



Musculoskeletal Case No. 8, November 2000

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Presenting Symptom: Shoulder Pain

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Appropriate Audience: Residents and practicing physicians

Learning Objectives: After completing this educational activity, participant will be able to (1) be able to formulate differential diagnoses for shoulder pain, (2) understand the utility of specific physical examination shoulder tests, (3) be able to manage progression of shoulder pain, and (4) be aware of various diagnostic imaging tests for the shoulder.

History

The patient is a 72-year-old right-hand dominant white male with previous shoulder problems and is referred to you by his primary care physician with a 3-week history of progressively increasing left-shoulder pain.

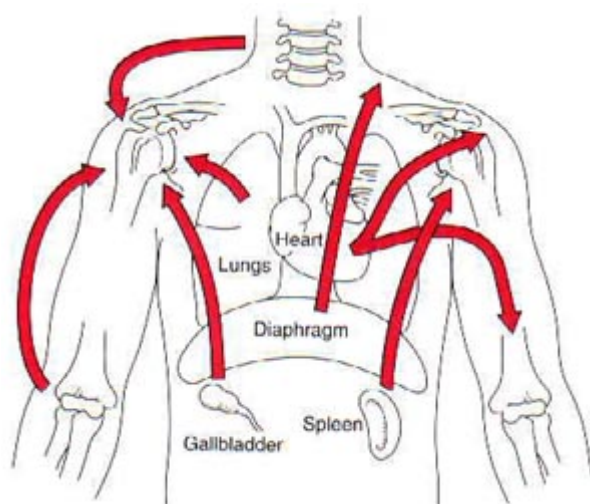
Approximately 6 weeks ago, the patient was pulled to the ground while walking his two large dogs. Falling on outstretched arms, this resulted in a large laceration of his right extensor pollicis longus (EPL), a left wrist fracture and loss of consciousness for an unknown duration. He required surgical repair of the right EPL and a short arm cast on the left for 4 weeks. It is unclear which wrist bone he fractured. His head CT was reportedly normal. He was unaware of any shoulder pain at that time.

Three weeks after his fall, he noted insidious onset of left shoulder pain located in the subdeltoid region, posterior arm, axilla, and occasionally in the anterior chest wall. Pain is provoked when he rolls onto his left side and with overhead activities. Pain is also noted in the early mornings, and it prevents him from sleeping. He denies neck and radiating hand symptoms. He also denies weakness, numbness and tingling in the shoulder and distal limb.

- *Prior to continuing, please develop a differential diagnosis and list each possible diagnosis in order of likelihood.*
 1. Rotator cuff tendonopathy (either tendinitis or tendinosis). A common diagnosis
 2. Rotator cuff tear. A slightly less common diagnosis than rotator cuff tendonopathy, especially in the elderly. Lateral shoulder pain, particularly with side-lying and overhead activities are a typical complaint.
 3. Subacromial bursitis. Difficult to differentiate between rotator cuff tendonopathy and this diagnosis. The treatment, however, is similar.
 4. Calcific tendonitis. A relatively uncommon diagnosis, frequently demonstrating calcium deposition in the supraspinatus tendon.
 5. "Impingement syndrome" is a non-specific term used to describe pain in the shoulder from narrowing of the subacromial space. Rotator cuff tendonopathy, rotator cuff tear, subacromial bursitis and calcific tendonitis fall into this category.



6. Adhesive capsulitis. Also known as frozen shoulder can often develop after a trauma to the shoulder. However, the late onset of symptoms may have developed because of decreased use of the bilateral upper limbs from the short cast and wrist splint.
7. Shoulder fracture. He may have had a fracture of the proximal humerus or glenoid from his fall. A 72 year old man may have significant osteopenia predisposing him to fracture. However, this type of fracture usually results in immediate shoulder pain, which the patient did not complain of until several weeks later.
8. Triceps strain. A less common diagnosis, however, pain in the posterior arm and axilla may be suggestive of this diagnosis. The history of falling on outstretched arms may have overloaded his elbow extensors.
9. Myofascial pain syndrome. A common disorder which is highlighted by diffuse, regional muscular pain and disordered sleep patterns.
10. Shoulder instability from a labral tear. A fall on an outstretched arm may have caused a labral tear. Patients typically present with deep shoulder pain. They also tend to complain of feeling that their shoulder is "grinding" or is "coming out of the socket." Shoulder instability can be described as anterior or posterior instability. Anterior instability may be the result of a traumatic dislocation or subluxation. It can also occur as the gradual result of repeated stressing of the static shoulder constraints. The most common type of posterior instability is from multidirectional instability.
11. Cervical radiculopathy. An elderly male likely has a significant degree of cervical spondylosis. A cervical radiculopathy should be considered.
12. Brachial plexopathy or plexitis. A less common diagnosis, brachial plexopathy should also be considered along with cervical radiculopathy. Brachial plexitis is also known as Parsonage-Turner syndrome.
13. Chronic regional pain syndrome (CRPS). Formerly known as causalgia or reflex sympathetic dystrophy, CRPS should also be considered in the post-traumatic patient even though it is not yet "chronic" per se.
14. Referred pain from the diaphragm, perforated duodenal ulcer, heart or spleen.



15. Conversion reaction or malingering. A very uncommon diagnosis and is a diagnoses of exclusion.

- *Is there any additional information regarding the clinical history that might be helpful in clarifying your differential list or changing its order of priority?*

He has had bilateral shoulder problems before. Eight years ago, he had an open right rotator cuff repair. Six years ago, he had a history of three cortisone injections into his left shoulder. Despite short-lived pain relief, he subsequently underwent an arthroscopic repair of left rotator cuff. He reports both shoulders were doing fine prior to his fall.

Two weeks prior to seeing you, he saw his chiropractor who performed neck and shoulder plain films. These are reported to you as "essentially normal," but are not available for your review. The chiropractor told him he probably has a left C4-C5 radiculopathy. He subsequently saw his orthopaedic surgeon who reviewed his shoulder and neck films and did not identify any bony pathology. His orthopaedic surgeon recommended a diagnostic arthroscopic surgery. He refuses to return to his orthopaedic surgeon since he does not want surgery. He states that 2 tablets of Vicodin every 4 hours, Valium, Celebrex 200 mg per day and ice have only provided marginal pain relief. He is concerned since his pain has worsened over the past week.

He states he went to the gym at least four times per week prior to his fall. He was able to lift light upper body weights, including assisted pull-ups, dumbbell shoulder abduction, military and bench press without difficulty. His training regimen also included lower limb resistive exercises and cardiovascular exercises by either walking or stationary cycling.

1. History of prostate cancer diagnosed 2 years ago. He has been treated with radioactive seed implants into his prostate. His PSA was greater than 100, but currently his PSA is less than 1. A bone scan 5 months ago revealed metastatic spread into his lumbar spine, which is unchanged from the time of diagnosis. He denies back pain.
2. Pacemaker for heart block.
3. Hypercholesterolemia and hypertriglyceridemia.



4. Non-insulin dependent diabetes
5. History of bilateral rotator cuff repairs, as above.
6. History of bilateral ankle sprains 40-50 years ago.

Commentary I

In addition to a detailed history of present illness, a comprehensive history including allergies, medication, social history and review of systems is always required.

History, continued

No known drug allergies.

Medications:

1. Vicodin 2 tablets q 4 hours
2. Valium 10 mg bid
3. Celebrex 200 mg qd
4. Tenormin
5. Glucotrol
6. A cholesterol/triglyceride medication
7. Lomotil
8. Lupron IM injections q month

There is no family history of similar symptoms.

The patient lives in the city with his wife. Their 4 children live in other cities. He is semi-retired from the construction industry, but spends 30-40 hours a week sitting at a desk performing consulting and foundation work. He drank socially years ago, but now is abstinent. He denies tobacco use.

He is positive for cardiac arrhythmia, non-restorative sleep pattern and intermittent diarrhea from the radiation seeds. He has not had any syncopal episodes, palpitations, or strokes. He also denies bowel and bladder dysfunction, swallowing disorders, change in vision, poor appetite, shortness of breath, depression, fevers, chills night sweats and unexplained weight loss. The remainder of his ROS is also negative.

- *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

Metastatic spread of prostate cancer to the involved shoulder should to be added to the differential. This differential diagnosis absolutely needs to be considered because of its ominous nature. However, with a PSA less than 1.0 and an unchanged bone scan since treatment, these findings make metastatic spread less likely.

1. Given the history of previous rotator cuff disease, assess for recurrent rotator cuff pathology, specifically looking for active and passive shoulder range of motion, scapulohumeral rhythm, scaption and impingement tests. These include the modified Hawkin's and Neer's tests. Speed's test can assess for bicipital tendonitis, which commonly occurs with rotator cuff tears. [See Glossary of Test Eponyms]



2. Structural shoulder pathology such as instability and labral tears should also be evaluated. Tests such as the load and shift, anterior glide and O'Brien's active compression tests should be considered. Palpation over the glenohumeral joint during joint motion may also suggest osteoarthritis or an osteochondral defect.
3. Because some of the symptoms may be suggestive of nerve irritation, a thorough neurologic examination should also be performed, including tests for ulnar, median and radial bias dorsal tension as well as a Spurling's maneuver.
4. Assessment of postural abnormalities should also be included as part of a cervical spine evaluation for radiculopathy. Cervical range of motion, tightness of the pectoralis, latissimus, and scalenes should also be assessed.

Physical Examination

The patient presents as a well-developed, well-nourished elderly white male who appears younger than his stated age. He is pleasant, conversant, cooperative, and in mild acute distress. There are no pain amplification behaviors.

Inspection reveals no evidence of muscular atrophy. He stands with rounded shoulders and a forward head attitude. He has a large well-healed scar on his right shoulder, a healing scar at the right wrist and three small well-healed scars on his left shoulder. There are no significant alignment abnormalities. He is no longer using splints or casts.

Cervical range of motion is limited in all planes. Cervical flexion and bilateral lateral rotation are limited to 50% normal while extension is limited to only 25%. Bilateral side-bending is also limited to 25% normal. The left medial border of the scapula is slightly laterally displaced relative to the right side. He has tight pectoralis and latissimus muscles, but shoulder range of motion is symmetric and nearly full. Bilateral glenohumeral rhythm is unremarkable.

Palpation of the scalenes is mildly tender. There is also some tenderness to palpation along the proximal origin of the long head of the triceps and axilla and chest wall. No masses are felt in the axilla or cervical region. There is no tenderness to palpation of the clavicle or AC joint. There is no crepitus, clicking or grinding in the glenohumeral joint with shoulder motion. There is no cervical spine or shoulder girdle muscular tenderness.

Muscle stretch reflexes are 1+/4 in the biceps, triceps, brachioradialis, knees and ankles. No upper motor neuron signs are seen in the lower limbs. There are no sensory deficits in the upper limbs. Bilateral radial pulses are 2+.

Manual muscle testing reveals mild pain-inhibited weakness of scaption on the left graded at 4/5 while right was 5/5. Otherwise, all other muscle strength is symmetric and full.

Specifically, strength testing reveals bilateral shoulder internal/external rotators 5/5, elbow flexion/extension 5/5, wrist flexion/extension 5/5, deep and superficial finger flexors 5/5, finger extensors, 5/5, abductor pollicis brevis 5/5 and finger abductors 5/5. The right EPL was not tested because of the recent surgery. Middle and lower trapezius are also mildly weak graded at 4/5. There was no evidence of scapular winging.

- *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

Absence of pain amplification behavior and a fully cooperative history and examination may cast some doubt on malingering. Patients with conversion reaction tend to demonstrate "la belle indifference." Despite apparent cervical spondylosis, in the absence of focal weakness, sensory changes and reflex changes, radiculopathy and brachial plexopathy seem less likely. Nearly full and symmetric shoulder range of motion argues against adhesive capsulitis. Absence of masses in the axilla is a good thing and argues against lymphatic metastasis. Tenderness at the origin of the head of the triceps may indicate a musculotendinous strain. Pain-inhibited weakness of scaption at the left shoulder is suggestive of rotator cuff pathology.

Physical Examination, continued

There are no skin or vasomotor changes. Special testing reveals Spurling's causes some mild axial pain, but does not change shoulder symptoms. Modified Hawkin's test is negative, but Neer test is positive. O'Brien's active compression, Speed, load and shift, apprehension and anterior glide tests are all negative. Upper limb dural tension signs are also negative. [See Glossary of Test Eponyms]

- *If necessary, revise your differential diagnosis based on the additional physical findings.*

Clinical Impression

The early stages of chronic regional pain syndrome may be difficult to diagnose. Signs of vasomotor instability may be evident early. Allodynia, hyperesthesia, discoloration, increased sweating, localized changes in skin temperature are typical findings. Early plain radiographs may be normal, but bone scan and diagnostic sympathetic blockade may assist in the diagnosis. Negative instability tests of the shoulder also make a labral tear less likely. Negative upper limb dural tension signs and a negative Spurling also make cervical radiculopathy or plexopathy less likely, though these are not highly specific.

- *What diagnostic tests would you order at this time?*

Test Results

Review of his plain radiographs of the left shoulder is appropriate at this time. He states he will obtain these films for your review.

He states that despite narcotics, anti-inflammatory medication and ice, his shoulder pain is increasing and asks if there is anything more you could do on today's office visit. You elect to perform a diagnostic subacromial shoulder injection with local anesthetic. If he appreciates significant pain relief, it would not be unreasonable to then consider a corticosteroid injection.

Ten minutes post-local anesthetic injection, the patient reports significant improvement of his shoulder pain. You then inject corticosteroids into his shoulder since he is refusing all surgical options.

- *If necessary, augment or change the clinical impression based on the test results.*



Commentary IV

At this juncture, the diagnostic shoulder injection suggests his symptoms are arising from pathology within the subacromial space. This is consistent with recurrent rotator cuff pathology or a subacromial bursitis.

- *What other recommendations would you make?*

Commentary V

1. Recommend he obtain the shoulder plain radiographs for your review.
2. Continue his narcotic and anti-inflammatory medications as well as use of ice.
3. Recommend lifting / activity modification, especially after the corticosteroid injection.
4. Recommend evaluation by a therapist to develop an active shoulder range of motion program, stretching of the pectoralis and latissimus muscles, and triplanar functional strengthening of the scapular stabilizers.

Interval History

Two days later, he calls requesting an urgent office visit with you. You see him in follow-up and he reports that after an hour of pain relief, his shoulder pain returned to baseline. Now he wants to know if this indeed was a recurrent rotator cuff injury.

- *What diagnostic test would you obtain at this point?*

Commentary VI

The most widely used diagnostic imaging test for a rotator cuff tear is a shoulder MRI. Given his history of prior rotator cuff tear and surgical repair, an MR arthrogram may be more useful. However, he has a pacemaker, and thus an MRI is contraindicated. Musculoskeletal ultrasonography have been used to effectively evaluate rotator cuff pathology. An ultrasound is ordered, but there is no evidence of rotator cuff or triceps tear / tendinosis.

Interval History, continued

The following morning, he again urgently requests to be seen in your office because of increasing pain. His complaints of pain have significantly worsened. On examination scaption is no longer painful. Neer's and modified Hawk's tests are now both negative. He now has some mild pain with elbow extension. Cranial nerve examination is normal. The remainder of his physical exam is unchanged. He brings copies of his lab reports which have indeed shown his PSA been less than one since he was treated for prostate cancer 2 years ago. He has still not obtained his plain radiographs for your review. Although you have not seen the plain radiographs of his left shoulder, you know and trust the orthopaedic surgeon who saw the films.

- *What would you recommend at this point?*

Commentary VII

A bone scan would be helpful to rule out metastatic bony infiltrate into the left shoulder. However, since his PSA has been less than one since his prostate cancer treatment, we felt

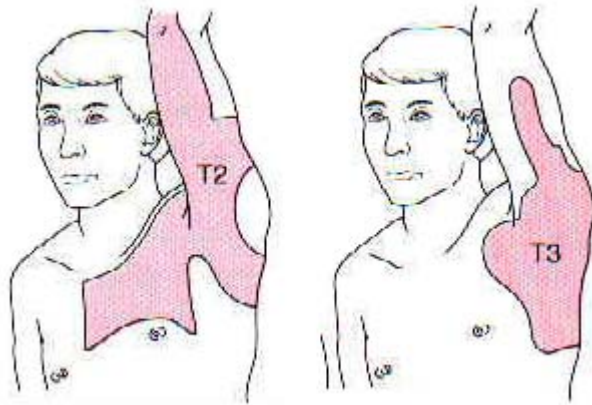
prostate cancer metastasis was very unlikely. You would not be faulted for ordering a bone scan.

Instead, a CT scan of his left shoulder is ordered to rule out occult fracture as well as a humeral tumor. On the day of the CT examination, you receive a phone call from the radiologist, who indicates evidence of prior rotator cuff surgery. There is no evidence of a fracture or dislocation. There is also no soft tissue or bony tumor in the left shoulder. However, reconstructed images of the chest found a 3.0 x 5.0 cm lobulated non-calcified soft tissue mass at the right hilum with prominence of the adjacent pre-tracheal and mediastinal lymph nodes. Prominent non-calcified left upper lobe lymph nodes were also seen. These findings are highly suspicious for malignancy. Furthermore, bone windows of the chest demonstrate a small localized destructive lesion involving the lateral aspect of the T3 vertebral body with adjacent non-calcified soft tissue mass.

Both the patient and the primary care physician were called with the results. The patient followed-up with an oncologist, and was subsequently diagnosed and treated for a primary lung carcinoma. Follow-up data is as yet unavailable.

Final Diagnostic Impression

Shoulder pain from direct metastatic invasion of the left T3 vertebral body involving the T2 (and/or T3) nerve roots or from a more remote cancer site.



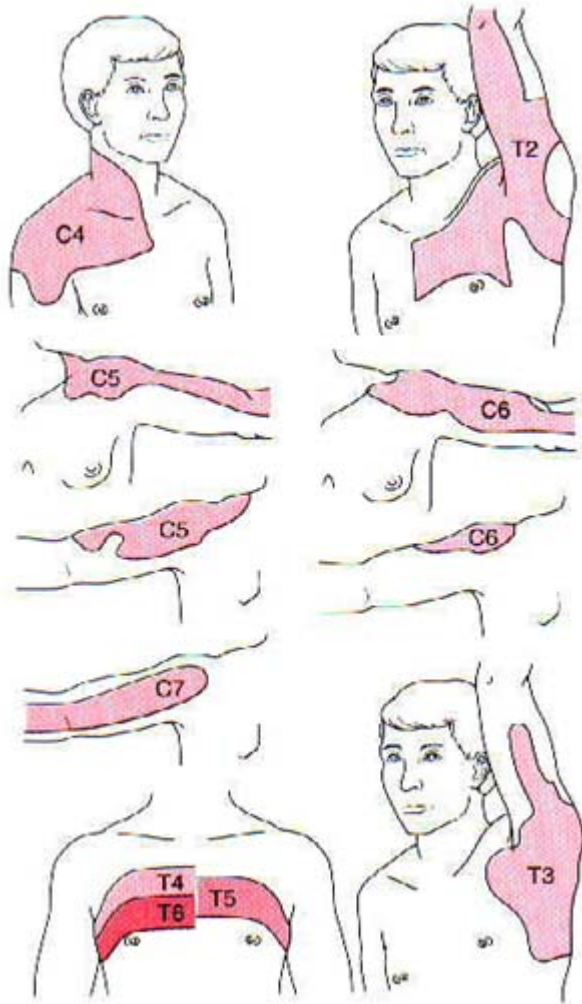
Final Discussion

Common things occur commonly. His history of a recent traumatic fall and previous rotator cuff surgery may have predisposed this patient to a recurrent rotator cuff injury. The history of a right EPL laceration and left wrist fracture as well as loss of consciousness with possible post-concussive symptoms may have prevented him from becoming more aware of his shoulder injury. He may have indeed had mild trauma to his rotator cuff as suggested by the improvement of some impingement tests (Neer and scaption) as well as a positive response to the diagnostic shoulder injection.

However, we must be always vigilant of more sinister diagnoses. In an otherwise seemingly non-malingering and appropriate patient, the constant progressively increasing pain, unmitigated with anti-inflammatories and narcotic medications, demands closer evaluation. Despite known metastases, we initially doubted the diagnosis of cancer pain since his PSA was less than 1. In the absence of other "hallmark" constitutional symptoms, such as

fevers, night pain and unexplained weight loss, we did not expect to find a second primary lung carcinoma in a non-smoker. The most common primary carcinomas that spread to bone include: breast, prostate, lung, kidney, pancreas and multiple myeloma.

Because the shoulder and axilla are not "typically" considered as part of the thoracic dermatome, there was a one week delay in making our diagnosis. While this may not have changed the ultimate outcome, it is important to recognize considerable overlap of dermatomal maps as well as dermatomal variations from person to person. A more thorough evaluation of the upper thoracic spine may have identified his pathology sooner.



Lastly, there was some degree of serendipity in ordering a CT scan of the shoulder. Because of his pacemaker, an MRI is contraindicated. An MRI of the shoulder would have clearly missed the osteolytic lesion of the T3 vertebral body. On the other hand, diagnosis may have only been marginally delayed if an MRI (or our CT scan) was negative. The next most likely diagnostic imaging study would have been a bone scan, which would probably have discovered the pathology in the thoracic spine.



Glossary of Test Eponyms

Anterior glide test — can evaluate for a SLAP (superior labral anterior posterior) lesion. It is performed by stabilizing the patient's hand on his waist while standing akimbo. An anterosuperior force is applied to the elbow while palpating a click or pop from the humerus riding over the torn labrum.

Apprehension test for anterior shoulder dislocation (anterior apprehension test, crank test) — by abducting the arm to 90 degrees and externally rotating the shoulder, the patient may indicate significant apprehension of an impending dislocation or subluxation. It is poor form to dislocate your patient's shoulder while testing for instability!

Hawkins (impingement) test — reproduces shoulder pain when the humerus is forcibly internally rotated when the arm is forward flexed to 90 degrees. The "modified" Hawkins forcibly internally rotates the humerus against the glenoid in multiple planes. Both test for impingement of the supraspinatus against the coracoacromial ligament and coracoid process.

Load and shift test — takes some practice before feeling comfortable with it. It evaluates for anterior or posterior shoulder instability. Medial compression of the humerus into the glenoid comprises the "load" portion, while translating the humerus anteriorly or posteriorly comprises the "shift."

Neer (impingement) test — is performed by internally rotating the arm at the side and then forcibly forward flexing the arm. Pain suggests an injury to the supraspinatus or occasionally the biceps tendon.

O'Brien's active compression test — is a fairly sensitive and specific test for SLAP (superior labral anterior posterior) lesions. It is performed in two parts. First, the arm is internally rotated, forward flexed and adducted 15 degrees. Pain with resisted forward flexion needs to be differentiated between superficial superior pain (suggesting AC joint pathology) and deep shoulder pain (suggesting labral pathology). Next, the arm is supinated and is again resisted in forward flexion. This second maneuver should not cause deep shoulder pain from labral pathology and is essentially an adducted Speed's test.

Scaption (Supraspinatus test) — resisted abduction with the arm abducted to 90 degrees and slightly horizontally abducted (30 degrees) causes pain or weakness. This test can be performed with the thumb pointing superiorly (full can test) or inferiorly (empty can test). Pointing the thumb inferiorly towards the floor decreases the subacromial space by rotating the greater tuberosity of the humerus under the acromion.

Speed test (Biceps test, Straight arm test) — pain at the bicipital tendon with resisted forward flexion of a supinated forearm

Spurling maneuver (Foraminal compression test) — is axial cervical compression with slight extension, side bending and rotation to the side of complaint. In a positive test, the patient notes pain radiating in the arm toward which the head is side flexed during compression. Axial pain alone is considered a negative test. This maneuver attempts to narrow the intervertebral foramen, which may lead to radicular symptoms.



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