



## March 1999 EMG Case-of-the-Month

**This case is no longer available for CME credit.**

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**Presenting Symptoms:** Shoulder pain

**Learning Objectives:** After completing this educational activity, participants will be able to (1) formulate an appropriate differential diagnosis for the presented shoulder pain and (2) devise an appropriate treatment plan for the presented shoulder problem.

### HISTORY

A 51-year-old right-handed woman presents with the chief complaint of pain and restricted mobility of her left shoulder. She first noticed intermittent pain in her left shoulder 3 months ago, which would occur when holding a heavy bag with her left arm. A few weeks after the onset of this pain she had a rhytidectomy (facelift procedure). It was a few weeks after this procedure (carried out 2 1/2 months prior to presentation) that she noticed limitation in the range of motion of her left shoulder when trying to blow dry her hair. She was unable to lift her arm above shoulder height and began to develop new, progressive pain in the left shoulder. This pain is now constant and is primarily located over her scapula. It has not improved with initial physical therapy treatments. Aggravating factors include elevating her left arm, while there are no relieving factors.

- **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 differential diagnosis falls into 2 broad categories: Neurologic (peripheral versus central) or musculoskeletal.

The peripheral nerve differential diagnosis would include injury to the spinal accessory nerve, long thoracic nerve, suprascapular nerve, and/or axillary nerve, all of which could present with shoulder pain and shoulder abduction weakness. Possible mechanisms of injury include focal entrapment, either iatrogenic from rhytidectomy or possibly idiopathic, as with neuralgic amyotrophy. With rhytidectomy, the most likely nerve injury would be to the spinal accessory. Neuralgic amyotrophy would most likely affect the long thoracic, suprascapular, or axillary nerve. However, she did not describe the typical intense shoulder pain associated with neuralgic amyotrophy. With peripheral nerve lesions, focal atrophy might be expected, but in this case the patient had not noticed any. Another possibility is a C5 or C6 radiculopathy presenting with pain and shoulder weakness. The patient did not describe weakness with other activities such as elbow flexion, and no loss of sensation or numbness was reported.



The differential diagnosis also includes musculoskeletal conditions that may present with limited range of motion of the shoulder in conjunction with pain. Considerations include anterior impingement syndrome, rotator cuff tear, subacromial bursitis, or adhesive capsulitis. She describes constant pain in her left shoulder, which makes anterior impingement syndrome, rotator cuff tear, and subacromial bursitis less likely. Those conditions are often pain free as long as aggravating activities are avoided.

Intraspinal causes to be considered include motor neuron disease, tumors, syringomyelia, or poliomyelitis, although the history does not provide strong support for any of these.

Further clarification is needed regarding trauma to the neck in the past, or chronic strain such from carrying heavy shoulder bags.

## **HISTORY, continued**

The patient reports that her physical therapist had noted atrophy of her left trapezius muscle. Her past medical history is unremarkable. She is not taking any medications and does not require any over-the-counter analgesics for her pain. She worked as a registered nurse, but in the past few years she has become a real estate agent. She smokes and does not have any history of alcohol abuse. For recreation, she enjoys playing tennis.

- **If necessary, revise your differential diagnosis based on the additional clinical history.**
- **On which details of the physical examination should you focus at this point?**

## **COMMENTARY II**

The additional information does not change the differential diagnosis, since trapezius atrophy could be related to disuse secondary to any musculoskeletal or neurologic cause.

The physical examination should focus on the left shoulder girdle, and should include testing for impingement or tendinitis. The neurologic examination should look specifically for the degree and location of atrophy and any weakness or sensory deficit in the left upper limb.

## **PHYSICAL EXAMINATION**

The patient appears comfortable and is of normal weight. There is atrophy of the left upper trapezius, supraspinatus, infraspinatus, and sternocleidomastoid muscles. There are no fasciculations. On strength testing she has weakness in left shoulder abduction, (1/5, although normal within the first 15 degrees), shoulder elevation (1/5), right neck rotation (4/5), and shoulder external rotation (4/5). There is winging of the left scapula, more marked with shoulder abduction than with shoulder flexion. Other left upper limb muscles had normal strength. Sensory examination for the upper limbs is normal for touch, pinprick and vibration.

- **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

There is no apparent sensory loss, therefore a radiculopathy is less likely. The most notable weakness is in shoulder elevation and abduction, with preserved power in the first few degrees of movement, suggesting weakness of scapular stabilization. This is further reinforced by the pattern of scapular winging. Since the sternocleidomastoid muscle is involved, this makes a neurologic cause such as spinal accessory nerve palsy more likely. A concomitant musculoskeletal cause cannot yet be definitely excluded.

Further physical observations that would be useful include the muscle stretch reflexes and the left shoulder examination. Cranial nerve examination should also be completed.

### PHYSICAL EXAMINATION, continued

The biceps, triceps and brachioradialis reflexes were 2+ bilaterally and symmetric. Active shoulder abduction is limited to 90 degrees, but there is full passive shoulder range of motion. She has no shoulder tenderness to palpation and shoulder impingement tests are negative. There is marked tenderness to palpation over the left upper trapezius muscle. She has full active range of motion of the cervical spine and no tenderness on palpation of the cervical spine. Cranial nerve examination was normal other than for the spinal accessory nerve.

- **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

The differential diagnosis is primarily that of a peripheral nerve, plexus (upper trunk), or possible radiculopathy. The most likely condition is spinal accessory nerve palsy. There was very little evidence on physical examination to suggest a musculoskeletal problem, therefore anterior impingement syndrome or subacromial bursitis would remain low on the differential list.

Since this is a proximal upper limb problem, the most useful information from the electrophysiologic examination will come from electromyography. Muscles to be studied include the left deltoid, supraspinatus, trapezius, and sternocleidomastoid. To assess the C6 root an upper limb H reflex may provide some further information. Musculocutaneous sensory nerve conduction study can aid in the evaluation of the C6 dermatome.



**ELECTROPHYSIOLOGIC DATA**

<b>ELECTROMYOGRAPHY</b>									
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 potential									
R/L	MUSCLE	INSERTION		SPONTAN		VOLUNTARY			
		activ	p wave	fib	other	recrt	amp	dur	poly
L	Upper Trapezius	incr	incr 2+	incr 2+	0	incr 3+	incr	n	incr
L	Middle Trapezius	incr	incr 2+	incr 2+	0	decr	incr	n	incr
L	Deltoid (Mid)	N	0	0	0	N	n	n	0
L	Supraspinatus	N	0	0	0	N	n	n	0
L	Sternocleidomastoid	incr	N/a	N/a	N/a	decr	n	n	incr
L	Biceps Brachii	n	0	0	0	n	n	n	0
L	Triceps	n	0	0	0	n	n	n	0
L	Flexor Carpi Radialis	n	0	0	0	n	n	n	0
L	First Dorsal Interosseous	n	0	0	0	n	n	n	0

<b>SENSORY NERVE CONDUCTION</b>									
nr = no response									
NERVE	LAT (ms)			AMP (uV)			CVm/s)		
	R	L	Norm	R	L	Norm	R	L	Norm
	(pos. to neg. peak)								
Musculocutaneous (technically unsuccessful)	-	-	1.8 ±0.1	-	-	24 ±7.2	-	-	65 ±3.6
Median (wrist to digit II)	2.5	2.6	2.5 ±0.1	26	22	32.9 ±10.4	56.0	53.8	56 ±4.0
Ulnar (wrist to digit V)	2.2	2.3	2.3 +0.3	32	36	64.3 ±27.4	63.6	60.9	57 ±5.0

<b>MOTOR NERVE CONDUCTION</b>									
nr = no response									
NERVE	LAT (ms)			AMP (mv)			CV (m/s)		
	R	L	Norm	R	L	Norm	R	L	Norm
	(pos. to neg. peak)								
Extensor Carpi Radialis H reflex	-	15.8	16.6	-	.242	0.9	-	-	-



			$\pm 1$			$\pm 0.4$			
Median (Wrist to APB)	-	3.2	3.4 $\pm 0.3$	-	11.0	13.2 $\pm 5.0$	-	-	-
Median (Elbow to wrist)	-	6.8	-	-	10.9	-	-	58.2	56.9 $\pm 5.1$
Ulnar (Wrist to ADM)	-	2.9	3.2 $\pm 0.5$	-	9.1	6.1 $\pm 1.9$	-	-	-
Ulnar (Elbow to wrist)	-	6.4	-	-	8.9	-	-	60.3	63.3 $\pm 5.2$

The patient could not adequately relax for examination of the left sternocleidomastoid muscle, so the presence of spontaneous activity was not ascertained.

No response was detected for the musculocutaneous nerve on either side due to technical difficulties. The extensor carpi radialis H reflex (to test the C6 root) was normal.

- **On the basis of both the clinical and electrophysiologic evaluations, formulate your diagnostic impression. List the most likely diagnosis first and follow in order with the other possibilities that are not excluded by the data. Eliminate those diagnoses not supported by the data.**
- **Are there additional electrophysiologic data that you feel would further delineate the diagnosis? (Remember, collecting data that are not needed for the diagnosis is costly and uncomfortable for the patient.)**

**COMMENTARY**

The most likely diagnosis is a left spinal accessory nerve palsy. This is supported by clinical weakness and atrophy in the left sternocleidomastoid and left trapezius muscles. EMG demonstrates denervation in the upper and middle trapezius muscle and some supportive evidence of axonal injury to the sternocleidomastoid muscle, which has marked polyphasicity. The C5-C6 innervated muscles are not abnormal, making another peripheral nerve lesion or radiculopathy less likely. The normal left ECR H reflex lends further support to show there is no involvement of the C5-C6 roots.

Further tests to consider include evaluation of other C5-C6 muscles such as rhomboid major, serratus anterior, biceps brachii, or the C5 and C6 paraspinal muscles. Motor conduction studies of the spinal accessory nerve could have been completed with recording over the upper trapezius muscle. Since there was a relatively clear clinical diagnosis and the patient had some intolerance for needles, the testing was not continued, with the patient's agreement.

- **Make the final revisions of your diagnostic impression(s).**

**DIAGNOSTIC IMPRESSION**

Left spinal accessory nerve palsy, with the lesion proximal to the branch to the sternocleidomastoid muscle. An intraspinal or intracranial nerve entrapment of the spinal accessory nerve has not been excluded.



- **What other diagnostic procedures (laboratory tests, etc.), if any, are needed?**
- **What treatment would you recommend?**

## COMMENTARY V

The most likely cause in this patient's case is entrapment of the spinal accessory nerve as a complication of rhytidectomy. There are no findings on clinical examination suggesting an intraspinal or intracranial cause. Her clinical course should be monitored, and she should be referred to physiotherapy for management of her shoulder pain and weakness. Use of a sling to support the shoulder may also provide pain relief. At 2 months post onset of symptoms the upper trapezius has marked weakness. Repeat EMG to assess recovery is recommended in 3 months. Should there be no further recovery then referral to plastic surgery may be indicated for nerve exploration.

Although spinal accessory nerve palsy has been reported as a complication of rhytidectomy, it is quite rare. This patient was typical in her presentation with the complaint of constant pain in the shoulder and scapular region. The spinal accessory nerve has no cutaneous component and for this reason the pain symptoms are believed to be muscular in origin, related to weakness in the trapezius causing altered scapulohumeral mechanics with activity. A unique feature of this patient is the involvement of the sternocleidomastoid muscle, usually spared, since most spinal accessory palsies following rhytidectomy occur more distally. Other iatrogenic causes of spinal accessory nerve palsy include carotid endarterectomy, internal jugular vein cannulation, cervical lymph node biopsy, and neck dissection.

On follow up examination 2 months later the patient had improved strength in her sternocleidomastoid muscle. She had been wearing a Bobath sling to support her shoulder. Strengthening focused on her periscapular musculature. EMG revealed an increased number of motor units with improved motor recruitment in the upper trapezius muscle; sternocleidomastoid EMG examination was declined. Since there was EMG evidence of recovery, it is hoped that she would have further clinical improvement at the next visit 3 months later.

## SUGGESTED READING

1. Blackwell K, Landman M, Calcaterra T: Spinal accessory nerve palsy: an unusual complication of rhytidectomy. *Head and Neck*. 1994;16:181-185.
2. Costagliola M, Rouge D, Reznik M, Julliard AF: [An unusual complication of cervicofacial lift: paralysis of the external branch of the accessory spinal nerve] [French]. *Annales de Chirurgie Plastique et Esthetique*. 1995;40:340-348.
3. Dumitru D: *Electrodiagnostic Medicine*. Mosby. St. Louis. 1995. P720-722.