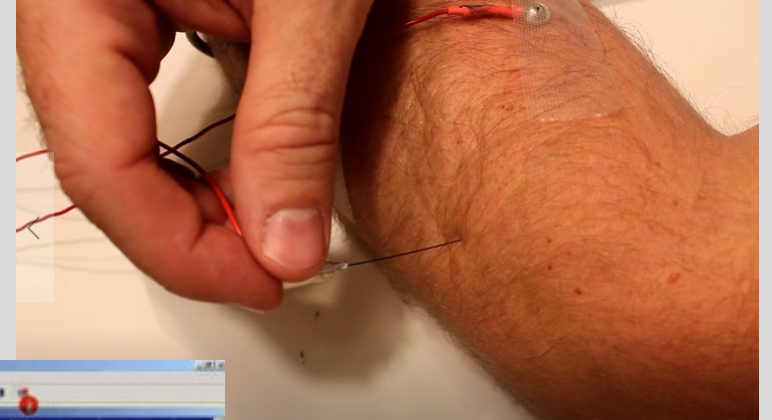
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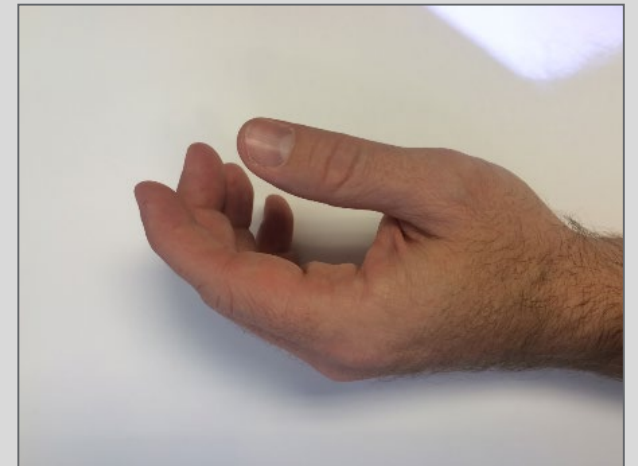
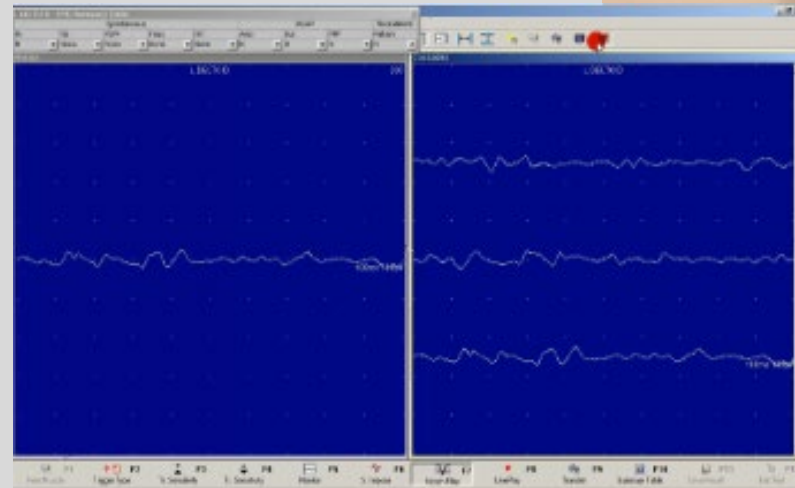
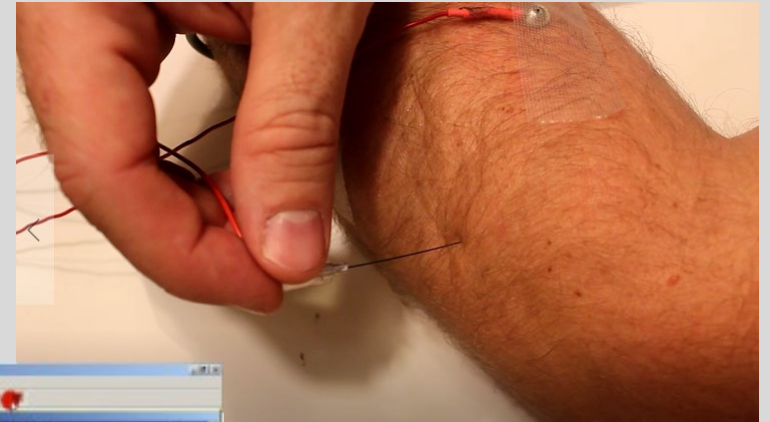
EMG being performed



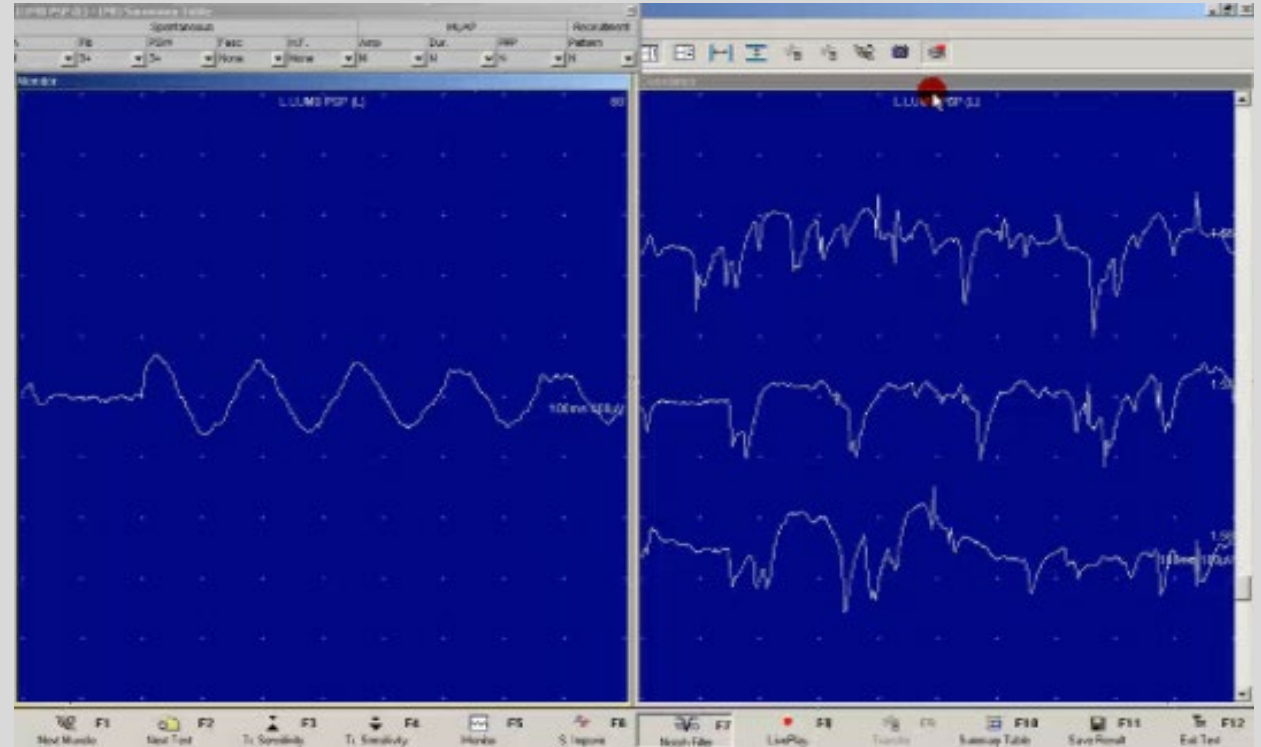
Video of: EMG (normal findings)



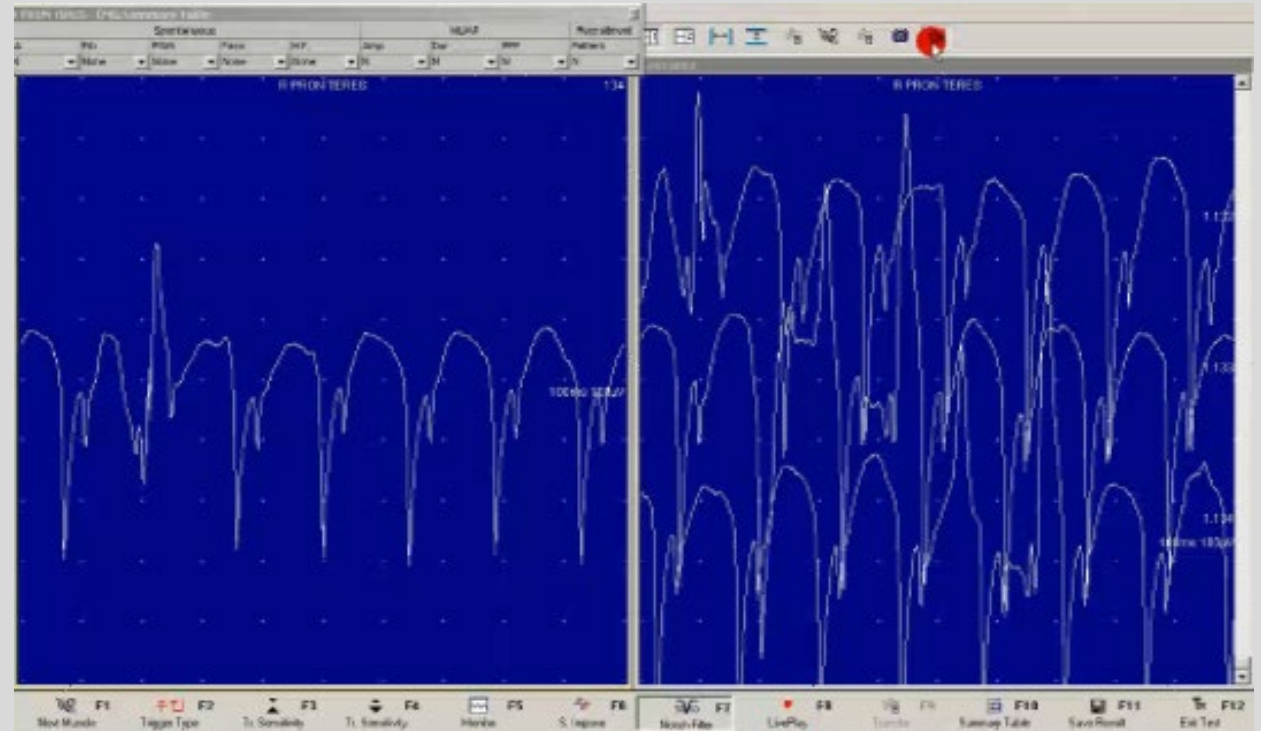
Video of: EMG (normal findings)



Video of: EMG (abnormal spinal muscles in lumbar radiculopathy)



Video of: EMG (abnormal arm muscle after c-spine surgery)



Sample EMG results - normal

EMG Summary Table									
	Spontaneous					MUAP			Recruitment
	IA	Fib	PSW	Fasc	H.F.	Amp	Dur.	PPP	Pattern
R. DELTOID	N	None	None	None	None	N	N	N	N
R. BICEPS	N	None	None	None	None	N	N	N	N
R. TRICEPS	N	None	None	None	None	N	N	N	N
R. PRON TERES	N	None	None	None	None	N	N	N	N
R. EXT DIG COMM	N	None	None	None	None	N	N	N	N
R. FIRST D INTEROS	N	None	None	None	None	N	N	N	N



Sample EMG results - normal

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	Spontaneous					MUAP			Recruitment
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R. TRICEPS	N	None	None	None	None	N	N	N	N
R. PRON TERES	N	None	None	None	None	N	N	N	N
R. EXT DIG COMM	N	None	None	None	None	N	N	N	N
R. FIRST D INTEROS	N	None	None	None	None	N	N	N	N



Sample EMG results - normal

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	IA	Fib	PSW	Fasc	H.F.	Amp	Dur.	PPP	Pattern
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R. TRICEPS	N	None	None	None	None	N	N	N	N
R. PRON TERES	N	None	None	None	None	N	N	N	N
R. EXT DIG COMM	N	None	None	None	None	N	N	N	N
R. FIRST D INTEROS	N	None	None	None	None	N	N	N	N



Sample EMG results - normal

EMG Summary Table									
	Spontaneous					MUAP			Recruitment
	IA	Fib	PSW	Fasc	H.F.	Amp	Dur.	PPP	Pattern
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R. BICEPS	N	None	None	None	None	N	N	N	N
R. TRICEPS	N	None	None	None	None	N	N	N	N
R. PRON TERES	N	None	None	None	None	N	N	N	N
R. EXT DIG COMM	N	None	None	None	None	N	N	N	N
R. FIRST D INTEROS	N	None	None	None	None	N	N	N	N



Poll #2

- You must answer **all three poll questions** to qualify for CE credit.
- If you cannot see the poll question, **it will be read aloud multiple times.**

To submit your poll question answer:

Use the Submit button on your screen



Example poll question?

A. Option 1

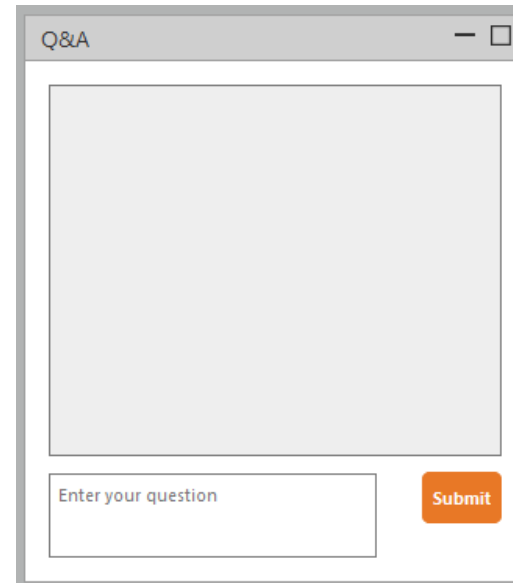
B. Option 2

C. Option 3

Submit

OR

Send your answer in the Q&A panel



Q&A

Enter your question

Submit

An EMG...

Is it painful?

Are there risks?

What parts of the neuromuscular system can be tested?

- It is uncomfortable
- Depends on the patient's pain experience
 - Needle phobia
 - Electrophobia
- Pain medications can be taken before and after the EMG examination
- Sedation is not usually provided

An EMG...

Is it painful?

Are there risks?

What parts of the neuromuscular system can be tested?

- Focal discomfort
- Occasional lightheadedness and/or nausea
- Local and very minimal bleeding
- Pacemakers are usually not an issue
- Higher risk EMG examinations are uncommon in workers' compensation
 - Thoracic radiculopathy
 - Phrenic nerve paralysis

An EMG...

Is it painful?

Are there risks?

What parts of the neuromuscular system can be tested?

- Sensory nerve fibers (NCS)
- Motor nerve fibers (NCS)
- Muscle fibers (EMG)
- Motor unit
 - Anterior horn cell (ALS)
 - Nerve root (radiculopathy)
 - Plexus (plexopathy)
 - Peripheral nerve (carpal tunnel)
 - Neuromuscular junction (botulism)
 - Muscle fibers (myopathy)

Conditions that CAN be diagnosed with an EMG

ANTERIOR HORN CELL DISEASE

ALS (Lou Gehrig's disease)

NERVE ROOT INJURY

- Cervical radiculopathy
- Lumbosacral radiculopathy

PLEXOPATHY

- Brachial
- Lumbosacral

MONONEUROPATHY

- Carpal tunnel syndrome
- Ulnar neuropathy
- Sciatic neuropathy

POLYNEUROPATHY

Guillain-Barre syndrome

PERIPHERAL NEUROPATHY

- Metabolic (diabetes, thyroid disease)
- Chemical exposure (alcohol, solvents)
- Medication-related (chemotherapy)

NEUROMUSCULAR JUNCTION DISORDER

- Myasthenia gravis
- Botulism

MYOPATHY

Inflammatory

*Not an all-inclusive list

Conditions that CANNOT be diagnosed with an EMG

CENTRAL NERVOUS SYSTEM

- Stroke
- Spinal cord injury
- Multiple sclerosis

MUSCULOSKELETAL SYSTEM

- Bone, ligament, tendon injuries
- Rotator cuff tears
- Meniscus injuries
- Muscle strains
- Plantar fasciitis

FIBROMYALGIA

SMALL FIBER PERIPHERAL NEUROPATHY

COMPLEX REGIONAL PAIN SYNDROME (CRPS)

Not an all-inclusive list

EMG timing



When should an EMG be completed?

- Immediately
 - Severe injuries
 - Amount of information obtained will be limited
 - Complete vs. incomplete nerve injury
- Three weeks after injury

EMG timing



When should an EMG be completed?

- Immediately
 - Severe injuries
 - Amount of information obtained will be limited
 - Complete vs. incomplete nerve injury
- Three weeks after injury



When should an EMG be repeated?

- Depends on the severity of symptoms and potential of a treatable cause
- When no abnormalities were initially found but symptoms persist or worsen
- If symptoms continue even after treatment (such as carpal tunnel release)

How do EMG results change over time?



- Nerve injuries may heal over time but healing may be slow and incomplete
- Although symptoms may improve, nerve conduction studies do not always go back to normal even after healing
- Reinnervation changes seen in the EMG study can give a clue as to when the injury occurred

Why would an EMG be normal in patients who have symptoms?



- Nerve compression without nerve injury (e.g., Carpal tunnel syndrome)
- EMG is performed before there has been enough time for abnormalities to show up
- Symptoms are not related to a nerve problem

Conditions that can mimic nerve injury

- Rotator cuff injury
- Labral injury
- Tendinitis
- Arthritis
 - Hand
 - Wrist
 - Hip
 - Spine
- Degenerative disc disease
- Muscle strain
- Fibromyalgia



The EMG report

- Nerves and muscles that are abnormal
- Specific location of nerve injury
- Extent of nerve injury
 - Mild, moderate, severe
 - Complete
 - Incomplete
- Acute or chronic
 - Reinnervation changes
- Prognosis



Using the EMG results



GUIDE AND DIRECT ONGOING TREATMENT	BASELINE FOR FUTURE COMPARISON	MORE INFORMATION
<ul style="list-style-type: none"> • Medications • Braces • Physical and occupational therapy • Surgical considerations 	<p>If recovery is delayed or incomplete</p>	<p>Prognosis for recovery</p>

Determining if EMG abnormalities are work-related

- Is there evidence of acute or chronic nerve injury?
- Do the EMG abnormalities relate to the
 - Site of injury
 - Time of the injury
 - Mechanism of the injury



ODG recommendations for EMG/NCS



GENERALLY RECOMMENDED

Neck and upper back conditions

- Atypical cases
- Needle EMG, not surface EMG
- More than one underlying condition

CONDITIONALLY RECOMMENDED

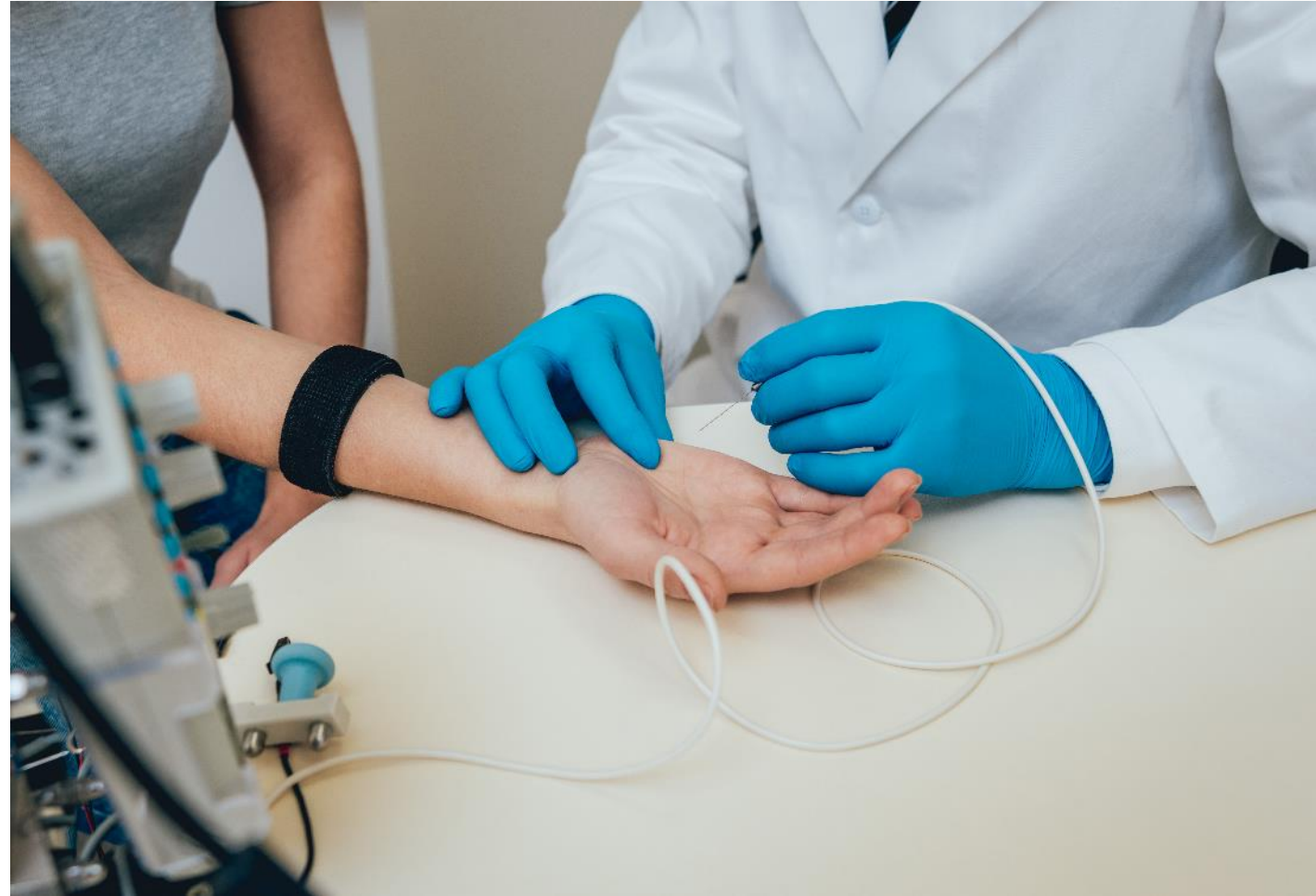
Low back conditions

- Following four weeks of conservative therapy
- Patient selection and predicting success with epidural steroid injections
- Not recommended for well-established chronic radiculopathy, UNLESS
 - Recent symptom worsening
 - Deterioration of neurologic findings

Resource: ODG

EMG providers

- Approved medical specialties with advanced neuromuscular training
 - Neurology
 - Physical Medicine and Rehabilitation (PM&R)
- Avoid noncertified or limited experience providers



Questionable billing practices in EMG testing

- Office of Inspector General (OIG) 2014 report on questionable billing
- Physicians with unusually high percentages or averages of the following:
 - Modifer 59 (distinct services not bundled)
 - Modifer 25 (evaluation and management on the same day as procedure)
 - High percentage of EMG claims
 - High percentage of claims that do not include both nerve conduction and needle EMG
 - High number of miles between provider and patients
 - High percentage of patients with three or more providers performing EMG testing
 - High number of EMG claims on the same day for the same patient

Fraud, waste and abuse related to EMG

- Isolated cases of over utilization
- Centers for Medicare and Medicaid Services (CMS) fee schedule changes
- Auditing

Poll #3

- You must answer **all three poll questions** to qualify for CE credit.
- If you cannot see the poll question, **it will be read aloud multiple times.**

To submit your poll question answer:

Use the Submit button on your screen



Example poll question?

A. Option 1

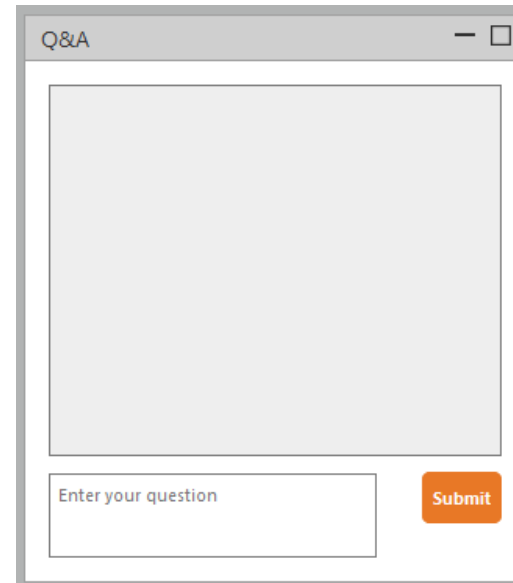
B. Option 2

C. Option 3

Submit

OR

Send your answer in the Q&A panel



Q&A

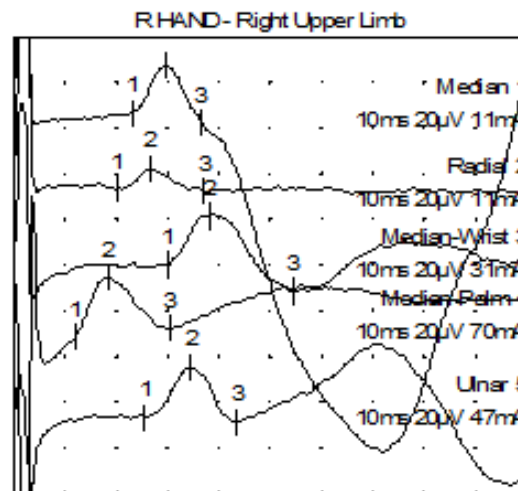
Enter your question

Submit

Sample cases

Normal sensory nerve conduction studies of the hand and wrist

Nerve / Sites	Rec. Site	Peak Lat ms	NP Amp μ V	Distance cm	Velocity m/s
R HAND - Right Upper Limb					
Median	Dig I	3.0	20.9	10	43.5
Radial	Dig I	2.7	8.9	10	50.0
Median-Wrist	Dig 3	3.8	21.7	14	46.7
Median-Palm	Dig 3	1.9	26.5	6	50.0
Ulnar	Dig 5	3.5	21.8	14	54.9



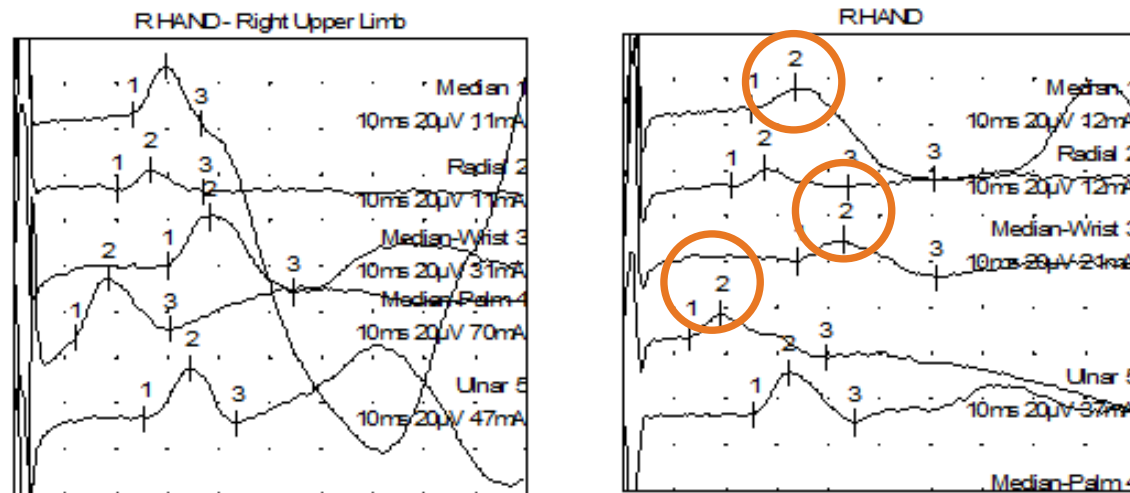
Normal

Mild carpal tunnel syndrome

Nerve / Sites	Rec. Site	Peak Lat ms	NP Amp μ V	Distance cm	Velocity m/s
R HAND					
Median	Dig I	3.4	9.6	10	40.0
Radial	Dig I	2.8	8.0	10	47.6
Median-Wrist	Dig 3	4.3	9.8	14	41.2
Median-Palm	Dig 3	1.9	10.8	5.5	42.3
Ulnar	Dig 5	3.2	18.4	14	54.9

What do the test results show you?

How can you use this information?

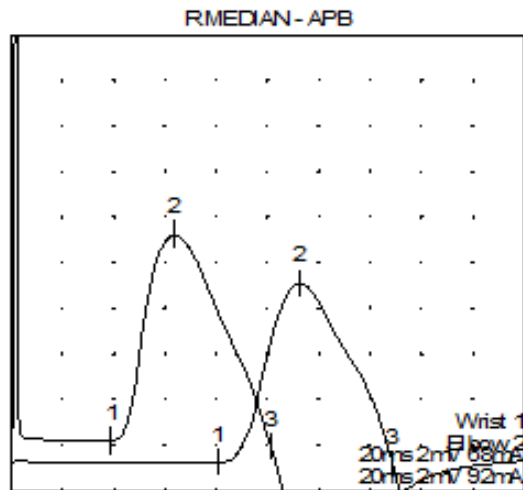


Normal

Abnormal- Mild

Normal motor NCS

Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
R MEDIAN - APB						
Wrist	APB	3.9	9.0	Wrist - APB	8	
Elbow	APB	8.1	7.9	Elbow - Wrist	21.5	51.8



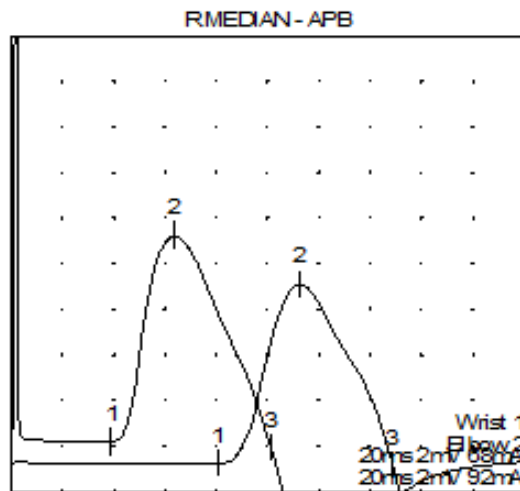
Normal

Moderate carpal tunnel syndrome

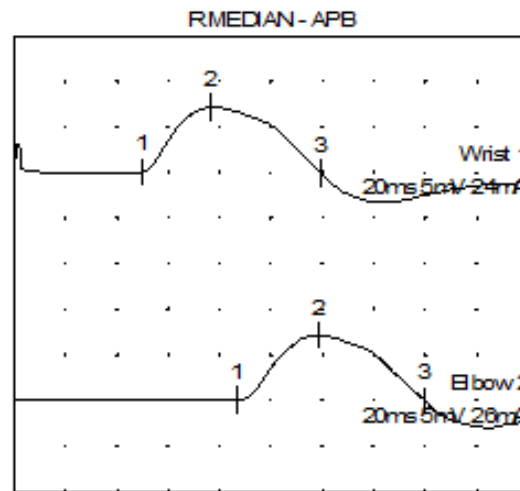
Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
R MEDIAN - APB						
Wrist	APB	5.0	7.1	Wrist - APB	8	
Elbow	APB	8.7	7.2	Elbow - Wrist	20	54.1

What do the test results show you?

How can you use this information?



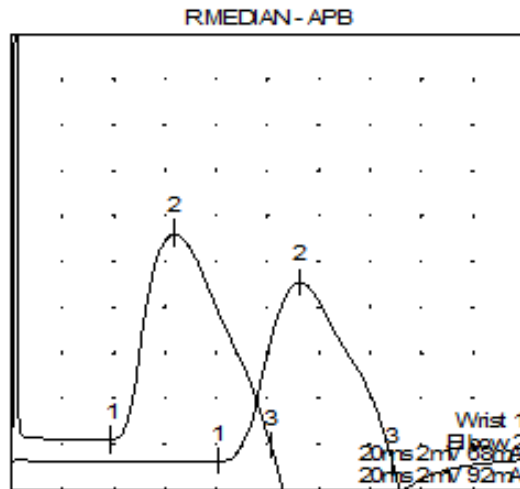
Normal



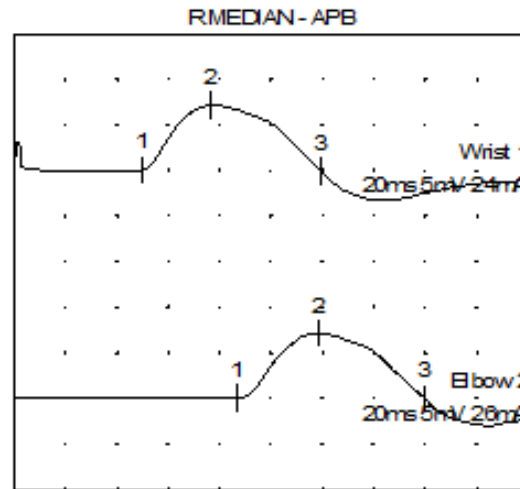
Abnormal - Moderate

Severe carpal tunnel syndrome

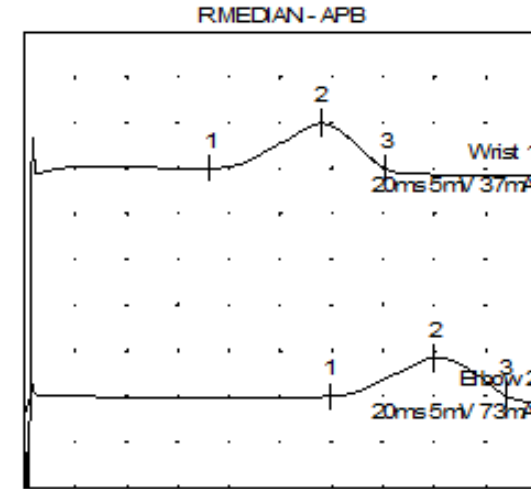
Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
R MEDIAN - APB						
Wrist	APB	7.3	5.0	Wrist - APB	8	
Elbow	APB	11.9	4.2	Elbow - Wrist	20.5	44.1



Normal



Abnormal - Moderate



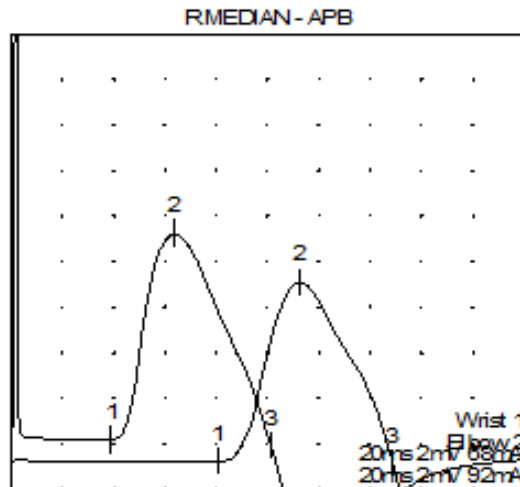
Abnormal - Severe

Severe carpal tunnel syndrome

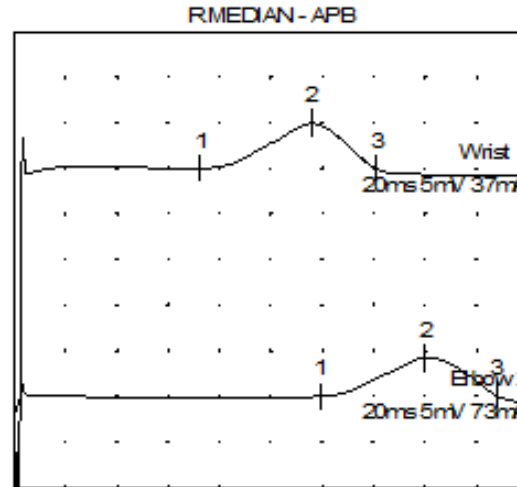
Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
R MEDIAN - APB						
Wrist	APB	7.3	5.0	Wrist - APB	8	
Elbow	APB	11.9	4.2	Elbow - Wrist	20.5	44.1

What do the test results show you?

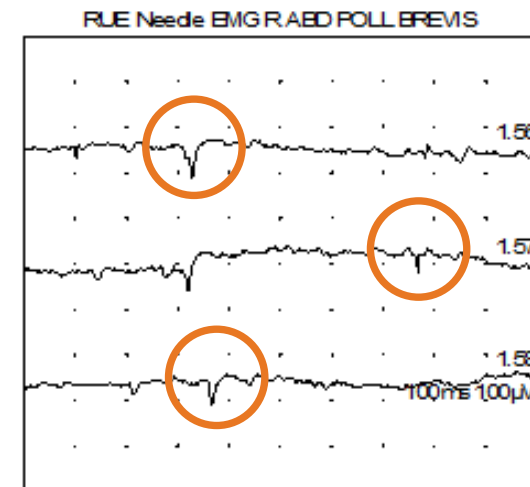
How can you use this information?



Normal NCS

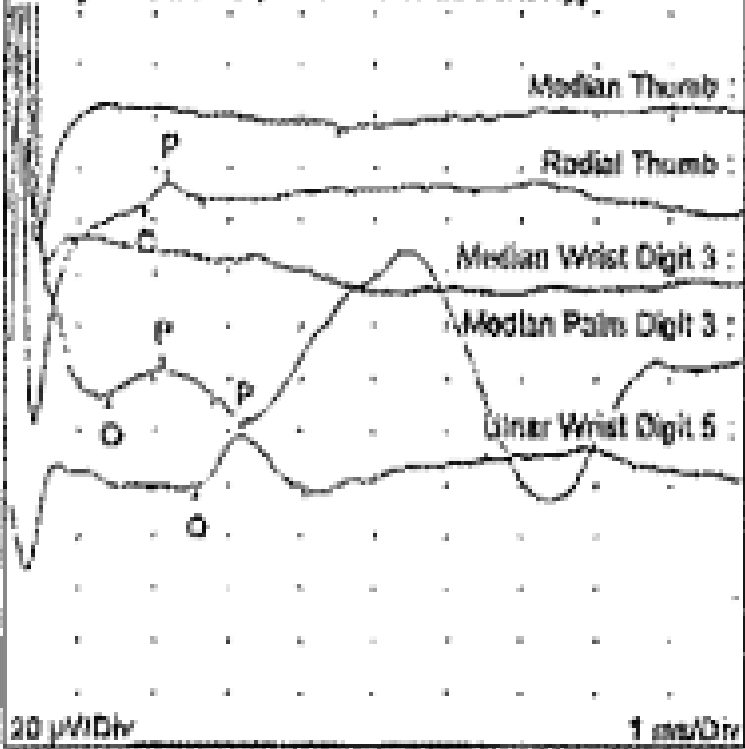


Abnormal NCS - Severe



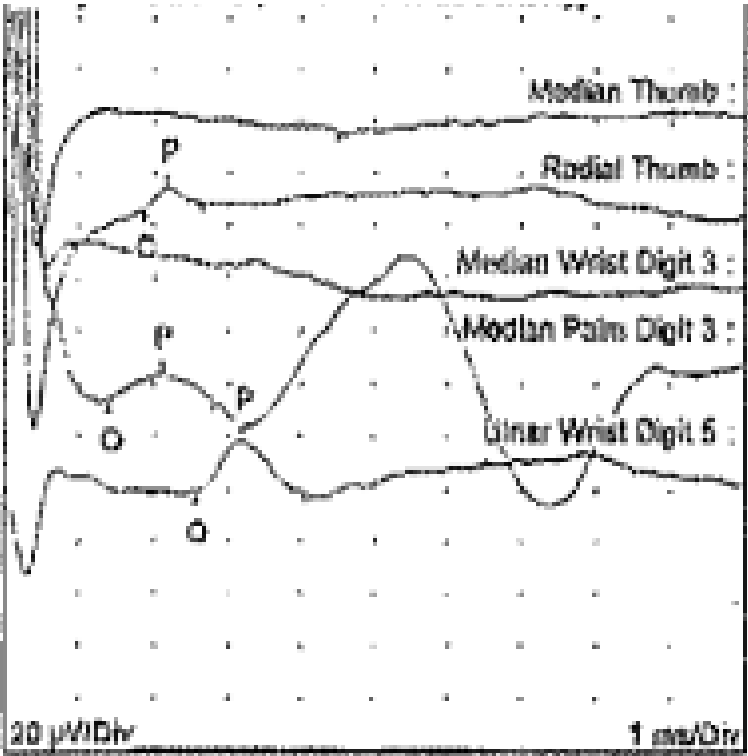
Abnormal EMG - Severe

Severe carpal tunnel syndrome

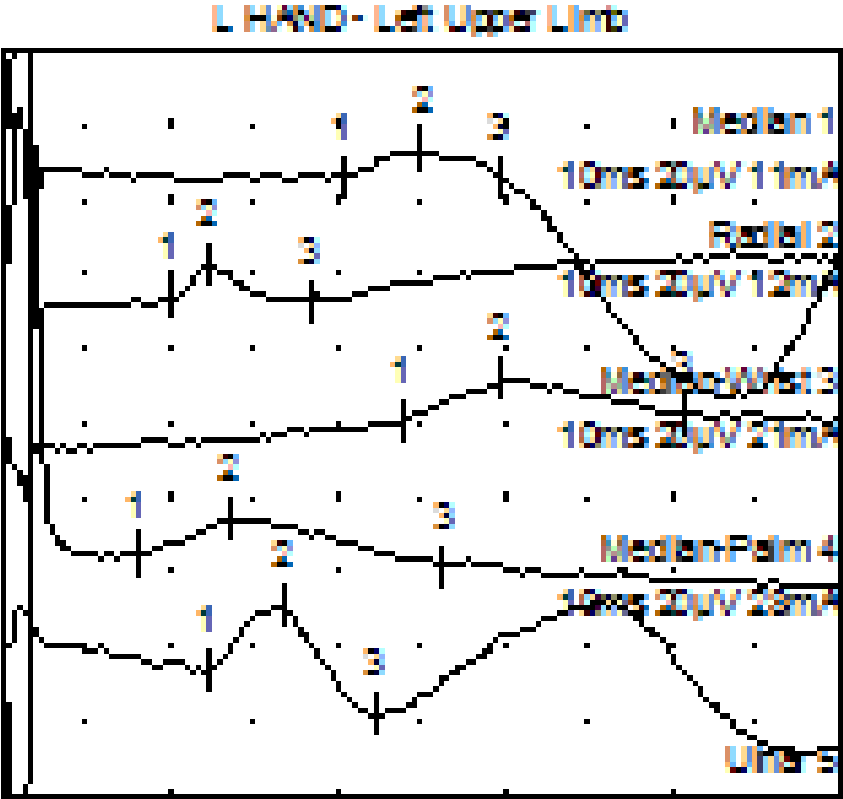


Before surgery

Severe carpal tunnel syndrome

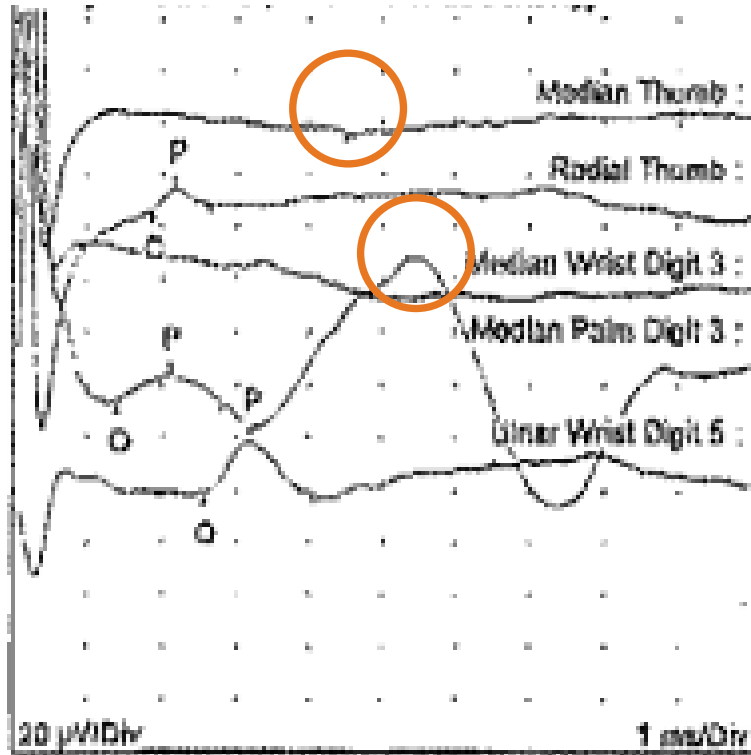


Before surgery



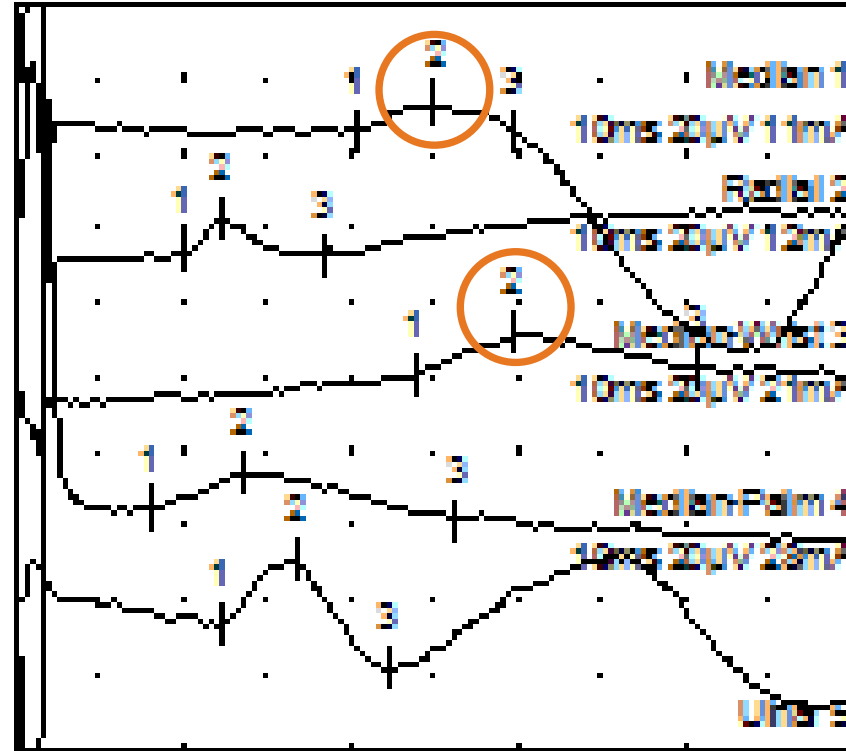
After surgery

Severe carpal tunnel syndrome



Before surgery

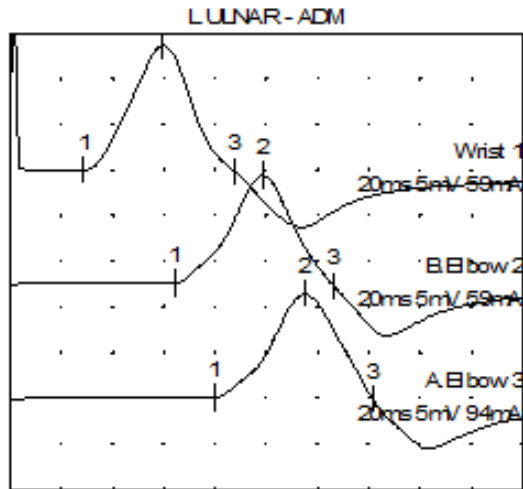
L HAND - Left Upper Limb



After surgery

Normal ulnar motor NCS

Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
L ULNAR - ADM						
Wrist	ADM	2.9	13.7	Wrist - ADM	8	
B.Elbow	ADM	6.5	11.9	B.Elbow - Wrist	18	50.0
A.Elbow	ADM	8.0	11.3	A.Elbow - B.Elbow	11.5	76.7



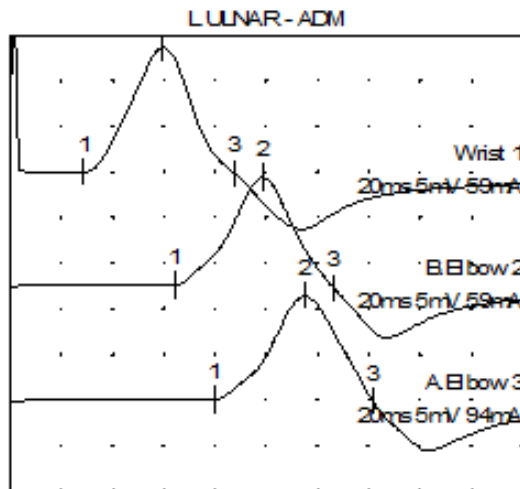
Normal

Ulnar neuropathy at the elbow

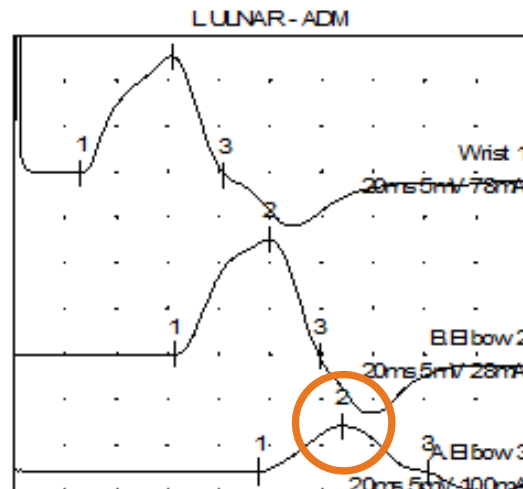
Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
L ULNAR - ADM						
Wrist	ADM	2.6	12.8	Wrist - ADM	8	
B.Elbow	ADM	6.3	12.6	B.Elbow - Wrist	19.5	53.4
A.Elbow	ADM	9.6	5.1	A.Elbow - B.Elbow	11	33.3

What do the test results show you?

How can you use this information?



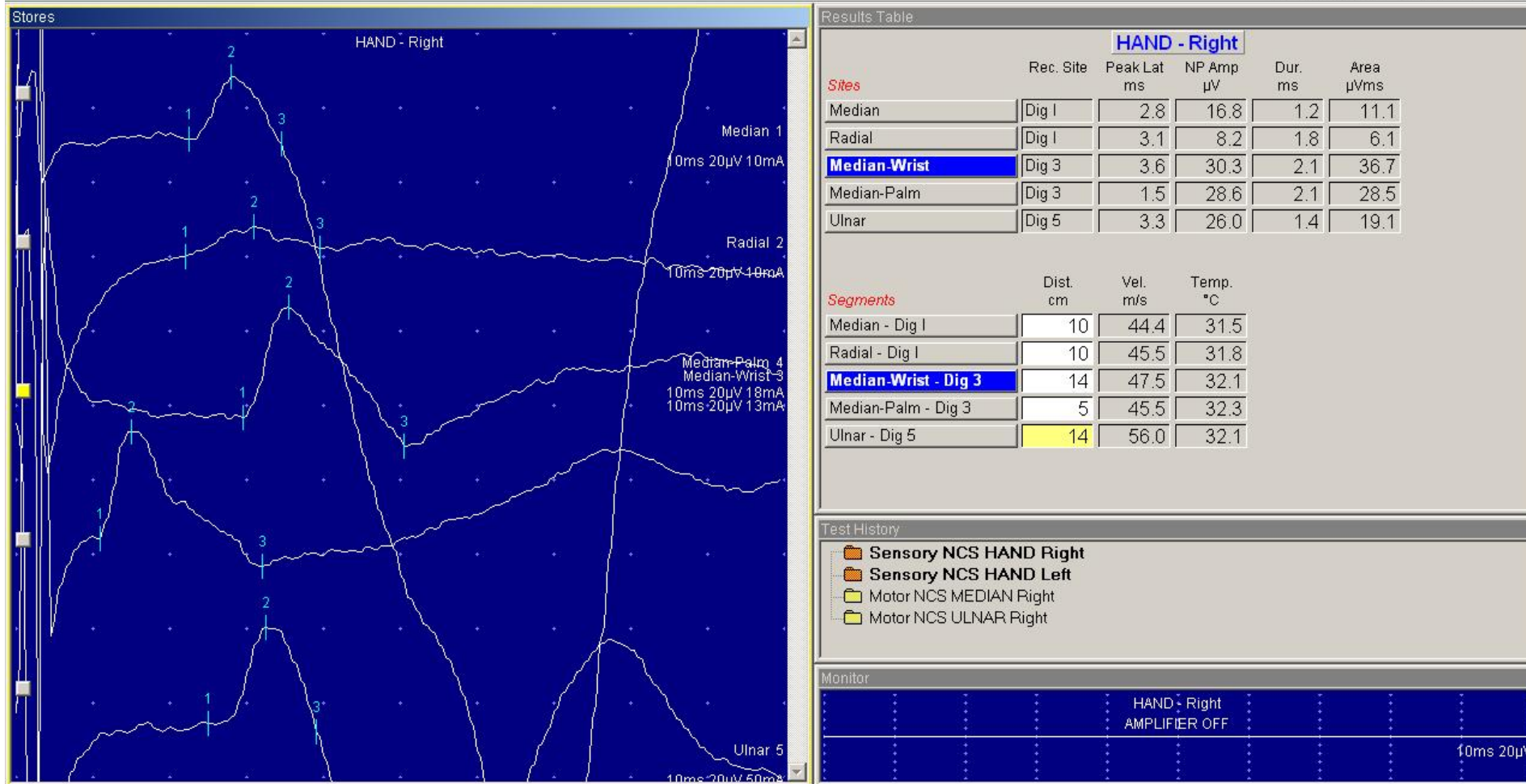
Normal



Abnormal

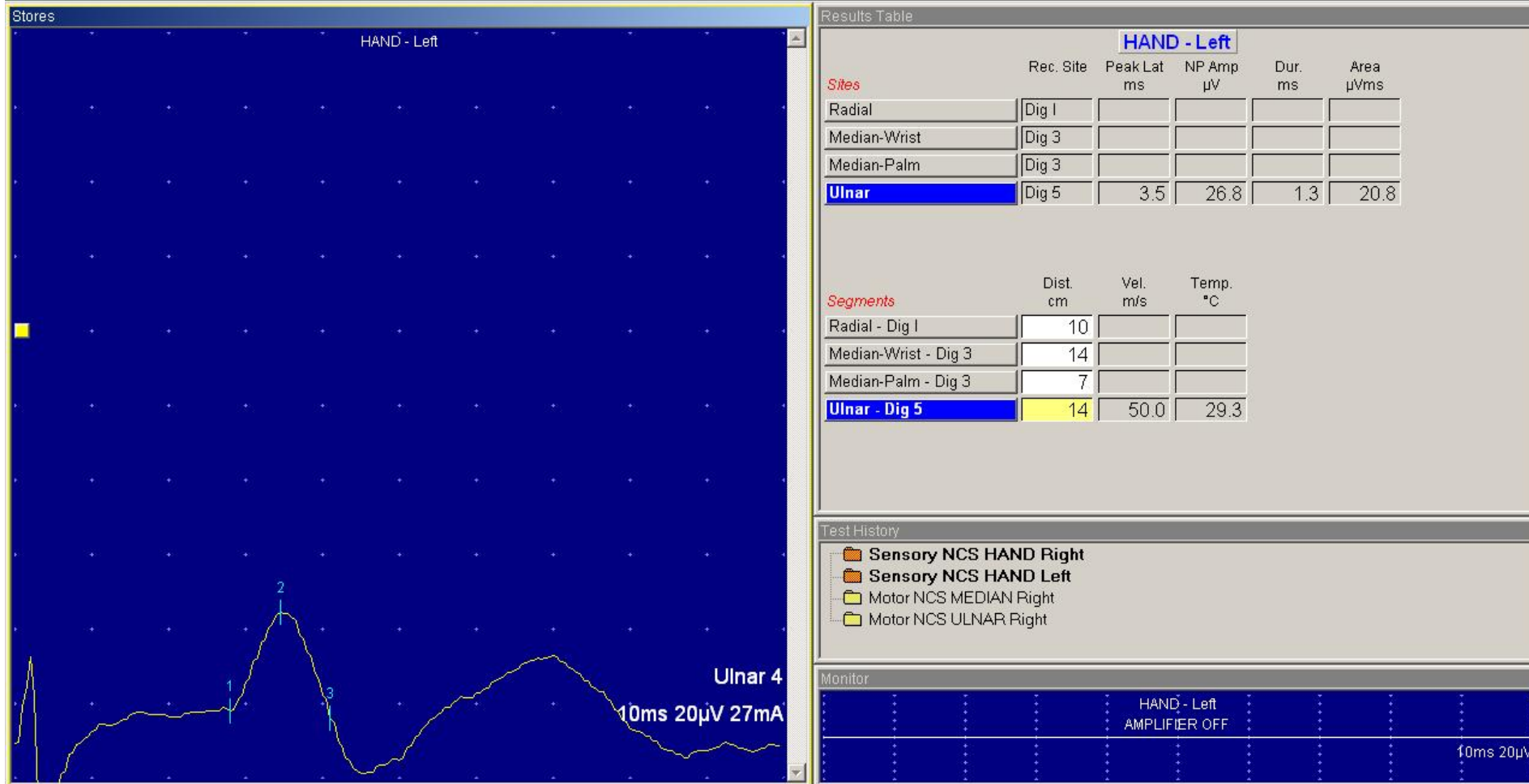
Workers' comp crush injury to hand and wrist with numbness and pain

Friday, October 01, 2021 12:18



Workers' comp crush injury to hand and wrist with numbness and pain

Friday, October 01, 2021 12:18

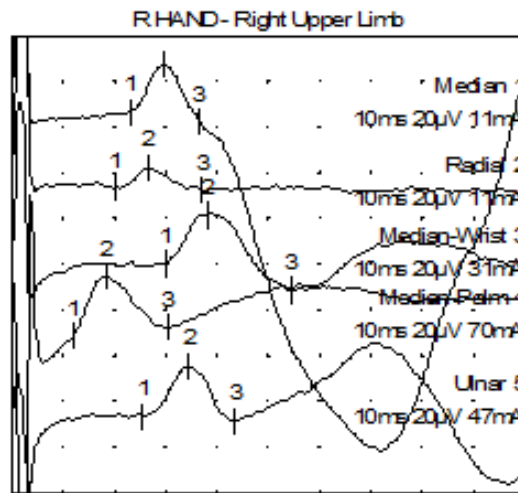


What do the test results show you?

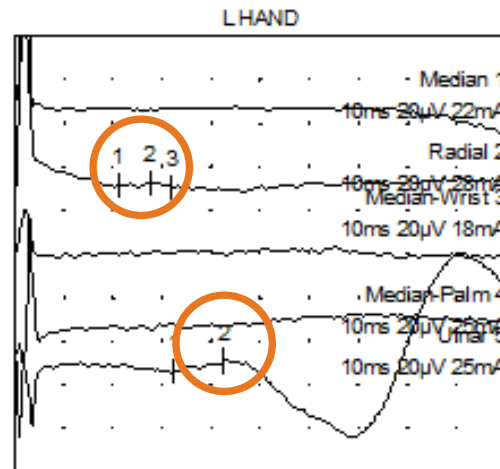
How can you use this information?

Peripheral neuropathy and carpal tunnel syndrome

Nerve / Sites	Rec. Site	Peak Lat ms	NP Amp μ V	Distance cm	Velocity m/s
L HAND					
Median	Dig I	NR	NR	10	NR
Radial	Dig I	2.8	0.92	10	47.6
Median-Wrist	Dig 3	NR	NR	14	NR
Median-Palm	Dig 3	NR	NR	7	NR
Ulnar	Dig 5	4.3	4.7	14	43.1



Normal



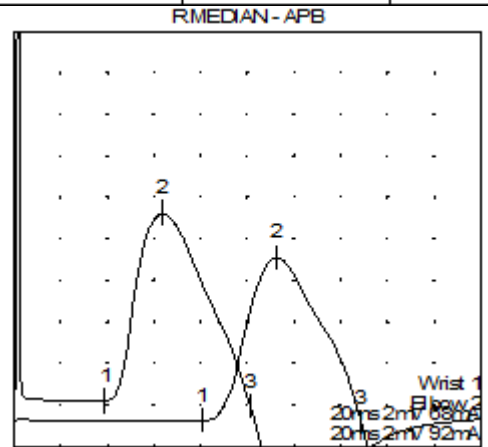
Abnormal

Peripheral neuropathy and carpal tunnel syndrome

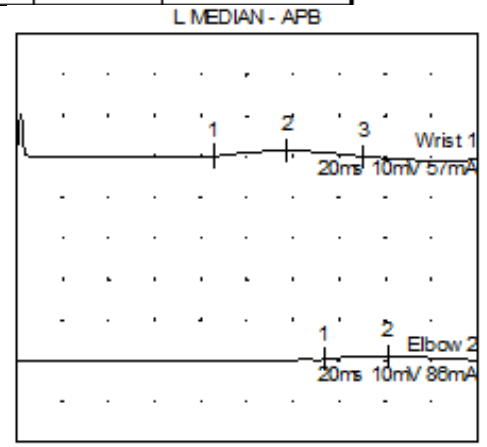
What do the test results show you?
How can you use this information?

Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
R MEDIAN - APB						
Wrist	APB	3.9	9.0	Wrist - APB	8	
Elbow	APB	8.1	7.9	Elbow - Wrist	21.5	51.8

Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
L MEDIAN - APB						
Wrist	APB	8.6	1.4	Wrist - APB	8	
Elbow	APB	13.4	0.9	Elbow - Wrist	21	43.7



Normal



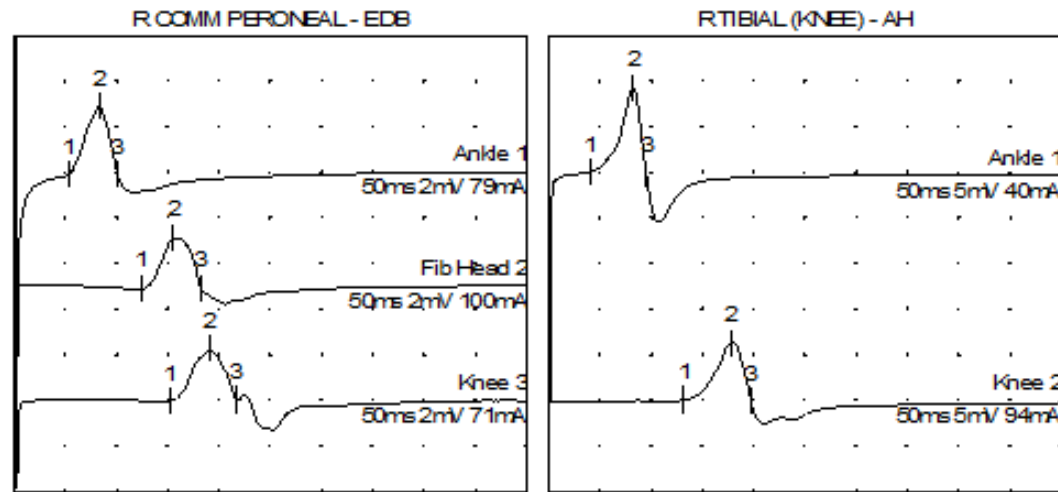
Abnormal



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Chronic low back and right leg pain

Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
R COMM PERONEAL - EDB						
Ankle	EDB	5.4	3.0	Ankle - EDB	8	
Fib Head	EDB	12.5	2.3	Fib Head - Ankle	28.5	40.1
Knee	EDB	15.2	2.3	Knee - Fib Head	15	55.6
R TIBIAL (KNEE) - AH						
Ankle	AH	4.1	9.3	Ankle - AH	8	
Knee	AH	13.2	6.3	Knee - Ankle	38	42.0



Normal

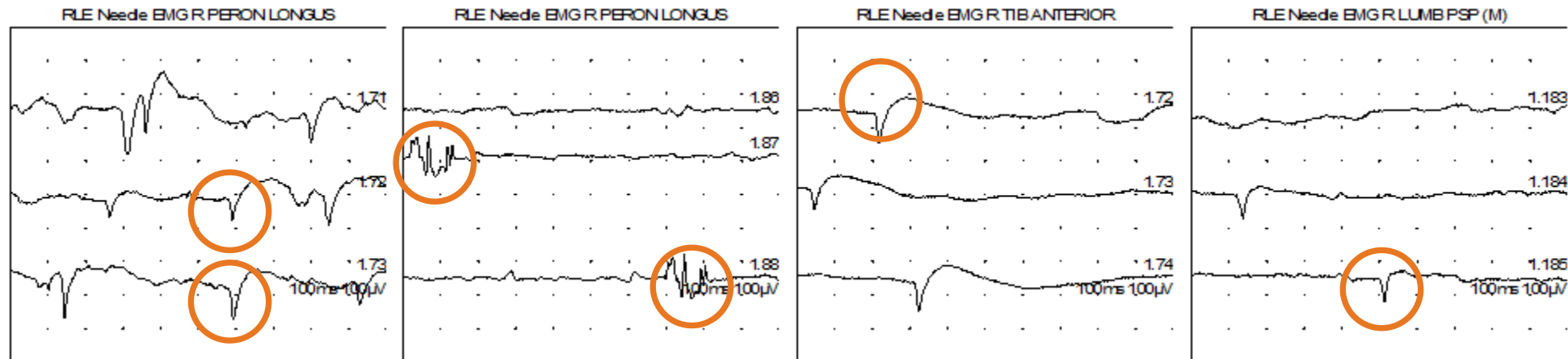
Abnormal

Chronic low back and right leg pain

EMG Summary Table	Spontaneous					MUAP			Recruitment
	IA	Fib	PSW	Fasc	H.F.	Amp	Dur.	PPP	Pattern
R. VAST MEDIALIS	N	None	None	None	None	N	N	N	N
R. GRACILIS	N	None	None	None	None	N	N	N	N
R. TIB ANTERIOR	N	None	1+	None	None	N	N	N	Reduced
R. PERON LONGUS	N	2+	2+	None	None	N	1+	2+	Reduced
R. GASTROCN (MED)	N	None	None	None	None	N	N	N	N
R. FIRST D INTEROS	N	None	None	None	None	N	N	N	N
R. LUMB PSP	N	None	1+	None	None				

What do the test results show you?

How can you use this information?

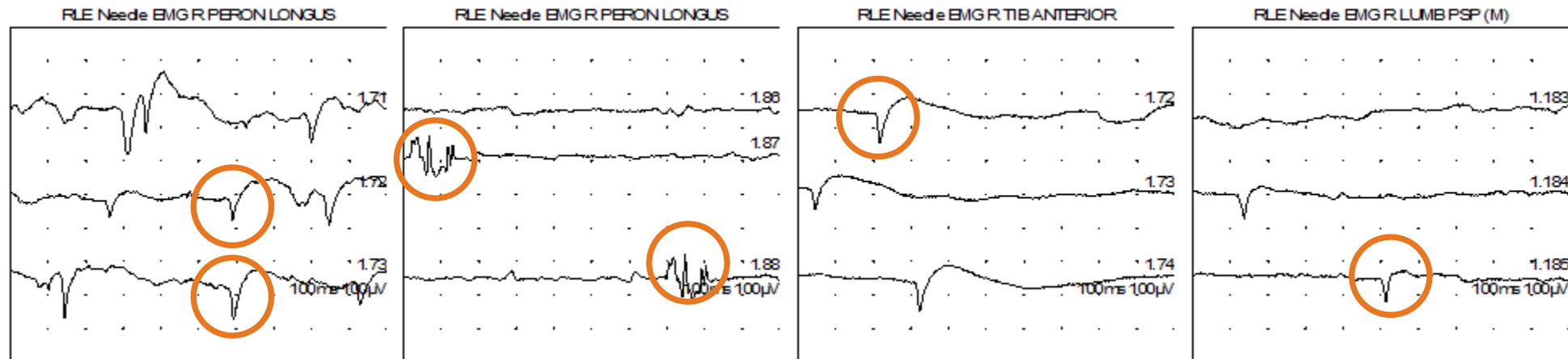


Chronic low back and right leg pain - Right L5 radiculopathy

What do the test results show you?

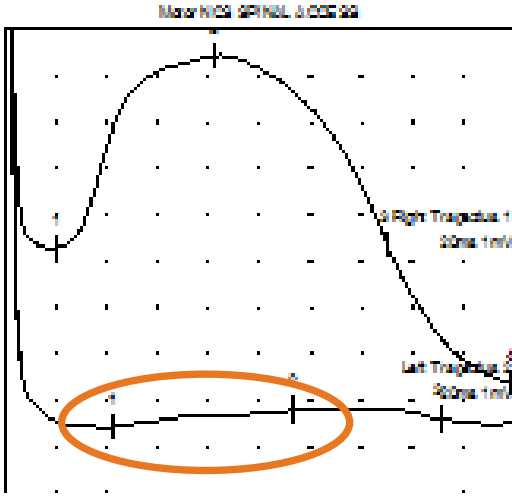
How can you use this information?

EMG Summary Table	Spontaneous					MUAP			Recruitment
	IA	Fib	PSW	Fasc	H.F.	Amp	Dur.	PPP	Pattern
R. VAST MEDIALIS	N	None	None	None	None	N	N	N	N
R. GRACILIS	N	None	None	None	None	N	N	N	N
R. TIB ANTERIOR	N	None	1+	None	None	N	N	N	Reduced
R. PERON LONGUS	N	2+	2+	None	None	N	1+	2+	Reduced
R. GASTROCN (MED)	N	None	None	None	None	N	N	N	N
R. FIRST D INTEROS	N	None	None	None	None	N	N	N	N
R. LUMB PSP	N	None	1+	None	None				



Winged scapula and shoulder pain

Nerve / Sites	Lat ms	Amp mV	Amp %
SPINAL ACCESS			
Right Trapezius	2.05	4.2	100
Left Trapezius	4.20	0.4	8.86

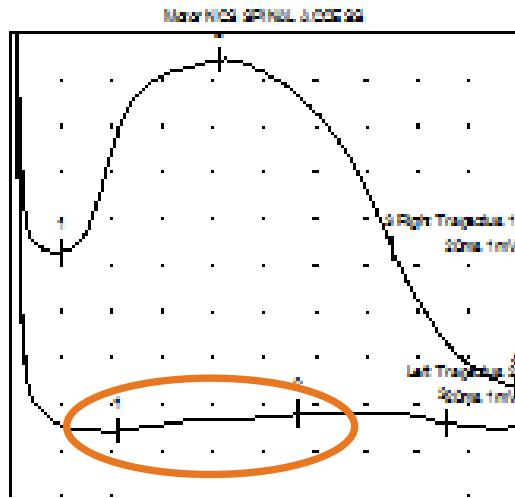


Winged scapula and shoulder pain – Severe spinal accessory neuropathy

Nerve / Sites	Lat ms	Amp mV	Amp %
SPINAL ACCESS			
Right Trapezius	2.05	4.2	100
Left Trapezius	4.20	0.4	8.86

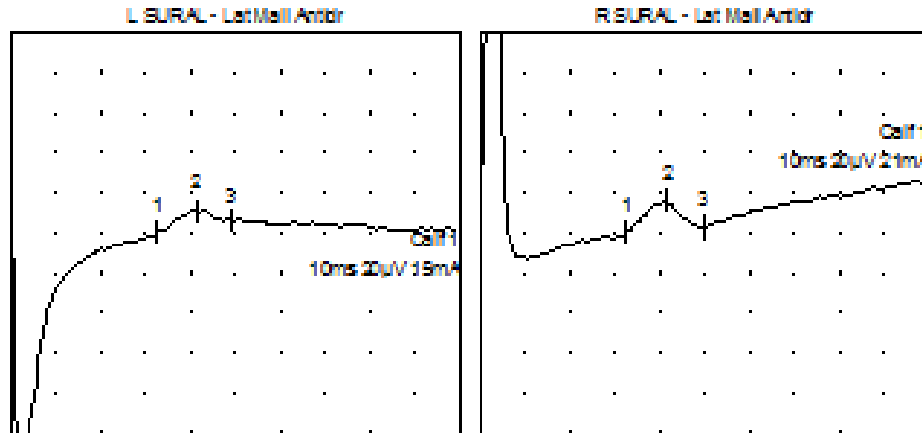
What do the test results show you?

How can you use this information?



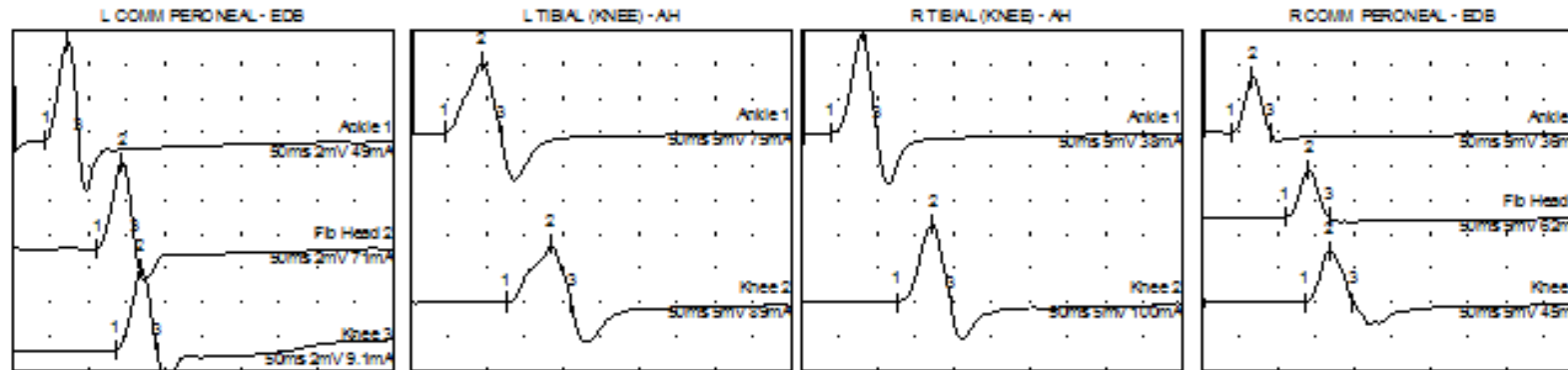
Muscle cramps and weakness

Nerve / Sites	Rec. Site	Peak Lat ms	NP Amp μ V	Distance cm	Velocity m/s
L SURAL - Lat Mall Antidr					
Calf	Lat Mall	4.1	11.3	14	43.1
R SURAL - Lat Mall Antidr					
Calf	Lat Mall	4.2	16.1	14	43.1



Muscle cramps and weakness

Nerve / Sites	Rec. Site	Lat ms	Amp mV	Segments	Dist cm	Velocity m/s
L COMM PERONEAL - EDB						
Ankle	EDB	4.3	5.8	Ankle - EDB	8	
Fib Head	EDB	11.1	5.1	Fib Head - Ankle	32.5	47.8
Knee	EDB	13.6	4.8	Knee - Fib Head	12	48.0
L TIBIAL (KNEE) - AH						
Ankle	AH	4.5	10.4	Ankle - AH	8	
Knee	AH	12.7	8.4	Knee - Ankle	36	44.2
R COMM PERONEAL - EDB						
Ankle	EDB	3.9	8.2	Ankle - EDB	8	
Fib Head	EDB	10.9	7.1	Fib Head - Ankle	32.5	46.1
Knee	EDB	13.4	7.5	Knee - Fib Head	12	48.0
R TIBIAL (KNEE) - AH						
Ankle	AH	4.0	14.7	Ankle - AH	8	
Knee	AH	12.5	11.4	Knee - Ankle	39	45.9

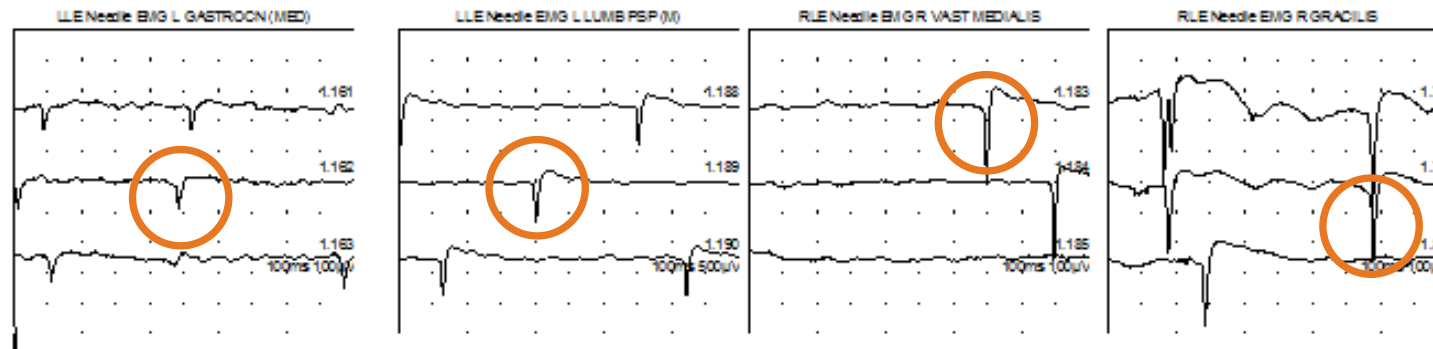


Muscle cramps and weakness

What do the test results show you?

How can you use this information?

EMG Summary Table	Spontaneous					MUAP			Recruitment
	IA	Fib	PSW	Fasc	H.F.	Amp	Dur.	PPP	Pattern
R. VAST MEDIALIS	N	None	1+	None	None	N	N	N	N
R. GRACILIS	N	None	2+	1+	None	N	N	N	N
R. TIB ANTERIOR	N	None	None	1+	None	N	N	N	N
R. PERON LONGUS	N	None	None	None	None	N	N	N	N
R. GASTROCN (MED)	N	None	1+	1+	None	N	N	N	N
R. FIRST D INTEROS	N	None	None	None	None	N	N	N	N
R. LUMB PSP	N	None	3+	None	None				
L. VAST MEDIALIS	N	None	1+	None	None	N	N	N	N
L. GRACILIS	N	None	1+	None	None	N	N	N	N
L. TIB ANTERIOR	N	None	1+	None	None	N	N	N	N
L. PERON LONGUS	N	None	1+	None	None	N	N	N	N
L. GASTROCN (MED)	N	None	None	None	None	N	N	N	N
L. FIRST D INTEROSS	N	None	None	None	None	N	N	N	N
L. LUMB PSP	N	None	1+	None	None				



Nonsurgical recommendations that can make a significant impact

- Posture
- Decrease repetitive motion
- Rest breaks and stretching
- Ergonomics
- Weight loss

Summary

- EMG and NCS are useful in determining if a significant nerve injury has occurred
- Some abnormal findings on EMG can be present immediately following nerve injury but the extent of the injury may not be observed until 3 to 4 weeks later
- EMG and NCS are most useful in determining the cause(s) of pain, numbness, tingling and weakness
- EMG and NCS should be performed by experienced providers
- Follow-up EMG and NCS studies for the same patient are not usually necessary but may be indicated on a case-by-case basis

Thank you!

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