

Shoulder Diagnosis: An Aid to Pattern Recognition and Orthopedic Tests

Each of the conditions in this document is followed by a list of findings that, when taken together, form a pattern suggesting a particular diagnosis. The signs and symptoms listed are not intended to be comprehensive. Standard texts, point of service data bases such as Dynamed, and other supporting literature should also be consulted. The references at the end of this document will be helpful and indicate the sources used to compile these data. Also note that some shoulder presentations may not fit neatly into any of these patterns and will require further investigation by the practitioner. This document is based on the opinions of the authors in the context of the cited references. It is not the result of a systematic review of the literature.

A WORD ON THE HISTORY AND PHYSICAL EXAMINATION

Taking the chief complaint history for a patient with a shoulder problem is essentially the same as taking the history of a patient with any other musculoskeletal presentation. A few lines of questioning bear special attention.

Location of pain: Initially this can be very useful in helping to generate a reasonable differential (see p 24). Later in the examination palpatory tenderness may be useful in localizing the site of injury as well as differentiating referred pain from the site of injury.²

Mechanism of injury: There are generally three possible categories of injury: a single traumatic event, an obvious overuse injury, or no obvious cause (sometimes related to postural cause). Single traumatic events and overuse syndromes trigger different sets of possible diagnoses (see p 25). When a single traumatic event is implicated, a detailed account of the mechanism including the activity, estimated force and force vectors can be useful. For example, a fall on the side of the shoulder could suggest a contusion or AC sprain; a fall on an outstretched hand (FOOSH injury) can suggest multiple possibilities including labrum tears, AC sprain, and rotator cuff injuries (see p. 30).

Aggravating and relieving factors: Besides asking the usual open-ended questions, it is useful to specifically ask about whether specific shoulder movements and loading, such as overhead activities (e.g., consistent with an impingement syndrome) or pulling/lifting motions (suggesting a possible biceps tendinopathy) are aggravating.

Neurological symptoms are *not* commonly associated with isolated shoulder pain. However, the presence of neurological symptoms (weakness, pain, paresthesia, concomitant neck pain) distal to the shoulder suggests a radicular, plexus, or peripheral nerve injury either causing the shoulder pain or associated with it.

¹ The 7/20/15 revision focused on updating the orthopedic tests and imaging, plus added a new extensive introduction and appendices. The 9/9/15 revisions made corrections in the directional preference appendix and made photo substitutions throughout the document.

² See the "Palpation" segment in the video *Shoulder Assessment* located the CSPE course on webcampus: <https://webcampus.uws.edu/mod/page/view.php?id=37815>.

The Physical Examination

When assessing the muscles of the shoulder as potential pain generators, the assessment starts with observation and active range of motion. Observation and inspection include symmetry of the cervical and shoulder region, shape, contours, texture, tone, color, location, changes that occur with changes in body position and between contracted and relaxed, involuntary movements, facial expression and vocal responses.



Clinical Tip: Both shoulders including, as much as possible, the scapula should be exposed and compared.

Active range of motion (AROM) includes

- flexion and extension
- abduction and adduction (abduction must also be observed from behind with the scapula exposed as much as possible)
- medial (internal) and lateral (external) rotation (both at 90 and 0 degrees abduction)
- horizontal adduction & horizontal abduction
- movement through the scaption plane, both with thumb up (full can) and thumb down (empty can).

Finally Apley scratch I and II maneuvers can be seen as complex AROM. Abduction and the Apley's positions must be viewed from behind with the back exposed with attention also placed on scapular motion.

The practitioner then tests muscles to see whether there is pain and/or reduced strength. The "hands on" physical examination of the rotator cuff muscles and biceps is generally comprised of just 3 types of procedure:



The Muscle Assessment Toolkit

- Palpation may need to include palpation with the muscle or tendon under load besides just in a relaxed position.
- Stretching should be done to detect pain, limited motion, tightness and altered end feel.
- Contraction may include any of the following: an isometric manual muscle test, resisted range of motion (concentric or eccentric), through a PNF cross pattern, or mimicking an activity of daily living or sport (e.g., reproducing the motion of spiking a volleyball).

The Key Differentials

Once identifying a painful tendon/muscle, the differential diagnoses include

- **tendinopathy/tendinosis** (formerly called tendinitis)
- **small to medium partial tears of the tendon**
- **large tears and ruptures of the tendon**
- **muscle strains:** grade 1 (mild), 2 (moderate), or 3 (severe/complete rupture)
- **contusion**
- **myospasm**
- **myofascial trigger point** (AKA myofascial pain syndrome)
- **myopathy:** a rare primary disease of muscles.

Note: Tendinopathy (especially supraspinatus or the longhead of the biceps) can sometimes be the result of an impingement syndrome diagnosis.

The “Biomechanical” or Manual Therapy Assessment

The exam procedures used to assess muscles and tendons outlined above are adequate for identifying muscle spasm, myofascial pain syndromes, and myofibrotic changes that are amenable to manual therapy interventions. Some procedures used to assess joint dysfunction may be similar to classic orthopedic tests (e.g., Fagin’s test for inferior instability and inferior joint glide assessment); others are different, and they are often interpreted differently. Besides static palpation for tissue tenderness and observing for misalignment, motion palpation (AKA joint glide assessment as described below) for pain and restrictions is used. The joint play maneuvers are usually done in an open/loose packed position (e.g., A-P glide is performed with the glenohumeral joint at around 90 degrees and is done in place of end range flexion and extension).



The Motion Palpation Toolkit

Glenohumeral joint

- AP and PA glide
- Internal and external rotation
- Medial and lateral glide
- Superior → inferior (SI) and inferior → superior (IS) glide



SC joint

- AP and PA glide
- Superior → inferior (SI) and inferior → superior (IS) glide.



AC joint

- AP and PA glide
- Superior → inferior (SI) glide.



Scapula

- Superior → inferior (SI) glide
- Medial and lateral glide
- Protraction and retraction



A WORD ON ORTHOPEDIC TESTS

Orthopedic tests which appear in italics in this document are described in section 3 and video demonstrations are available at the CSPE site on *webcampus*. Issues of test validity are sporadically addressed in this document. Be aware that while many of the orthopedic tests cited are useful in demonstrating that the shoulder complex is the source of pain, they overall are less accurate at identifying a precise tissue. Research is ongoing and sensitivity, specificity, and likelihood ratios are available but are often changing. The general rule for many of the tests that have been studied is that test validity often appears very encouraging in preliminary research on select patients, but proves to be less accurate overall with subsequent clinical studies and when applied to broader and more varied patient groups. The reader is encouraged to stay current with this shifting evidence.

A WORD ON IMAGING

Plain radiographs are useful when a disease, fracture, or dislocation is suspected. They may also be useful in identifying osseous lesions and changes in joint space in complicated patients that may present with impingement signs and symptoms with a past history of dislocation or when instability is comorbid. Musculoskeletal (MSK) diagnostic US is an inexpensive technique to evaluate rotator cuff and biceps tendons. MRI or MRA (magnetic resonance arthrogram) is best for the evaluation of labrum, cartilage and soft tissue damage but limited by cost and accessibility. CT (with or without contrast) is an excellent alternative when MRI is unavailable or contraindicated. (Godefroy 2001, King 1999)

Radiographs

When radiographs are indicated, the general recommended views include AP internal rotation, AP external rotation, Y-scapula view and axillary view. Additional views as clinically indicated may include PA chest view, cervical spine views as well as Grashey view. Critical exclusionary diagnoses in adult patients with shoulder pain include osteonecrosis, septic arthritis, acute fractures including avulsion fractures, dislocation, malignant tumor and pain radiating from the chest. The following recommendations are based on diagnostic imaging guidelines for the shoulder (Bussieres 2008)³

³ This diagnostic imaging guideline for the adult with shoulder pain was pilot-tested and peer-reviewed by practicing chiropractors and by chiropractic and medical specialists. International experts on the topic of musculoskeletal disorders were part of a Delphi panel that reviewed and proposed recommendations on indications for diagnostic imaging. Clinicians are encouraged to read the entire article for a more comprehensive appreciation of the shoulder diagnostic imaging guideline.

General indications

- No response to care after 4 weeks,
- Significant activity restriction greater than 4 weeks
- Non-mechanical pain (unrelenting pain at rest, constant or progressive symptoms and signs, pain not reproduced on assessment)
- Red flags indicators for disease or trauma.

Red flag indicators for cancer

- History of cancer
- Signs and symptoms of cancer
- Unexplained deformity
- Palpable enlarging mass or swelling
- Age greater than 50 years⁴
- Pain at rest
- Pain at multiple sites
- Unexplained weight loss
- Significant unexplained shoulder pain with no previous imaging performed.

Red flag indicators for infection

- Red skin
- Fever
- Systemically unwell
- Immunosuppression (e.g., diabetes, HIV)
- IV drug use
- Penetrating wound
- Underlying disease process that predisposes to osteomyelitis and/or septic arthritis.

Red Flag Indicators associated with Shoulder Trauma in the Adult Patient

In the adult patient with significant shoulder/glenohumeral joint trauma radiographic examination is recommended when signs and symptoms compatible with fracture or dislocation are present. Note that a negative tuning fork or percussion test cannot rule out a fracture.

- Acute disabling pain
- Significant weakness such as a positive arm drop test
- Unexplained significant sensory or motor deficit
- Loss of normal shape
- Palpable mass or deformity
- Examination is unable to localize anatomical structure responsible for patient symptoms
- Severely restricted shoulder mobility
- History of epileptic seizure or electrical shock
- History of non-investigated trauma.
- First-time dislocation
- Blunt trauma (e.g., fall greater than 1 flight of stairs, a fight/assault episode, or a motor vehicle crash)
- Age greater than 40 years.

⁴ Age by itself is not a strong indicator for cancer or the need for a radiograph.

Musculoskeletal (MSK) diagnostic ultrasound⁵

MSK diagnostic ultrasound is an injury assessment modality that uses sound waves to create images of painful or injured areas in the body. This technique provides high resolution images. Musculoskeletal ultrasound is known to be effective in improving care of patients with a variety of musculoskeletal injuries. Ultrasound imaging is safe and noninvasive without risk factors. It can also be used in patients when MRI is contraindicated. There is no radiation involved and can therefore be used repeatedly if clinically necessary.

Indications of musculoskeletal ultrasound

This modality is useful in evaluating for rotator cuff injuries, calcific or non-calcific tendonitis, subacromial bursitis, joint effusion and impingement syndrome. If there is suspicion of instability with potential SLAP and labral lesions referral for an MRI is indicated. Glenoid labrum and synovial cavity are better delineated by arthrogram with MRI and with CT. MRI will demonstrate Bankart, ligamentous, and tendinous injuries that result from dislocation and can lead to instability. One of the domains of musculoskeletal ultrasound is identifying sport injuries and thus providing accuracy in diagnosis and preventing injury progression.

Special imaging

Specialist referral and/or specialized imaging, such as MRI or MR arthrography, even if the conventional radiographs are unremarkable is indicated if there is pain and disability lasting over 6 months, in the absence of clinical improvement after 4 weeks of therapy, if function does not improve or deteriorates, history of instability or acute, severe post-traumatic acromioclavicular pain, in the presence of serious pathology as suggested by the patient history, examination and/or radiographs.

Tendon/Muscle	Ancillary study
Full tear or large partial tear	MRI or ultrasound or arthroscopy
Small partial tear	MRI or ultrasound
Tendinopathy	MRI or ultrasound
Impingement syndrome	Radiograph or ultrasound or MRI
Joint	Ancillary study
AC sprain	Radiograph (weighted and unweighted) ⁶
Labrum tear	MR arthrography, ⁷ MRI, or arthroscopy
Capsulitis/frozen shoulder	Arthroscopy
Fracture/dislocation	Radiograph

⁵ Although MRI dominated as an imaging procedure for many years in North America, musculoskeletal ultrasound is now emerging as an affordable alternative to MRI. Historically this technique was developed in the German-speaking countries, mainly Germany and Switzerland, and is now being utilized throughout Europe.

⁶ Stress views are used to differentiate between Grade 2 and 3 injuries. Some authors have suggested that the usefulness of stress views do not outweigh the added cost, discomfort, and time. (Provencher 2009)

⁷ MRA (magnetic resonance arthrogram as opposed to a magnetic resonance angiogram) sensitivity 88%, specificity 93% vs. MRI sensitivity 76% vs. specificity 87%). (Smith 2012)

A WORD ON THIS DOCUMENT

This protocol is divided into four sections. The first section presents an overall strategy for assessing the shoulder. The second section is a list of 21 shoulder conditions arranged in alphabetical order. The third section organizes the same conditions into various patient presentations. The last section offers pictures and descriptions of the orthopedic tests cited in the main document.

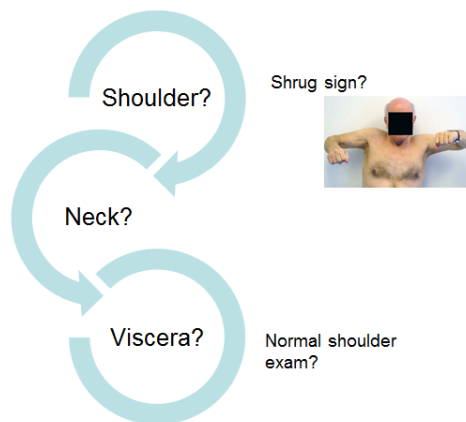
SECTION 1: *ASSESSMENT STRATEGY*

When working up a shoulder complaint, the following key issues must be addressed (see Appendix I for a flow diagram):

1. What region is the pain actually coming from (i.e., shoulder, neck, viscera)?
2. What is the pathoanatomical pain generator/diagnosis (e.g., muscle/tendon or bone/joint/capsule)?
3. What is the biomechanical/manual therapy diagnosis (e.g., myofascial pain syndrome, myospasm, glenohumeral joint dysfunction)?
4. Is there a directional preference?
5. What problems in the kinetic chain are contributors/complicators?

1. What region is the pain coming from (shoulder, neck, viscera)?

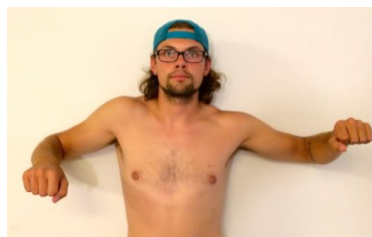
While most shoulder problems usually originate from the shoulder complex, referred pain from the cervical spine and muscles and viscerosomatic referrals must be routinely considered as well. The history and physical examination are important tools for making this differentiation.



Shoulder

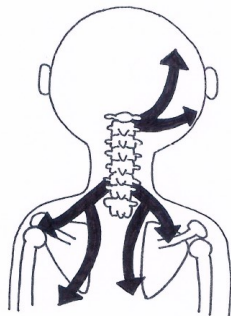
The inability to reproduce the shoulder symptoms during the physical examination should prompt the practitioner to look elsewhere for the cause. Shoulder shrugging while performing active abduction *due to pain* can be an indication that a shoulder structure is the main pain generator. Several studies with low threat of bias (Hegedius systematic review 2012) have reported that *absence of shrugging* carries -LRs around 0.1 for OA and adhesive capsulitis (but not necessarily rotator cuff tear).

SHRUG SIGN



Cervical spine and musculature

Lesions in the cervical spine and musculature can cause somatic pain referral to the shoulder and upper arm and so a cursory examination of the neck is recommended.



Shoulder pain may also result from cervical *radiculitis*. A preliminary 2013 study found that a simple arm squeeze test might be useful. The middle third of the arm is squeezed hard enough to compress the radial, ulnar and median nerves. Firm palpation is also directed to the AC joint and anterolateral-subacromial area. If the arm squeeze produces considerably more pain than pressure on the shoulder (> 3 point difference on a 10 point pain scale), a cervical radicular lesion should be suspected (+LRs ranged from 10-48 depending on the shoulder condition it was compared to). (Gumina 2013)



Visceroreferred pain

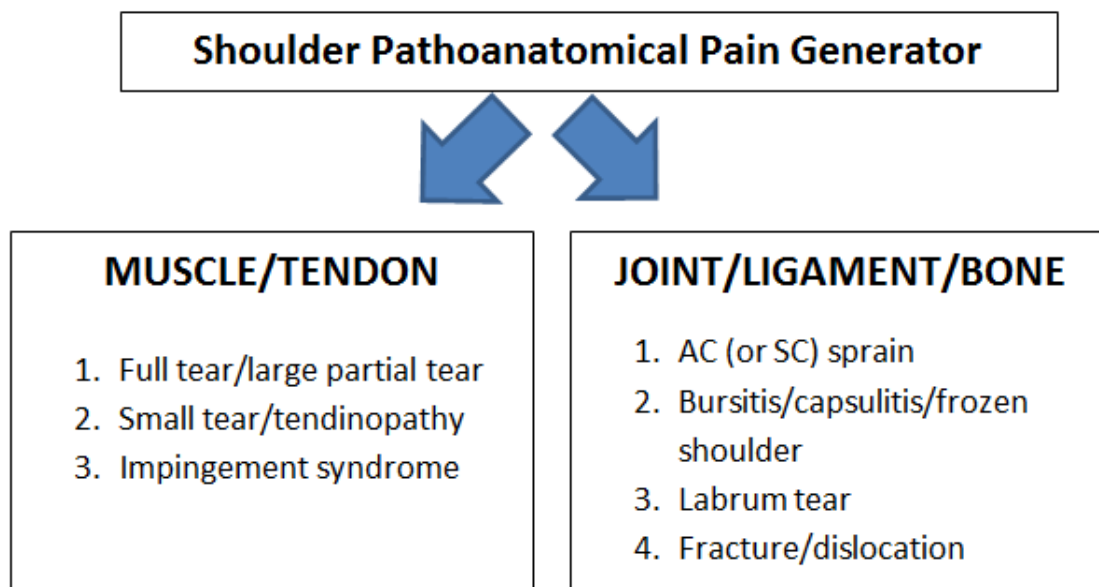
Shoulder pain can be the result of visceral referral, especially cardiac. The pain from an MI can sometimes present in the shoulder with or without chest pain. Age, associated symptoms such as shortness of breath, dizziness, nausea, palpitations, or pre-syncope or the inability to aggravate or relieve the shoulder symptoms during the physical examination should alert practitioners.

PAIN LOCATION LRs FOR MI

Chest Pain Radiation (May also occur without chest pain)	LR+ (95% CI)	LR- (95% CI)
Both arms with pain	9.7 (4.6-20)	0.64 (0.54-0.74)
Right arm pain	7.3 (3.9-14)	0.62 (0.52-0.73)
Left arm pain	2.2 (1.6-301)	0.60 (0.48-0.75)
Right shoulder pain	2.2 (1.4-3.4)	0.90 (0.82-0.97)

2. What is the pathoanatomical diagnosis (muscle/tendon or bone/joint/capsule)?

Making an exact pathoanatomical diagnosis based on history and physical examination alone can be challenging. The first general differential is to decide whether the pain is related to the rotator cuff tendons (including the long head of the biceps) or the joint complex. The table below offers the most common injury diagnoses in these categories to consider.



Small Tears and Tendinopathy

The most common shoulder problems are rotator cuff lesions, with the lesion most likely in the tendon rather than the muscle belly. In these cases two challenges face the practitioner—identifying 1) which tendons are involved and 2) the nature of the injury and proper diagnostic label. Pain location, palpatory tenderness, and provoking the familiar pain with stretching or muscle testing may help to identify which muscle or tendon is injured. However, isolating individual muscles and tendons is not always possible and it is not unusual for the practitioner to suspect a rotator cuff problem in general without being able to identify the exact structures.

Specific diagnoses include *tendinopathy*, *small to medium tear* (AKA partial tear or grade 1-2 strain) or a *large tear or rupture* (AKA grade 3 strain). In terms of the nature of the injury, a simple tendinopathy can be very difficult to differentiate from a mild to moderate tear. Fortunately, the management is similar for both and often only the response to care can help make this distinction. Poor response may lead to a decision for ancillary testing to rule out small to large tears. An MRI or diagnostic ultrasound can often differentiate between tears and tendinopathy. But, more importantly, the practitioner needs to know when to suspect a possible large tear or rupture .

Large Tears and Ruptures.

While tendinopathy and small to medium tears can be treated quite similarly, the presence of large tears or ruptures can have a significant effect on the initial and long term management of patients. **Therefore identifying large tears is a key clinical consideration.** The suspicion of a large tear would signal early consideration for confirming with either diagnostic ultrasound or an MRI and presenting to the patient during the PARQ the pros and cons of conservative care versus surgery. If a conservative care rehabilitation program is initiated, the patient should be aware that the

success of the program will depend on their compliance and may require dedication for 3-6 months. There are no definitive physical examination findings to diagnose a large tear/rupture, so the practitioner will need to initially rely on a group of signs and tests for which there is at least limited evidence as well as monitoring patients' overall response to care (e.g., no to poor response over 6 weeks should signal further assessment). The simple classic notion of significant weakness with isometric muscle testing indicating a large tear or rupture often fails because of the ability for the patient to recruit uninjured muscles to mask the failure of the ruptured tendon.

Large tears and ruptures are more common in older patients and are usually associated with repetitive microtrauma coupled with age-related degeneration. In one study (Litaker 2000) the combination of age greater than 65, night pain, and weakness when testing the external rotators at 0 degrees abduction resulted a +LR of 9.8 for a large rotator cuff tear (without indicating specifically which tendon). Other tests and signs for which there is at least some clinical research evidence include internal and external lag tests, lift off test, Codman's arm drop and the dropping sign, and the inability to perform a belly press, hug test or bugler test without demonstrable biomechanical "trick movements." (See section four of this protocol as well as the Shoulder Assessment video on the CSPE site on *webcampus*.)

When large tears or ruptures are suspected, the management plan is significantly affected: options include immediately ordering MRI/US/ arthroscopy and considering surgery versus extended physical rehab. In one study, three different treatment approaches--a home exercise plus video instruction, home exercise with PT instruction, and surgery-- all had similar outcomes at 1 year. (J Orhtop Phys Ther 2002)

A Word on Painful Muscle Weakness

When muscle weakness is associated with pain, the first differential would be a traumatic or repetitive injury of the tendon (e.g. tendinopathy, small to large tear). Even a minor injury may sometimes result in a weak muscle test due to pain. The weakness, however, may also be due to a pain response associated with internal derangement of the shoulder joint. For example, during an isometric contraction of the rotator cuff, muscles create a mild compression load to the injured joint.

A Word on Painless Muscle Weakness

Painless weakness can be associated with a complete tendon rupture, proximal damage to the nerve supply to the muscle (e.g., in the spine), reflex inhibition (from a myofascial trigger point or perhaps from a short tight antagonist muscle), or from disuse and atrophy. In some rupture cases there may be pain during the very initial "set phase" loading of the muscle. Note: local muscle pain and tenderness is not unusual at the location of the MFTP, thus resulting in weakness of the muscle where the MFTP is located as well as symptom referral. Note that grade 3 weakness is more likely due to major nerve damage or tendon rupture than simple reflex inhibition or disuse.

Bone, Joint and Capsule

Rather than a rotator cuff problem, the lesion may be primarily joint based, as is the case of AC sprains, subacromial bursitis, capsulitis, labral tears, dislocations and fractures. In each of these cases, the overall management and treatment schedule may differ and, therefore, a specific diagnosis should be sought whenever possible. For example, a labral tear would have a considerable effect on management compared to a routine rotator cuff lesion. Ancillary studies can be helpful in making this differentiation. A number of physical examination procedures are available for AC sprains and labral tears which may aid in patient selection for radiographs and advanced imaging. Again, these physical exam procedures have overall disappointing validity as

individual tests, but may be more useful when done in clusters or combinations. (See section four of this protocol as well as the Shoulder Assessment video on the CSPE site on *webcampus*.)

A Word on Fractures

Fractures in the shoulder region are not commonly seen in a chiropractor's office. Yet when a patient presents with an acute traumatic injury, it is important to carefully and thoroughly evaluate the patient with the expectation that a fracture may have occurred. Therefore, the examination should begin with the "first 3 first" rule whereby the practitioner 1) observes and inspects, 2) asks the patient to actively move the shoulder through various ranges of motion as much as is tolerable, and 3) screens for fracture. **It is very important to rule out a fracture at the beginning of the physical evaluation prior to passively moving the shoulder and especially prior to stress testing, muscle testing, joint plays or any other procedure that could harm the patient.** If it is decided that radiographs are needed because of a significant probability of fracture (or dislocation), the physical examination should cease until the results of the radiograph are known. If the radiographs are negative, the physical examination can continue. If there is evidence of a fracture and there is any reason to believe that there may also be nerve damage (e.g., a brachial plexus injury associated with a fracture of the humerus), vascular tests (e.g., radial and ulnar pulses) and sensory testing (e.g., light touch, sharp dull) are recommended prior to treatment or referral. Vascular compromise would warrant an urgent referral.

Historical clues that should alert one to the possibility of fracture include age (>55), mechanism of injury, high energy traumatic force (e.g., a significant fall or FOOSH injury), visible displacement at the time of injury, extreme or rapid swelling or bruising, history of osteoporosis, significant localized bony tenderness, and/or patient describes a "crack" or "crunch" at the time of injury.

3. "Manual Therapy" Diagnosis (myofascial pain syndrome, myospasm, joint dysfunction)?

The "manual therapy" assessment guides the manual therapist in selecting whether and where to manipulate a joint of the shoulder girdle or spine and to identify muscle spasms or myofascial pain syndromes amenable to some form of soft tissue manipulation.

The physical examination again essentially is governed by the general philosophy of **palpate, stretch** and **contract** against resistance. More specifically, these tools include static and motion palpation of the shoulder girdle (e.g., assessing glenohumeral joint glide), palpation of muscles and tendons (sometimes under gentle load by pre-stretching or a low intensity contraction), length testing muscles to assess tightness or provoke pain, and muscle testing. ***The results of these procedures guide the in-office, visit-to-visit manual therapy interventions much more often than does the pathoanatomical diagnosis.***

The AC joint, glenohumeral joint, and scapula complex should be palpated statically and with joint glide to assess vectors in which the joint could be manipulated. For example, the glenohumeral joint should routinely be assessed for anterior and posterior glide, abduction and adduction, and external and internal rotation. Palpation and length testing should be performed to identify painful muscle spasms (which can occur frequently in the subscapularis muscle) or myofascial trigger points which may then lead to direct soft tissue manipulation, pin and stretch, or PIR. Point tenderness with isometric muscle testing may direct where to apply cross friction massage. "Instrument-assisted soft tissue manipulation" (IASTM) assessment may further direct that particular therapeutic intervention.

4. Is there a directional preference?

Another level of analysis is to try to identify a directional preference to guide home-based treatment and sometimes guide joint manipulation, especially during the acute phase. This assessment is purely empirical and is not based on determining a diagnosis or identifying a pain generator. It is derived from McKenzie's approach to the spine where the joints under investigation are repetitively loaded to end range in an attempt to decrease the symptoms or to centralize the territory of pain. Similarly, this approach is based on having the patient explore various directions repetitively looking for symptom reduction. Clinical investigation of this approach has lagged far behind compared to the spine and is based primarily on case reports. For more information see Appendix II.

5. What problems in the kinetic chain are contributor/complicators?

The final step of analysis is to assess the stability of the joints and the function of the rest of the kinetic chain. Rather than attempting to identify the pain generators, the objective is to seek out functional problems which may be contributing to the loads on the tissues which are generating pain, thereby sustaining the symptom picture. Although there are many possible weak links, the following are some important potential ones to explore in routine cases.

- Structural instability
- Scapular functional instability
- Shoulder girdle and spinal dysfunction
- Postural syndromes
- Poor core stabilization

Structural instability

Structurally unstable glenohumeral joints complicate management and may require lengthy rehabilitation programs and/or surgery. The most common instability is anterior (e.g., identified by the anterior apprehension test), followed by inferior instability (e.g., positive Fagin's test), and least common posterior instability (e.g., positive Norwood's test). (See section four of this protocol as well as the Shoulder Assessment video on the CSPE site on *webcampus*.)

Scapular functional instability

This is a common underlying problem in many shoulder conditions. Most exercise programs will routinely target the scapula strength and stability. A common muscle imbalance that can lead to functional instability is a combination of weak/inhibited serratus anterior (e.g., identified by inferior angle winging with scapular protraction), weak/inhibited lower and middle trapezius (e.g., identified by early shoulder hiking during shoulder abduction) and tight/overactive pectoralis muscles, upper trapezius and levator scapular. For more information on assessing and treating scapular instability, see the following CSPE protocols: *Scapular Training Track*, *Serratus Anterior Training Track*, *Key Movement Patterns* (and video), and *Shoulder Exercises: Building Strength and Endurance*.

Shoulder girdle and spinal dysfunction

Even when the main pain generator has been diagnosed (e.g., supraspinatus tendinopathy or glenohumeral labral tear), the acromioclavicular and sternoclavicular joints should be assessed and treated as necessary. Poor movement in these joints even when not painful may need to be addressed to ensure proper mechanics and more evenly distribute loads and movements across the shoulder girdle. Likewise, full spine assessment for joint dysfunction is recommended, especially the cervical and thoracic spine and costovertebral joints. Short tight muscles can also alter mechanics and loads. Subscapularis and pectoralis muscles may be short and tight. In other individuals, the posterior capsule or external rotators may require stretching.

Postural syndromes

Assessing the patient for postural asymmetries may be helpful, especially looking for forward head carriage and shoulders rolled forward. These postures may increase loads on the rotator cuff muscles and potentially close the AC-glenohumeral space. Functionally, observing for habitual shoulder hiking with arm elevation even when pain is not associated with this movement may be important to identify and discourage, especially during prescribed exercises or daily activities.

Core stabilization

For many jobs and sports, poor core stabilization may result in transference of greater loads into the shoulder complex. Over time this can result in tissue failure and a variety of shoulder conditions. Assessing the patient for a lower cross syndrome, poor core endurance, and motor control issues may direct the practitioner to key weaknesses that may need to be addressed. (See the CSPE protocols *Key Movement Patterns* and *Low Back Rehabilitation*.)

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 - Crank
 - O'Brien (Active Compression Tests)
 - Passive Compression
 - Passive Distraction
 - Passive Rotation
- Rotator Cuff Tests (Internal and External Rotators) p. 48
 - Arm Drop
 - Bugle
 - Dropping Sign
 - Empty Can
 - External Rotator Lag Sign
 - External Rotators
 - Hug
 - Napoleon
 - Supraspinatus Test

SECTION II: CONDITIONS

AC SPRAIN, AC JOINT SEPARATION (also called “shoulder dislocation”)

ICD9 code: 840.0

- Trauma to the clavicle (blow to posteriosuperior point of shoulder, fall on outstretched hand, heavy lifting).
- Swelling, possible deformity (step defect).
- Patient may present with arm cradled in opposite hand.
- Point tenderness over AC joint/localized swelling.
- Pain with active arm raising (flexion or abduction), external rotation, active horizontal adduction.
- Neck and shoulder spasms are common.
- Assume AC pathology is present when simple procedures such as palpation and/or the *Paxinos squeeze* provoke local pain at the ACJ.
- These follow-up tests are recommended: *cross body adduction*, *acromioclavicular resisted extension*, and *active compression (O’Brien)*. The more of them that are positive, the higher the +LR.

Imaging

- Bilateral stress x-rays (superior displacement of distal clavicle, increased coracoclavicular space, and/or increased joint space). Stress views are used to differentiate between Grade 2 and 3 injuries. Some authors have suggested that the usefulness of stress views do not outweigh the added cost, discomfort, and time. (Provencher 2009)
- Some Grade I injuries are compressive and may lead to osteolysis; initial films after muscle guarding resolves; new radiographs in four to eight weeks with persistent or increasing signs and symptoms. Note: Osteolysis is also common in weight lifters in the absence of acute trauma.
- Refer to ER/Orthopedist if clavicle is displaced: grade 4 (posterolateral displacement of distal clavicle which can penetrate trapezius), grade 5 (excessive superior displacement greater than 2x normal 11mm coracoclavicular space), or grade 6 (infracoracoid displacement).

BICEPS TENDINOPATHY (long head)

ICD9 code: 726.12 (tenosynovitis)

- Traumatic (e.g., sudden or excessive loading) or overuse (e.g., overhead).
- May be isolated, part of impingement syndrome, or associated with anterior instability.
- Anterior shoulder/arm pain exacerbated by lifting, pulling, and overhead activities.
- Point tenderness over tendon (intertubercular groove).
- Pain with biceps resistance: elbow bent, elbow straight (*Speed’s test*). Unfortunately most of the individual biceps muscle tests are not very accurate.
- Pain with passive stretch (*biceps extension test*).
- May have positive impingement sign (with external rotation, palm up).
- If the tendon is unstable, history of snapping, *positive modified Yergasen’s Test* (rule out labral/ AC snapping).
- Often accompanies subscapularis pathology.
- May cross react with some labrum tests such as biceps provocation and biceps load, but pain should be more in the intertubercular groove.

BICEPS RUPTURE

ICD9 code: 727.62 (complete rupture)

- History of acute onset of anterior shoulder pain following a popping or tearing sensation.
- History of chronic tendinopathy or steroid injections.
- Often caused by sudden or forceful contraction or sudden stretch.
- Elbow flexion and/or supination weakness and pain (if partial); possibly no pain with contraction or stretching if complete.
- Rolled up deformity (may be more visible with Ludington's) is pathognomic.
- Visible swelling or bruising occurs occasionally.

BURSITIS (usually subacromial, also called subdeltoid)

ICD9 code: 726.10 (disorders of bursa and tendons in shoulder, unspecified)

726.19 (disorders of bursa and tendons in shoulder, subacromial)

May be primary due to infection, associated with inflammatory joint disease, or direct impingement. More commonly it is secondary to tendinopathy or calcific tendinitis. Note: Unless primary, the diagnosis of bursitis should not stand alone. Chronic bursitis is seldom an isolated finding and is difficult to diagnosis.

Acute

- Excruciating pain, no positional relief, may occur after period of intense use of shoulder.
- All AROM are painful.
- Subtle heat or edema may be present (visible swelling is rare, however).
- Passive abduction most painful, followed by passive internal or external rotation.
- Extreme tenderness on palpation of bursa (periacromial and anterior to acromion with shoulder extended or extended and internally rotated – hand behind back).
- Resisted muscle testing may be painful in all directions.

Imaging

- Rarely may need to be confirmed on MRI or by injection.
- May be associated with calcification on radiograph or rotator cuff fibrosis and degeneration on MRI.

NOTE: Dawbarn's bursa test is not recommended as a useful test although interns are recommended to know it for formal academic exams such as the National Boards.

CALCIFIC TENDINITIS (usually supraspinatus)

ICD9 code: 726.11

Acute

- Often very severe pain at rest and intense pain with movement in any direction.
- Pain with most/all AROM; often patient supports injured extremity with opposite hand.
- Nontraumatic (sometimes associated with overuse).
- No fever or signs of systemic disease.

(Continued on next page)

CALCIFIC TENDINITIS (continued)

- May be chronic and non-symptomatic for many years.
- Often middle-aged female, sedentary, nondominant arm (uncommon in the elderly).

Chronic

- Painful arc in one direction: elevation (flexion or abduction) or rotation.
- May be symptom-free; if painful, not as intense and disabling as acute.

Imaging

- Radiographic evidence of calcification/degeneration when linked to *acute* presentation is considered to be pathognomic. Sometimes see sclerosis of greater tuberosity in chronic cases.

DEGENERATIVE JOINT DISEASE (OSTEOARTHRITIS)

ICD9 code: **715.11** localized primary to shoulder

715.91 unspecified (primary or secondary) to shoulder

Primary DJD is rare. May be secondary due to trauma, crystal deposition (CPPD), or surgery.

Acromioclavicular: (very common)

- Pinpoint pain and crepitus.
- Neck pain and neck muscle spasms (especially trapezius).
- Localized pain at 90-180 degrees of abduction.
- No pain with resisted muscle testing with arm dependent (localized increase in pain with arm abducted, flexed, externally rotated).
- Localized pain with *passive horizontal adduction* and external rotation.
- Localized pain with *resisted horizontal extension*, *active compression test* (O'Brien's thumb down), and *Paxinos squeeze*.
- DDx: post-traumatic osteolysis of the clavicle.

Imaging

- Positive x-ray findings: expansion of distal clavicle, spur/osteophyte formation, subchondral cysts, subchondral sclerosis, narrowing of joint space. (X-rays recommended when passive horizontal adduction, resisted horizontal extension, and active compression are all +).

Glenohumeral: (less common than RA; unilateral or asymmetric)

- More common in the elderly; characterized by its chronicity and ebb-flow of symptoms.
- Coarse crepitus.
- May have history of trauma, surgery, CPPD, chronic shoulder pain, or chronic impingement.
- Pain may be worse in AM (gel time, 1 hour or less) and then again at end of the day, or after heavy use.
- Cold weather may exacerbate.
- Pain in a capsular pattern with passive ROM (external rotation, abduction) may be indistinguishable from/associated with frozen shoulder.

Imaging

- Positive radiographic findings: periarticular osteophytes, subchondral sclerosis, subchondral cysts, deformations of humeral head and neck, less uniform joint space narrowing compared to RA.

DISLOCATION/SUBLUXATION (medical subluxation, displacement just short of dislocation)

For chiropractic subluxation/joint dysfunction, see Joint Dysfunction/Subluxation Syndrome.

ICD9 code: 831.0 (closed dislocation/direction unspecified)

831.01 (anterior)

831.02 (posterior)

- May be with or without recent trauma.
- Generalized shoulder pain and disability.
- Shoulder deformity (sulcus sign, loss of deltoid contour), arm may be cradled in opposite hand pain in all AROM and PROM (deformity subtle in posterior—often missed).
- If tendency toward subluxation or recurrence, positive apprehension/instability tests.
- Dislocation before the age of 15 and inadequately braced dislocations may lead to recurrence.
- Neurologic signs (especially, axillary n. may be present); check for vascular involvement; repeat evaluation of deltoid contour and strength.
- Recurrent dislocations should be referred to an orthopedist for assessment.

Anterior (and often inferior):

- Very common (approximately 96% of cases) especially in young active people.
- Most common mechanisms are excessive external rotation of abducted arms or fall on outstretched hand (FOOSH) injury.
- Patient antalgic with arm held rigidly in a semi-abducted position.
- All movement excruciatingly painful.
- Unable to reach across and touch opposite shoulder (*Dugas test*).

Posterior:

- Posterior dislocations frequently are overlooked in a clinical setting.
- Rare in all age groups (approximately 4%); subluxation more common than dislocation. More common in the elderly than other age groups.
- Most common mechanism: blow to shoulder or fall on outstretched hand with arm flexed and internally rotated.
- Patient antalgic with arm held in internal rotation against the body.
- All movement excruciatingly painful, especially abduction.
- *Dugas test* may be negative in posterior dislocation.

Imaging

- Bankart lesion on MRI (can be seen on plain film and CT); Hill-Sachs/Hatchet defect on x-ray. Positive weight-bearing x-ray: inferior displacement of humeral head and increase in acromiohumeral space.
- With recurrent anterior dislocation: Hill-Sachs's lesion (i.e., posterolateral humeral head compression fracture) or Bankart lesion (injury of the antero-inferior glenoid labrum or fracture of inferior glenoid rim).
- With recurrent posterior dislocation: May be associated with fracture of inferior glenoid rim. Displaced and nondisplaced fracture of surgical neck, impression fracture of humeral head (trough sign), tubercle fracture of humerus, posterior glenoid fracture.

FRACTURE OF THE CLAVICLE

ICD9 code: 810.0 (closed)

- Trauma (direct blow, fall direct on shoulder, fall on outstretched hand—perhaps with “pop” or “crunch”).
- Local pain, swelling, bruising, point tenderness.
- May have deformity (usually middle third of clavicle), pain with arm raising (flexion or abduction), lifting or pulling.
- A negative tuning fork test cannot be used to rule out a fracture.

Imaging

- Positive radiographic findings (10-15 degrees cephalad)—visible fracture line, fragment, or displacement.
- Note: Fracture at the distal end may result lead to osteolysis.

FRACTURE OF THE HUMERUS

ICD9 code: 812.00 upper and, unspecified, closed (proximal end/shoulder)

812.20 shaft, unspecified, closed

812.50 lower end, unspecified, closed

- Traumatic fall on outstretched hand, on elbow, or on shoulder; blow to shoulder (perhaps with “pop” or “crunch”).
- Swelling or bruising near fracture site.
- Significant pain and point tenderness; occasionally crepitus on palpation.
- May have deformity or displacement.
- Inability to move arm; may be cradled in opposite hand; painful crepitus on movement.
- A negative tuning fork test cannot be used to rule out a fracture.
- Higher risk in the elderly.

Imaging

- Positive radiographs: visible fracture line, fragment, or displacement; most common site surgical neck.
- GH joint dislocation/subluxation, labrum damage, or fractures of the glenoid rim (Bankart lesion) may accompany (see Dislocation, GH).
- Musculoskeletal ultrasound may be helpful in detecting an occult greater tuberosity fracture.

FROZEN SHOULDER (also called adhesive capsulitis)

ICD9 code: 726.0

Early stage (capsulitis)

Difficult to distinguish from other acute shoulder conditions (may develop as a result of primary shoulder condition or without associated shoulder conditions).

- History of poor response to manipulation and rehabilitation may indicate capsulitis.
- History of mastectomy, cardiopulmonary disease, diabetes (increases risk 5-8X), thyroid disease, CVA, Parkinson's disease, radiculopathy or neck trauma, shoulder trauma, prolonged bed rest, or upper extremity immobilization or tendinopathy/bursitis.
- Pain with passive and active capsular stretch procedures (especially external rotation); no pain with isometric contractions (if uncomplicated).
- Constant pain/pain at night.

Middle stage

- Hallmark is ROM restriction with capsular pattern (i.e., significant restriction of AROM and PROM with pain, especially external rotation and abduction). Passive external rotation often decreased by 50% (compared to the asymptomatic side) or more (or greater than 30 degrees).
- Usually preceded by an acutely symptomatic shoulder condition.
- May demonstrate pain with resisted muscle testing.
- Pain may gradually subside but motion restriction increases, finally with only endpoint pain during AROM and PROM.

Late stage

- Marked restriction of AROM and PROM without pain (especially external rotation and abduction).
- Classic pattern: Loss of external rotation > loss of abduction > loss of flexion > loss of internal rotation.

IMPINGEMENT SYNDROME

ICD9 code: **726.10 or 726.1** (rotator cuff syndrome and allied disorders)

Must be evaluated for possible associated mild instability. **Note:** The clinical impression/diagnosis should indicate the structures impinged.

Superior impingent syndrome (most common type)

- Pain usually anterior or lateral shoulder, rarely posterior.
- Associated with overhead activities; common in swimmers ("swimmers shoulder").
- Chronic/recurrent low grade pain.
- Often associated with other shoulder conditions.

Note: none of the individual impingement tests are thought to be accurate in isolation.

- *Painful arc* in flexion or abduction (usually dominant side). +LR: 2.25 (95% CI, 1.33-3.81); -LR .38 (95% CI, .16-.90) (Michener 2009)
- Positive impingement tests/signs (Neer's passive flexion, Hawkins-Kennedy). These tests are no longer thought to be very specific to impingement syndrome. Negative tests may have small reduction on the probability of having the condition: Neers -LR 0.47 (95% CI 0.39-0.56); Hawkins-Kennedy -LR 0.35 (95% CI 0.27-0.46) (Hegedus systematic review 2012)
- *Pain with external rotation* (tested at 0 abduction): +LR 4.39 (95% CI, 1.74-11.07); -LR .50 (95% CI, .28-.89) (Michener 2009)
- Point tenderness over involved structures (long head of the biceps tendon, supraspinatus tendon, coracoacromial /coracohumeral ligaments).
- Pain with loading or passive stretching of supraspinatus and/or biceps.
- Worse with arm abducted or flexed.
- In a study (Michener 2009) which was rated to be one of the higher quality studies in a 2012 systematic review, a combination of Hawkins Kennedy Hawkins, painful arc, pain with resisted external rotation, Neer and empty can had a + LR 2.9 when all 3 were positive and -LR 0.34 when all were negative.
- In a 2005 study in an orthopedic setting, the most diagnostic combination of tests was a positive *Hawkins-Kennedy*, a *painful arc* and either weakness in *external rotation* or a *lag sign* when attempting to maintain full external rotation (performed with arm at the side). When all 3 were positive, the likelihood ratio was 10; when all were negative, the LR was 0.17. (Park 2005)

Less Common Forms

- Another form of impingement is internal/posterior whereby the posterior-superior cuff and labrum are injured – common among baseball pitchers.
- A third form of impingement is subcoracoid impingement of the subscapularis.

INFECTIOUS ARTHROPATHY

ICD9 code: 711.81 shoulder, unspecified organism

ICD9 code: 730.11 osteomyelitis of shoulder (chronic)

730.01 acute osteomyelitis of shoulder

- Prominent pain at rest, aggravated by nearly all movements.
- Elevated ESR or CRP, possible anemia and/or elevated WBC.
- Characteristic changes on x-ray (7-10 day latent period):
 1. Joint effusion.
 2. Loss of subchondral white line of articular surfaces.
 3. Uniform joint space narrowing.
 4. Can affect AC or glenohumeral joint.
- History of prior infection, recent surgery or hospitalization, or an immuno-compromised patient (e.g., diabetics, chronic alcohol, AIDS).
- IV drug users.
- Rapid onset/progressive/destructive.
- May be accompanied by fever, local redness (usually, unless TB).

Imaging

- Consider MRI in first few days of pain.

INSTABILITY (GLENOHUMERAL JOINT)

ICD9 code: 718.81

A mild degree of instability may be associated with impingement syndrome and bicipital tendinitis. More severe instability may be associated with dislocations and capsular or labrum tears.⁸

Note: Diagnosis should indicate the direction of instability.

- Sometimes a tendency toward subluxation/dislocation.
- Chronic or recurrent presentation often has limited response to conservative treatment.

Inferior instability:

- *Sulcus sign*/reinforced sulcus.
- Positive *Faegin's sign*.

Anterior instability

- *Anterior apprehension*, followed by step 2 the *relocation test*, then step 3 the *release maneuver* (all have high +LR and low -LR). Apprehension and relocation both positive: +LR 17 (95% CI 10-30, Hegedus systematic review 2012); in JAMA 2004 systematic review, individual studies reported for the anterior release step of the test a +LR 8.3 (95% CI 3.6-19) and -LR 0.09 (95% CI 0.03-0.27) and for the relocation step a +LR 6.5 (95% CI 3.0-14.0) and -LR 0.18 (95% CI 0.07-0.45) **Note:** Apprehension during stress testing is a better prediction of instability than pain alone.
- Positive anterior drawer sign: test accuracy is unknown.

Posterior instability

- Positive *posterior drawer sign*, painful posterior shift/clunk with *Norwood test*.
- Positive findings on *posterior apprehension test*.
- Pain with push up/bench press, or resisted forward flexion.

Imaging

- History of recurrent dislocations: AP internal and external rotation, Stryker view². Note: AP external rotation not recommended after recent dislocation/reduction.
- Internal rotation and Stryker good for detection of Hill-Sachs lesion (posterolateral humeral head compression fracture). Stryker Notch 92% sensitive in detection of Hill-Sachs. Hill-Sachs is considered pathognomonic for previous dislocation. Patients with Hill-Sachs are prone to recurrent dislocation.
- West Point – good for glenoid rim (Bankart) lesions (Gusmer 1996).

⁸ The literature is inconsistent when using the terms hypermobility and instability. Hypermobility may be bodywide or represent slight perceived increase in joint motion in an otherwise structurally sound joint. For the purposes of this document, instability will be considered to be associated with loss of structural integrity and runs on a continuum from mild (as in cases where it may be associated with impingement syndrome) to severe (where it is associated with labrum tears or a tendency toward dislocation).

² Supine patient supine with hand on head, elbow straight up, beam 10° cephalic aiming at coracoid.

JOINT DYSFUNCTION/SUBLUXATION SYNDROME

(for medical *subluxation*, see Dislocation/Subluxation).

ICD9 code: 739.7 upper extremity (nonallopathic lesions)

Usually found in conjunction with other shoulder diagnosis (e.g., rotator cuff strain, impingement syndrome, etc.), but may be isolated.

- Painful loss of joint glide and/or restriction.
- Abnormal end feel or joint play.
- May or may not have painful or decreased AROM and/or PROM.

Imaging

- Radiographs are not helpful.

LABRUM TEAR

- Prevalence of glenoid labral lesions varies from 6% in the general population (Handelberg 1998) to 35% in the sporting population (Funk 2007).
- SLAP lesion (i.e., superior labral tear, anterior to posterior) most common; it can be stable or unstable
- Can result from high load trauma or repetitive micro-trauma (e.g., overuse in a pitcher)
- Recurrent catching/locking.
- Recurrent painful “click,” pop, or clunk in shoulder (DDx from bicipital snapping tendon or AC crepitus). In one study, the absence of popping, clicking or catching when combined with a negative crank or anterior slide test has modest ability to rule out a labral tear (-LR 0.33) (Walsworth 2008)
- *Biceps provocation* and *biceps load*: These tests have not held up well on subsequent study. Note that any test that loads the biceps tendon of the long head of the biceps may be positive in a labral tear.(Hegedus 2012 systematic review).
- *O’Brien’s active compression test*: No longer considered to be very accurate as a solo test—but in one study a +LR 7.0 and –LR 0.10 were reported when combined with the passive distraction test. (Hegedus 2012)
- *Passive compression test*, +LR 2.81 (meta-analysis of 2 studies, n=355, Hegedus 2012; cited in Cochrane 2013).
- *Anterior slide*: When combined with the crank +LR 3.75 (Hegedus 2012); combined with O’Brien’s test +LR 2.75 (Walsworth 2008)
- *Passive rotation*: +LR 2.8 (Hegedus 2012; based on meta-analysis of 2 studies (n=355), Hegedus 2012; cited in Cochrane 2013 systematic review as a promising test.
- *Passive distraction*: In combination with O’Brien’s Test +LR 7.0 and –LR 0.1 (Hegedus 2012)
- *Crank test*. +LR 2.4 in 2012 meta-analysis including 4 heterogenous studies with 282 subjects. It did show promise in combination with a positive anterior slide test. (Hegedus 2012)
- *Apprehension and relocation*: Although classically associated with anterior instability, it can also help to rule in an unstable SLAP lesion +LR 3.75 (Hegedus 2012)
- A positive anterior slide result combined with either a positive active compression or crank result yielded positive likelihood ratios of 2.75 and 3.75, respectively.
- Failure to respond to conservative care.

Imaging

- MR arthrography (preferred) or MRI, and CT arthrography helpful.

MYOFASCIAL PAIN SYNDROME

ICD9 code: 729.1 unspecified (myalgia and myositis)

728.9 unspecified disorder of muscle, ligament, or fascia (myofascitis)

May accompany one of the other diagnoses. **Note:** The diagnosis or the clinical impression should indicate the key muscle or muscles involved. Also, this condition must be differentiated from more systemic conditions: myositis, polymyalgia rheumatica, chronic fatigue syndrome, hypothyroidism, primary fibromyalgia, inflammatory arthritis, drug reactions, Lyme disease.

- Tender palpable nodule/band.
- Symptoms reproduced by palpation of trigger point.
- Pain with stretch.
- May result in referred pain patterns; fibromyalgic tender points don't exhibit referred pain.
- Jump sign (less extreme than in fibromyalgia).
- Twitch sign.
- May reside in a weak muscle.
- May be in a short, tight muscle.
- DDX from "tender points" of fibromyalgia (less likely to have constitutional symptoms such as fatigue and trouble sleeping).

RHEUMATOID ARTHRITIS

ICD9 code: 714.0 rheumatoid arthritis, unspecified

714.01 rheumatoid arthritis of shoulder

714.9 unspecified polyarthropathy

May involve any synovial membrane lined structure (swollen bursae, tendon sheath, synovial joints).

- Pain at rest, worse in morning (> 1 hour gel period) and at end of day; signs and symptoms ebb and flow, often independent of mechanical stress.
- May have systemic signs (fever, malaise).
- Multiple sites and bilateral, symmetrical joint involvement (including the hands).
- Elevated ESR, CRP, may have anemia.
- Fine crepitus.
- Nonspecific pain, or deep in joint.
- Pain with active or passive range of motion.
- Positive RA factor (70-80% sensitivity); anti-CCP.
- Consider cervical flexion-extension study to screen for instability, if treating the occiput or upper cervicals.
- DDX from psoriatic, AS, Reiter's syndrome, other inflammatory arthritides, Lyme disease.

Imaging

- Radiographic findings: erosion, uniform joint space narrowing, periarticular osteopenia, joint effusion.

ROTATOR CUFF TEAR/TENDINOPATHY

ICD9 code: **840.9** shoulder muscle unspecified
840.3 infraspinatus
840.5 subscapularis
840.6 supraspinatus

May be part of impingement syndrome. **Note:** Whenever possible, the diagnosis or clinical impression should indicate the muscles involved. Findings for mild to moderate tears (strains) and tendinopathy are often essentially the same. The only potential key difference is that grade 2 strains may demonstrate weakness with muscle testing *not due to pain* or longer recovery time than expected.

- Pain with resistance of the involved muscle (especially, *empty can with resistance* for supraspinatus, *hug* and *Napoleon test* for subscapularis, *bugle test* for infraspinatus)
- Pain with passive stretch in opposite direction.
- Local tenderness (very helpful in identifying injured muscle tendon).
- Single traumatic event (e.g., fall on outstretched hand), overuse, postural overload.
- Onset often within 24 hours of instigating activity.
- Anterior, lateral or posterior pain (depending on muscles involved), can refer to elbow.
- Pain with AROM especially when using the involved muscles.
- No visible swelling.
- Difficult to ddx from shoulder impingement and may be comorbid.
- Very high likelihood with + arm drop sign in patient age 60 and over (suggests large tear).
- Very high likelihood of rotator cuff tear if 2 of the following occur in patient age 60 and over (Murrell 2001):
 - Supraspinatus weakness
 - External rotator weakness
 - + *Hawkins-Kennedy*
 - Very low likelihood when none of the three above are +.

Complete Ruptures

Prevalence increases with increasing age. Almost always over 40 years of age; relatively rare under 50 unless involved in throwing sport, i.e., baseball (especially pitcher), javelin, football (especially quarterback), MVA, past history of steroid injection(s).

- In a 2005 study in an orthopedic setting, the most diagnostic combination of tests for a complete tear of one of the rotator cuff muscles was a *positive drop arm sign*, a *painful arc* and either weakness in *external rotation* or a *lag sign* when attempting to maintain full external rotation (performed with arm at the side). When all 3 were positive, the likelihood ratio was 15; when all were negative, the LR was 0.16. (Park 2005)
- *External rotation lag sign*: + LR 7.8 (supraspinatus), + LR 6.3 (infraspinatus). The test can also be positive for smaller tears, tendinopathy and impingement syndrome but with smaller LR's. (based on one moderate quality study, Somerville 2014)
- *Internal rotation lag sign*: this test has conflicting evidence for subscapularis tears. +LR 5.6 (95% CI 2.6-12.0) based on 1 high quality study (Hermans 2013), but was very poorly predictive in Somerville 2014 study
- Lift-off Test: + LR 5.0 for full tear ; +LR 15 for any injury of subscapularis tendon (Somerville 2014) (Continued on next page)

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ROTATOR CUFF TEAR/TENDINOPATHY (continued)

- Arm dropping sign (drop sign): +LR 3.2 (95% CI 1.6-6.5), -LR 0.35 (95% CI 0.15-0.83) but may also be associated with a supraspinatus rupture based on 1 high quality study (Hermans 2013)
- *Arm drop test: Pain may be associated with bursitis or any rotator cuff tear. +LR 3.3 (95% CI: 1.0-11) for supraspinatus tendinopathy/tear (may include rupture) (Hermans 2013)*
- *Napoleon sign (belly press): +LR 12 for full tear of subscapularis, +LR 17 for any injury of subscapularis (Somerville 2014)*
- Palpable defect not likely.
- Painless, Grade 3 weakness (sometimes a patient may be able to raise arm by a recruitment strategy such as bending torso away from the injured side).
- Complete passive ROM, decreased active ROM.
- Often associated with RA.

Partial tear/tendinopathy

- Pain and weakness with muscle tests.
- More end ROM/stretch pain than with complete tear.
- May have decreased AROM with pain.
- Partial tears (especially versus vs tendinopathy) cannot be diagnosed reliably by history and physical (consider MRI or diagnostic US).

Imaging

- MRI or diagnostic ultrasound best for confirmation detecting tears (some prefer MR arthrography).
- Radiographic signs of acromiohumeral space narrowing may be present (less than 3-4mm) (rare under 50 yrs).

SCAPULOCOSTAL SYNDROME

(Not in ICD book: Use shoulder enthesopathy, not classified elsewhere, or unspecified enthesopathy, **726.19**)

May be primary or secondary to other shoulder pathology. This term is also used in medical literature to describe postural fatigue syndrome.

- Pain along medial border of scapula (sometimes palpable tender nodules and trigger points).
- Often postural (e.g., slumped posture, protracted scapula, kyphosis, head forward), but may be due to overuse or trauma.
- May be associated with costovertebral joint dysfunction.
- May be associated with pain, crepitus or grating during AROM or PROM.
- Serratus anterior may be tight and tender.
- Abnormal scapular motion.
- Trapezius, rhomboids, levator scapula, cervical extensors and deep cervical flexor muscles may also be involved.

SNAPPING SCAPULA SYNDROME

(Not in ICD book): (see scapulocostal syndrome, **726.19**)

- History of shoulder snapping especially when raising arm.
- Palpable catch/snap near superior or inferior angle with protraction-retraction or elevation-depression.
- Parascapular pain or localized superior or inferior angle pain and tenderness.
- May be associated with irregular or bulging of the ribs, rib joint dysfunction (739.8), reactive subscapular bursitis (726.10), osteochondroma, anomalies of superior or inferior scapular angle, adhesions.
- Tight or atrophied serratus anterior or latissimus dorsi and other muscle imbalance.
- Poor posture or thoracic kyphosis or scoliosis.
- It may be a benign condition when painless.

Imaging

- Radiographs may show thickened or anterior angulation to superior or inferior angle of scapula (rarely seen).

STERNOCLAVICULAR SPRAIN

ICD9 code: **848.41**

- Point tenderness, swelling, sometimes bruising (rule out fracture when bruising is present).
- Pain or crepitus over SC with active or passive abduction or external rotation.
- Posterior dislocation is a life-threatening injury (Call 911).
- Trauma to the clavicle (e.g., seatbelt).

Imaging

- Radiographs may show displacement or associated chip or avulsion fracture but radiographs are limited by overlapping anatomy such as spine. Displacement and medial clavicle or sternal fractures are best imaged with CT. Sprained SC joint is best imaged with MR.

SECTION III: KEY PRESENTATIONS

The following is a list of key patient presentations and appropriate differential diagnoses. Most of the diagnoses cited can be cross-referenced with the first part of this document.

Pain at Rest

If the patient has significant pain at rest (and often greatly increased by any motion), consider...

Nontraumatic (repetitive microtrauma or etiology unknown)

- Calcific tendinitis.
- Severe acute bursitis.
- Acute capsulitis (which may or may not progress to frozen shoulder).
- Infection.
- RA.
- Gout.
- Cellulitis.
- Malignancy

If none of the above seems likely, consider an early acute manifestation of a rotator tendinopathy which may even be in the beginning stage of frozen shoulder.

Traumatic

- Clavicle, scapula or humeral fracture.
- Glenohumeral or sternoclavicular dislocation.
- AC separation.
- Severe labral tear or detachment.
- Rotator cuff strain or sprain.

Note: If shoulder exam does not reproduce symptoms, consider acute MI, angina, other chest pathology, plexopathy or radiculopathy, pneumonia, pleurisy, gallbladder, inflammation of subdiaphragmatic organs or other pain referral.

Mode of Onset

If the patient has had significant trauma (especially if arm held “cradled”), consider...

- GH dislocation, AC sprain, or labrum tear.
- Fracture: rib/vertebra/humerus/scapula/clavicle.
- Tendon rupture.
- Acute rotator cuff or other shoulder muscle strain/tear.
- Radiculopathy (e.g., disc herniation).

If the pain came on suddenly, consider...

Nontraumatic (etiology unknown)

- Calcific tendinitis.
- Gout.
- Acute bursitis
- Infection
- Pathological fracture.
- Acute visceral pain referral (e.g., MI, gall bladder).

Traumatic (microtrauma)

- Rupture, severe strain or sprain.
- Humeral, clavicular, scapula fracture.
- Dislocation/separation.
- Labral tear.

If the pain came on over time, perhaps due to overuse or posture, consider...

- Rotator cuff strain/tendinopathy.
- Impingement syndrome.
- Biceps tendinopathy.
- Myofascial pain syndrome, scapulocostal syndrome, TOS.
- Bursitis (secondary).
- OA or RA.
- Visceral pain referral.
- Labral tear.
- GH instability.
- Referred pain from neck or rib.

Associated with Systemic Signs/Symptoms

If the patient has shoulder pain plus systemic symptoms (fever, malaise, weight loss) or other signs of disease (e.g., Virchow’s node, Horner’s syndrome), consider...

- Infection
- Arthritis
- Cancer

By Location

MOST COMMON: If the patient has anterior or lateral shoulder pain, consider...

- Rotator cuff (especially supraspinatus and subscapularis) strain/tendinopathy (pain is often lateral).
- Impingement syndrome.
- Biceps brachii strain/tendinopathy (usually not lateral).
- Anterior GH sprain or capsulitis.
- Pec major/minor tendinitis or strain, coracobrachialis.
- Upper costosternal or costochondral separation.
- Anterior instability.
- Referred pain from infraspinatus; (infraspinatus usually refers to lateral or anterolateral shoulder).
- AC joint sprain involving coracoclavicular ligaments which gives rise to anterior upper chest pain.
- Latissimus dorsi tendinopathy.
- Scalene myofascitis.
- Other causes of anterior chest wall pain or viscerosomatic pain including acute coronary syndrome.

Note: It is common that shoulder and neck pathology refers pain down the upper extremity often causing elbow, wrist, and hand symptoms.

If the patient has posterior shoulder or periscapular pain, consider...

- External rotator cuff strain or tendinopathy.
- Myofascial pain syndrome (levator scap, trapezius, rhomboids, scalenes).
- Myofascial pain referral from subscapularis or less commonly supraspinatus or posterior deltoid.
- Vertebral or costovertebral joint dysfunction.
- Posterior instability.
- Posterior capsulitis.
- Triceps tendinopathy.
- Snapping scapula.
- Cervicogenic (e.g., disc herniation) if periscapular.
- Referred visceral pain (e.g., lung, heart, gallbladder).

If patient has superior shoulder pain (medial to deltoid), consider...

- AC sprain (Grade I AC sprains only; superior shoulder pain and neck pain and spasms).
- Shoulder pointer (contusion of deltoid or trapezius).
- Trapezius or levator scapulae strain.
- Myofascial pain.
- Upper thoracic or cervical vertebral dislocation, facet, disc injury, muscle, or root injury or pathology.
- Cervical, upper thoracic or rib subluxation syndromes.
- Scapular/first rib/clavicle fracture.
- Apical lung pathology.

Note: Superior shoulder pain is rare with GH and rotator cuff pathology.

Mechanism of Traumatic Injury

If the patient suffered a traumatic fall on outstretched hand, consider...

- AC sprain
- Humeral head fracture
- Impingement syndrome
- Rotator cuff tear
- Posterior or anterior glenohumeral dislocation
- Labrum tear
- Clavicular fracture

If the patient suffered a traumatic fall onto lateral shoulder, consider...

- Clavicular fracture
- AC sprain
- Humeral head fracture/ bone contusion
- Soft tissue contusion ("shoulder pointer")

If the patient suffered a traumatic blow to the front of the shoulder, consider...

- Posterior instability
- Posterior dislocation
- Contusion

If the patient suffered a traumatic blow to the top of the shoulder, consider...

- AC separation
- Inferior dislocation
- Contusion

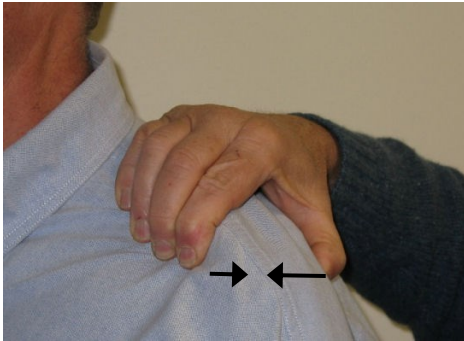
If the patient's arm was forced into abduction and external rotation, consider...

- Anterior dislocation
 - Labrum tear
-

SECTION IV: ORTHOPEDIC TESTS

AC TESTS

Paxinos squeeze

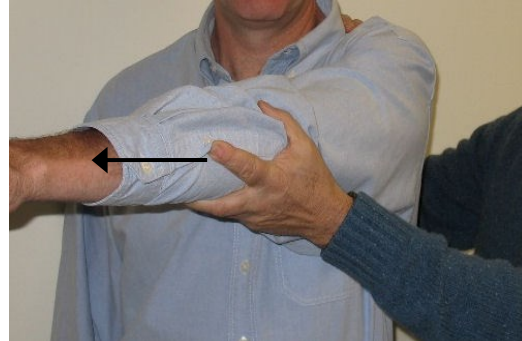


Directions: Squeeze AC joint together.

Positive test: Pain over the joint.

Indicates: AC lesion (e.g., dysfunction, sprain, separation).

Cross body adduction

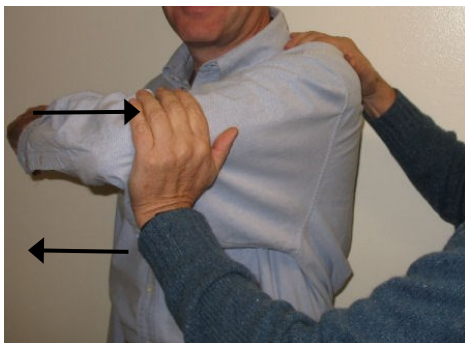


Directions: With the upper extremity at 90° of flexion, apply passive horizontal adduction with over-pressure.

Positive test: Pain over the AC joint.

Indicates: AC lesion (e.g., dysfunction, sprain, separation).

Resisted extension (horizontal abduction)

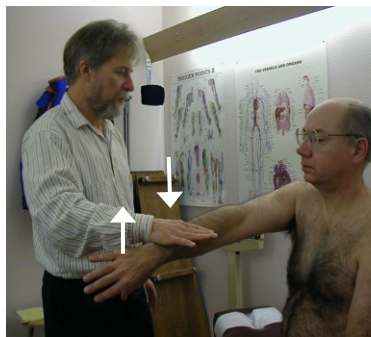


Directions: Isometric muscle test performed in horizontal abduction with shoulder at 90° of flexion.

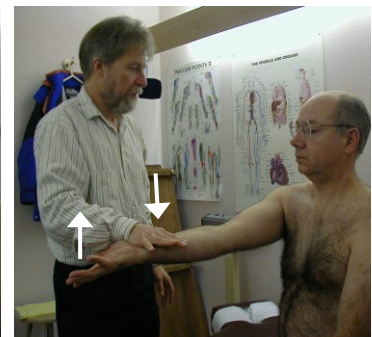
Positive test: Pain over the AC joint.

Indicates: AC lesion (e.g. dysfunction, sprain, separation).

O'Brien (active compression test)



Part 1



Part 2

Directions: Part 1 The shoulder is at 90° flexion and about 15° adduction in full internal rotation (thumb pointing down). An isometric muscles test is performed pressing the patient's arm toward the floor. Part 2 If there is pain, the test is repeated with the arm fully externally rotated (palm up).

Positive test: Pain over the AC joint in either position.

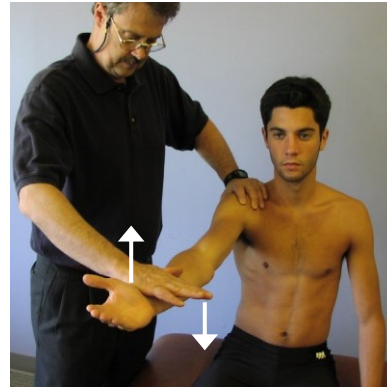
Indicates: AC lesion (e.g. dysfunction, sprain, separation), but may also be positive for labrum tear (if part 2 of the test is less painful and the pain location is felt inside the shoulder or presents on anterior or lateral aspect).

BICEPS TESTS

Speed's test



Start position



End position

Directions: Starting in the dependent position with the elbow locked in full extension, the patient flexes the upper extremity to 90° overcoming the practitioner's resistance (resulting in a resisted concentric contraction). In addition, one can provoke a resisted eccentric contraction by pushing the upper extremity toward the floor while overcoming the patient's resistance.

Positive test: Reproduction of pain at the anterior shoulder.

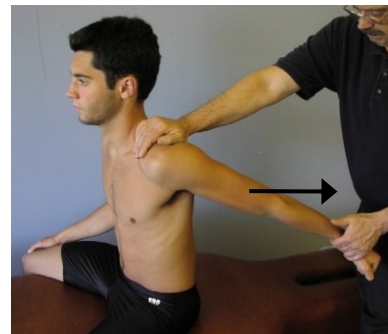
Indicates: A lesion of the tendon of the long head of the biceps or a strain of the biceps muscle. Note: This test may also provoke a labral lesion.

Clinical comment: Generally, the eccentric version of the test should be reserved for cases where the concentric application is negative.

Biceps extension test



Step 1: Stretch capsule



Step 2: Stretch biceps

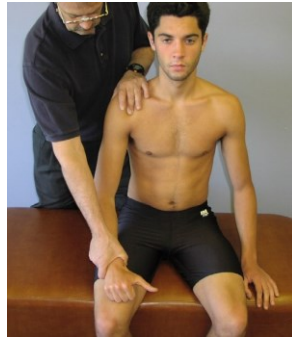
Directions: Step 1 While stabilizing the patient's shoulder, the upper extremity is extended to end range while the elbow remains fully flexed. Step 2 With the shoulder held in end range extension, the forearm is then fully extended at the elbow.

Positive test: Reproduction of pain at the anterior shoulder.

Indicates: Pain provoked by step 1 but not increased by step 2 suggests a capsular related lesion. No pain after step1, but provoked by step 2 suggests a biceps strain or tendinopathy.

BICEPS TESTS

Yergason's



Start position



End position

Directions: The upper extremity is in a dependent position with forearm pronated and palm nearly resting on the thigh. The patient then supinates and flexes at the elbow against the practitioner's resistance (as if hitchhiking while keeping the elbow tucked near the body). During the procedure, the practitioner's indifferent hand can either palpate the biceps tendon or stabilize the elbow to prevent abduction.

Positive test: Reproduction of anterior shoulder pain or painful snap.

Indicates: A lesion of the tendon of the long head of the biceps or a strain of the biceps muscle. Painful suggests biceps tendon instability.

Modified Yergason's



Start position



End position

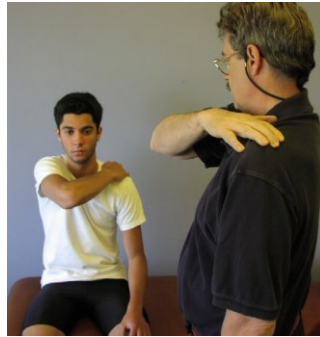
Directions: The patient's upper extremity is in a dependent position with pronated forearm and palm nearly resting on the thigh. The patient then supinates and flexes at the elbow while abducting and externally rotating at the shoulder against the practitioner's resistance (as if signaling an "out" in baseball). The practitioner's indifferent hand palpates the biceps tendon during the procedure.

Positive test: Reproduction of pain at the location of the biceps or a painful snap in the bicipital sulcus.

Indicates: A lesion of the tendon of the long head of the biceps (tendinopathy or tendon instability) or a strain of the biceps muscle.

DISLOCATION

Dugas



Part 1



Part 2

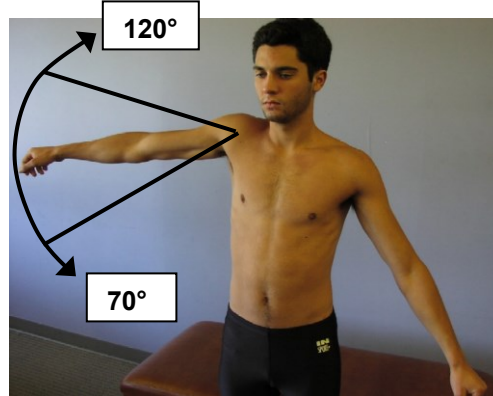
Directions: The patient attempts to actively reach across to the asymptomatic shoulder (horizontal adduction). If the first part can be performed, the patient maintains this position while attempting to press his/her elbow against the abdomen.

Positive test: An inability to perform either part of the maneuver due to pain or apprehension.

Indicates: Anterior dislocation of the proximal humerus.

IMPINGEMENT TESTS

Painful arc

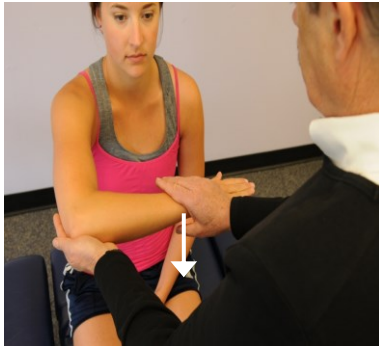


Directions: The patient actively abducts the upper extremity through a full range.

Positive test: As the shoulder moves through an arc of motion, only the middle portion of the range recreates the patient's pain, while the initial range and the final range are pain free.

Indicates: Possible impingement syndrome (without specifically implicating what structures are involved). This test can be positive in other shoulder conditions as well including instability.

Hawkins Kennedy test



Start position



End position

Directions: The starting position is with the patient's upper extremity in the sagittal plane, shoulder and elbow each flexed to 90°, the shoulder externally rotated to the point that the forearm is parallel to the floor, and the forearm is pronated so that the palm faces the floor. The practitioner should support the fully relaxed upper extremity at the elbow in this position. The shoulder is then passively internally rotated to end range with slight overpressure.

Positive test: Reproduction of pain at the anterior or lateral aspect of the shoulder.

Indicates: Possible impingement syndrome (without specifically implicating what structures are involved), especially if the pain occurs before end range. This test can be positive in other shoulder conditions as well. Posterior pain suggests that the pain generator may be the posterior capsule or the infraspinatus/teres minor muscles.

Clinical comment: Mild pain at end range with overpressure is not uncommon and so it is important to cross reference the pain with the patient's familiar pain as well as comparing with the asymptomatic shoulder.

IMPINGEMENT TESTS

Neer's impingement test (modified into 4 steps)



Step 1



Step 2



Step 3



Step 4

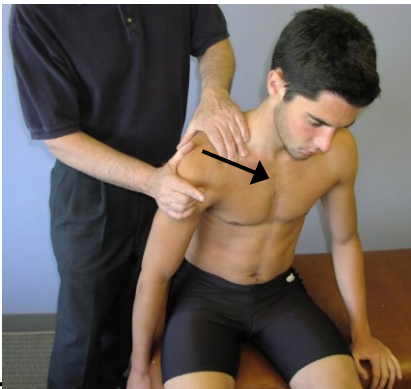
Directions: Step 1 The practitioner passively elevates the arm through a sagittal plane (into full end range flexion) with the palm up (supinated). Step 2 The procedure is repeated with palm down (pronated). Step 3 The test is repeated palm up while the shoulder girdle is depressed by the practitioner. Step 4 The test is repeated palm down while the shoulder girdle is depressed by the practitioner.

Positive test: Reproduction of familiar pain in the anterior or lateral aspects of the shoulder or felt inside the glenohumeral joint. Posterior shoulder pain suggests a possible lesion of the external rotators or posterior capsule.

Indicates: Possible impingement syndrome. Pain with the palm up suggests that the biceps tendon may be impinged. Pain with the palm down implicates that the supraspinatus tendon may be impinged. This test can be positive in other rotator cuff conditions as well.

Clinical comment: The first of the four steps is the original Neer's impingement test.

INSTABILITY TESTS (ANTERIOR)



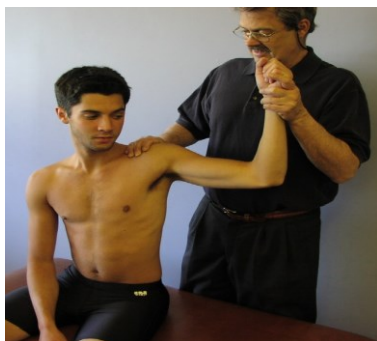
Load + shift (anterior)

Directions: Grasp the proximal humerus and translate the humeral head anteriorward (similar to a drawer test).

Positive test: Increased motion with or without pain.

Indicates: Anterior instability of the humeral head.

Anterior apprehension

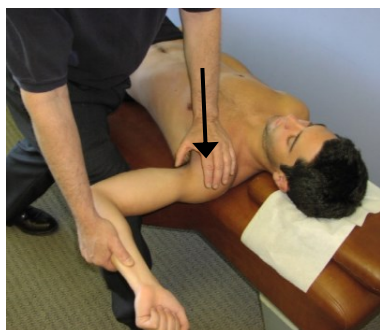


Seated

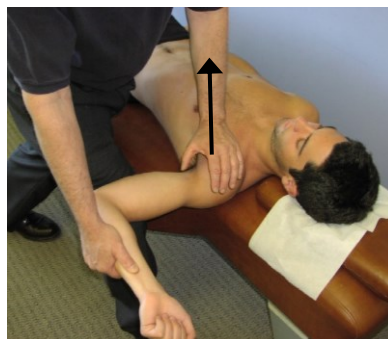


Supine (with added load)

Relocation test



Release test



Directions: Apprehension test: The shoulder is abducted to 90° and is passively externally rotated (if necessary, further load can be added by pushing the posterior shoulder P-A). Relocation test: If there is a positive finding on the Apprehension test, stabilize the shoulder A-P and repeat the external rotation with the arm abducted 90°. Release test: If the relocation step decreases symptoms, then *cautiously* release the stabilization hand to see if symptoms return. Note that the Relocation test has two components: the first component requires a positive Apprehension test in order to be valid; and the Release maneuver has three components, the first two consisting of positive Apprehension and positive Relocation tests to be valid.

Positive test: Apprehension, "clunk," or hypermobility (with or without pain). Confirmation can be made by improvement with the Relocation test and instability signs reproduced again during the Release test.

Indicates: Anterior instability of the humeral head. Pain *only* is a non-specific finding for other dysfunction or pathology.

INSTABILITY TESTS (INFERIOR)

Sulcus test



Practitioner Loads



Alternate method: Patient Loads

Directions: The arm is tractioned inferiorly while palpating the proximal humerus.

Positive test: The appearance of a sulcus or palpating a *clunk*.

Indicates: Inferior instability of the humeral head. Pain *only* is a non-specific finding for other dysfunction or pathology.

Faegin's test



Directions: The upper extremity relaxes comfortably on the practitioner's shoulder. Superior to inferior load is applied very near the glenohumeral joint.

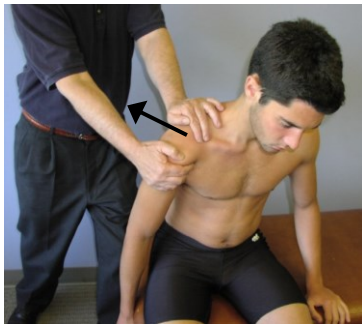
Positive test: Excessive movement with or without pain.

Indicates: Inferior instability of the humeral head. Pain *only* is a non-specific finding for other dysfunction or pathology.

Clinical Note: This procedure can double as inferior glide motion palpation for pain and restriction.

INSTABILITY TESTS (POSTERIOR)

Load + shift (posterior)



Directions: Take hold of the proximal humerus and translate the humeral head posteriorward, similar to a drawer test.

Positive test: Increased motion with or without pain.

Indicates: Posterior instability of the humeral head.

Norwood



Step 1



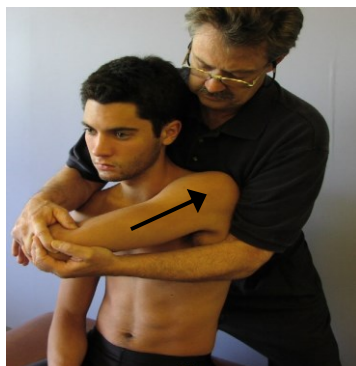
Step 2

Directions: The upper extremity is abducted to about 90° and is brought across the body while the shoulder is simultaneously loaded in a posterior direction.

Positive test: Apprehension, *clunk*, or hypermobility (with or without pain).

Indicates: A painful *clunk* or apprehension indicates posterior humeral instability. A painless *clunk* is equivocal. Pain without a clunk is negative.

Posterior apprehension



Seated



Supine

Directions: The patient's hand is on the symptomatic shoulder. The symptomatic shoulder is flexed to 90°. The humerus is loaded posteriorward (applying the force through the elbow). The scapula is stabilized either by the practitioner's chest, the table, or the indifferent hand.

Positive test: Apprehension, "clunk," or hypermobility (with or without pain).

Indicates: Posterior instability of the humeral head. Pain *only* is a non-specific finding for other dysfunction or pathology.

LABRUM TESTS (based on biceps tendon)

Biceps provocation



Starting position



Ending position (causing pain)

Directions: First the shoulder is supported at approximately 90° of abduction with the elbow flexed to 90°. Then the patient externally rotates the arm to the *point of apprehension*. The forearm is in a neutral position, with the palm oriented toward the patient's head. This completes the starting position. To perform the test, the patient pronates the forearm.

Positive test: Pronation creates a painful snap or aggravates pain felt inside the GH joint. Supination back to the start position returns the symptoms to baseline.

Indicates: Labrum tear (SLAP lesion).

Biceps load



Directions: First the shoulder is supported at approximately 90° of abduction with the elbow flexed to 90°. Then the patient externally rotates the arm to the *point of apprehension*. The forearm is in a neutral position, with the palm oriented toward the patient's head. This completes the starting position. The practitioner then attempts to create extension at the elbow while the patient resists (resulting in an isometric contraction).

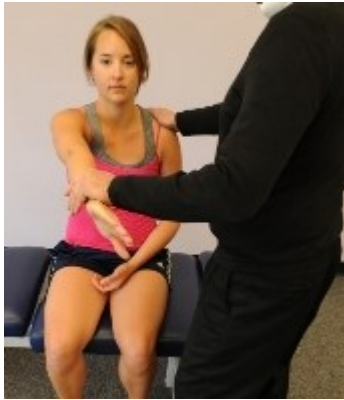
Positive test: Pain or a painful snap is felt inside the GH joint when the biceps contracts and is relieved when the biceps relaxes.

Indicates: Labrum tear (SLAP lesion).

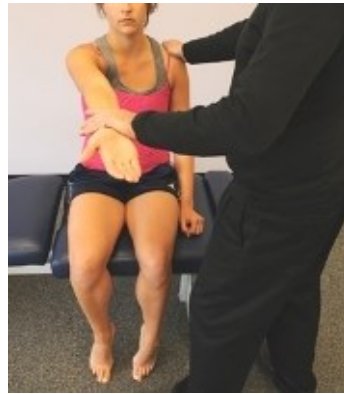
LABRUM TESTS (based on biceps tendon)

O'Brien

(active compression tests)



Part 1: ++ pain



Part 2: + pain

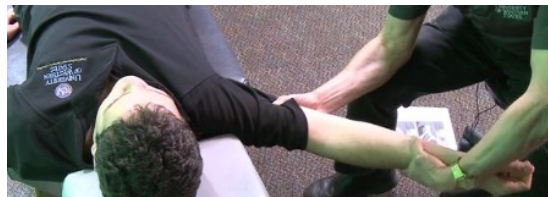
Directions: **Part 1:** The shoulder is at 90° flexion and about 15° adduction in full internal rotation (thumb pointing down). An isometric muscles test is performed pressing the patient's arm toward the floor.

Part 2: If there is pain, the test is repeated with the arm fully externally rotated (palm up).

Positive test: Pain felt inside in the GH joint or over the anterior aspect of the shoulder when the shoulder is fully internally rotated (in part 1), but less (or no) pain with the shoulder is externally rotated (in part 2).

Indicates: Labrum tear (SLAP lesion). Pain localized over the AC joint suggests an AC lesion.

Passive Distraction Test



Palm up: 0 pain



Palm down: + pain

Directions: The shoulder is at 150° abduction with the elbow fully extended and forearm supinated (palm up). To prevent rotation, the upper arm is stabilized. The test occurs when the practitioner gently pronates the forearm. Despite the name of the test, the practitioner does not distract the upper extremity (the distraction that occurs is caused by the pulling of the tendon of the long head of the biceps pulling on the labrum).

Positive test: Pain deep inside either the anterior or posterior the glenohumeral joint.

Indicates: Labrum tear (SLAP lesion).

LABRUM TESTS (based on “grinding”)

Crank

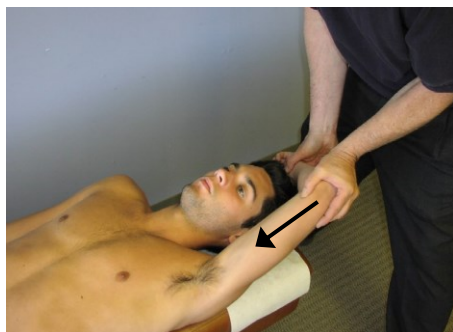


External rotation

(seated)

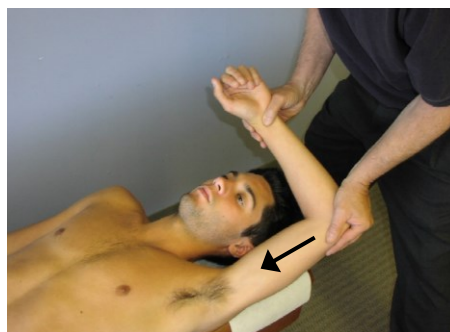


Internal rotation



External rotation

(supine)



Internal rotation

Directions: The shoulder is passively abducted to above 120°. While maintaining steady axial compression, the shoulder is internally and externally rotated (grinding the GH joint).

Positive test: Pain felt inside the joint or painful crepitus (snap, grind or *clunk*).

Indicates: Labrum tear (SLAP lesion).

LABRUM TESTS (based on “grinding”)

Passive Rotation Test



Directions: The patient is supine and the practitioner applies a compressive force through the humerus into the glenoid fossa. While maintaining this compression, the upper extremity is internally and externally rotated, grinding the joint (similar to the Crank test and Appley's compression test for meniscus tears of the knee).

Positive test: Palpable catching and snapping.

Indicates: Unstable slap lesion.

LABRUM TESTS (based on anterior glide of humerus)

Passive compression



Step 1



Step 2

Directions: The patient is side lying, symptomatic side up. In the starting position the upper extremity is stabilized with a hand over the AC joint, the extremity is abducted about 30° and externally rotated to end range while axial compression is applied through the elbow. Maintaining the compression and external rotation, the shoulder is then passively extended to end range.

Positive test: Reproduction of familiar pain or a palpable or audible painful *clunk* or snap.

Indicates: Labrum tear (SLAP lesion).

LABRUM TESTS (based on anterior glide of humerus)

Anterior Slide Test



Directions: The patient's hand is placed on hip. The practitioner loads the humerus in a superior direction into the glenoid fossa while simultaneously pressing the elbow forward against the patient's resistance. The fingers of the practitioner's other hand palpates the anterior aspect of the joint.

Positive test: Reproduction of familiar pain that patient describes while performing overhead activities, or pain localized to the front of the shoulder or a palpable or audible pop or click.

Indicates: Unstable slap lesion.

ROTATOR CUFF TESTS: INTERNAL AND EXTERNAL ROTATORS (Strains and Tendinopathy)

Clinical comment: When testing the internal and external rotators, a variety of positions can be used to increase the likelihood of challenging the particular fibers of a muscle that may have been injured. These muscles should be isometrically tested with arms at side, at 90° of shoulder abduction, and in unique positions thought to minimize unwanted recruitment (e.g., the hug and Napoleon test for subscapularis and the bugle test for the external rotators). Finally, these muscles can also be tested through resisted full range of motion (either concentrically or eccentrically) and even through functional motions such as the PNF D1 and D2 diagonals or pitching motions.

Large tears and ruptures: Exam findings suggesting large tears and ruptures include positive lag tests (internal and external rotation), Codman arm drop and dropping arm signs, inability to perform the lift off test, and the inability to perform the belly press, hug test, or attain the bugler position without cheating *by using trick movements*.

Hug



Directions: The starting position is with the arm crossed over to the opposite shoulder with the elbow down nearly touching the abdomen. The practitioner slips a hand beneath the patient's wrist and performs an isometric muscle test, pulling the arm into external rotation as the patient presses the arm back into internal rotation.

Positive test: Pain, weakness, or pain and weakness. **Large tear/rupture sign:** inability to push down on shoulder.

Indicates: Subscapularis lesion (tendinopathy or tear).

Napoleon



Supine



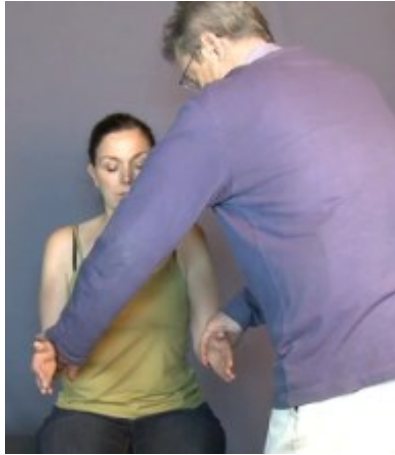
Seated

Directions: The starting position is with the arm resting across the abdomen. The practitioner slips a hand beneath the patient's wrist and pulls the arm into external rotation as the patient presses the arm back into internal rotation (resulting in an isometric muscle test).

Positive test: Pain, weakness, or pain and weakness. **Large tear/rupture sign:** inability to press belly without trick movement (e.g., extending shoulder, flexing wrist).

Indicates: Subscapularis lesion (tendinopathy or tear).

Internal Rotators



Supine, arm at side



Supine, 90° abduction

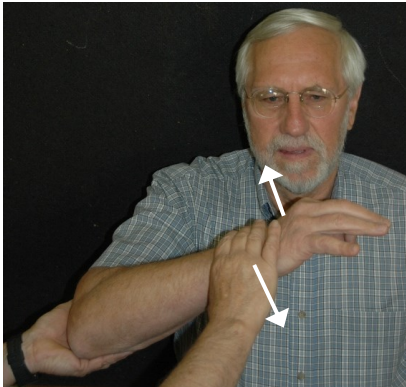
Directions: Internal rotators should be tested at both 90° of abduction and with arm by the side (0° abduction)

Positive test: Pain, weakness, or pain and weakness.

Indicates: A lesion of the internal rotators (usually subscapularis tendinopathy or tear).

External Rotators

Bugle



Directions: The starting position is with the arm positioned as if blowing a trumpet or bugle. The elbow is stabilized and the practitioner then performs an isometric muscle test, loading the shoulder into internal rotation as the patient tries to externally rotate.

Positive test: Pain, weakness, or pain and weakness. **Large tear/rupture sign:** inability to attain the position without trick movement (e.g., elevating elbow above ear).

Indicates: Teres minor/infraspinatus tendinopathy or tear.

External rotators (seated, arm at side)



Directions: The starting position is with elbow flexed to 90° and the upper extremity dependent at the patient's side. The shoulder is in neutral rotation (forearms parallel to each other). The practitioner then performs an isometric muscle test, loading the shoulder into internal rotation as the patient actively tries to externally rotate. Both shoulders are tested simultaneously. Be sure to prevent recruitment of abductors.

Positive test: Pain, weakness, or pain and weakness.

Indicates: A lesion of the external rotators or supraspinatus (tendinopathy or tear). Possible impingement syndrome.

External rotator lag sign



Step 1



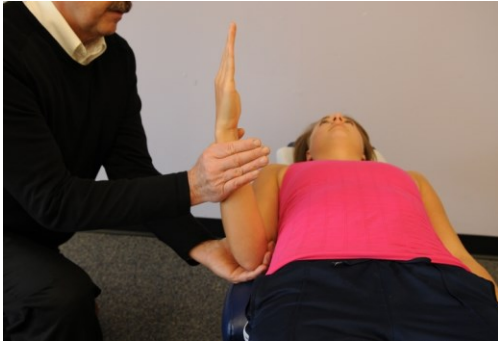
Step 2 (arm drifts back)

Directions: The starting position for this muscle test is with the upper extremity dependent and at the patient's side elbows flexed to 90°. The practitioner then passively externally rotates both shoulders to end range, asks the patient to *maintain* this end range position, and lets go.

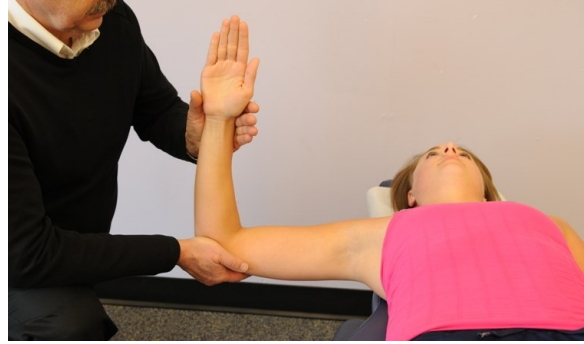
Positive test: Unable to maintain this end range position, the symptomatic shoulder drifts back toward internal rotation or "lags" a few degrees from end range (with or without pain).

Indicates: Possible large tear or rupture of supraspinatus or external rotators. This has also been linked with impingement syndrome.

External Rotators



Supine, arm at side



Supine, 90° abduction

Directions: Alternate methods to muscle test external rotators with arm by side and at 90° of abduction.

Positive test: Pain, weakness, or pain and weakness.

Indicates: A lesion of the external rotators (tendinopathy or tear).

Dropping Arm Sign



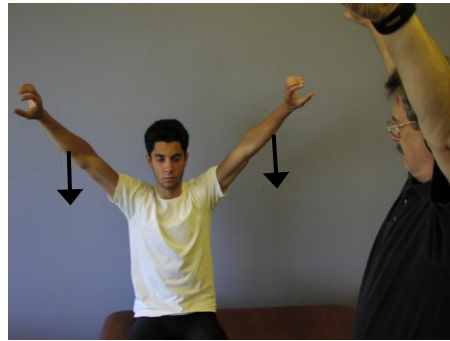
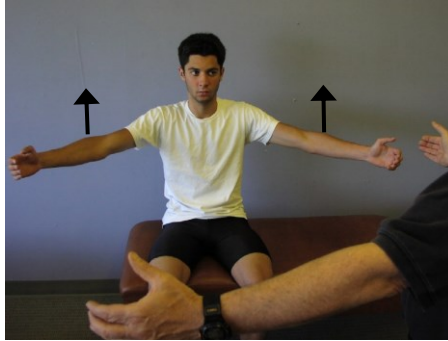
Directions: With the shoulder abducted to 90° and the upper extremity supported, the practitioner externally rotates the involved extremity nearly to end range. The patient is instructed to maintain the position and the practitioner releases the forearm.

Positive test: The arm dropping forward.

Indicates: A possible large tear or rupture of the external rotators or supraspinatus.

ROTATOR CUFF TESTS: SUPRASPINATUS (Strains and Tendinopathy)

Empty can



Directions: The patient actively raises and lowers the upper extremity in the scaption plane, with thumb down (empty can) and thumb up (full can).

Positive test: Pain on the anterior or lateral surface of the GH joint or felt inside (but not posterior shoulder pain).

Indicates: Supraspinatus lesion (strain or tendinopathy). It may or may not be associated with impingement syndrome.

ROTATOR CUFF TESTS: SUPRASPINATUS (Strains and Tendinopathy)

Arm drop (AKA Codman's arm drop)

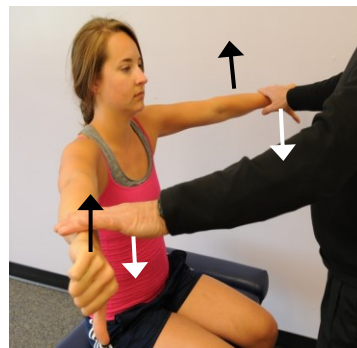


Directions: The practitioner supports the upper extremity with the shoulder at 90° of abduction and then releases.

Positive test: The patient is unable to maintain this position when unsupported (with or without pain)—often called “arm drop sign.”

Indicates: Grade 3 supraspinatus strain (full rupture).

Supraspinatus test



Directions: This is an isometric muscle test in the scaption plane. It can be done unilaterally or bilaterally.

Positive test: Pain, pain with weakness, weakness alone (compared to asymptomatic side).

Indicates: A lesion of the supraspinatus (grade 1 strain or tendinopathy). Pain can occur with this test in other shoulder conditions without a supraspinatus lesion, especially in the acute phase.

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Appendix II: Shoulder Directional Preference Assessment reviewed and revised by Karen Baranick, DC, Cert. MDT.

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Reviewed by CSPE Working Group (2015)

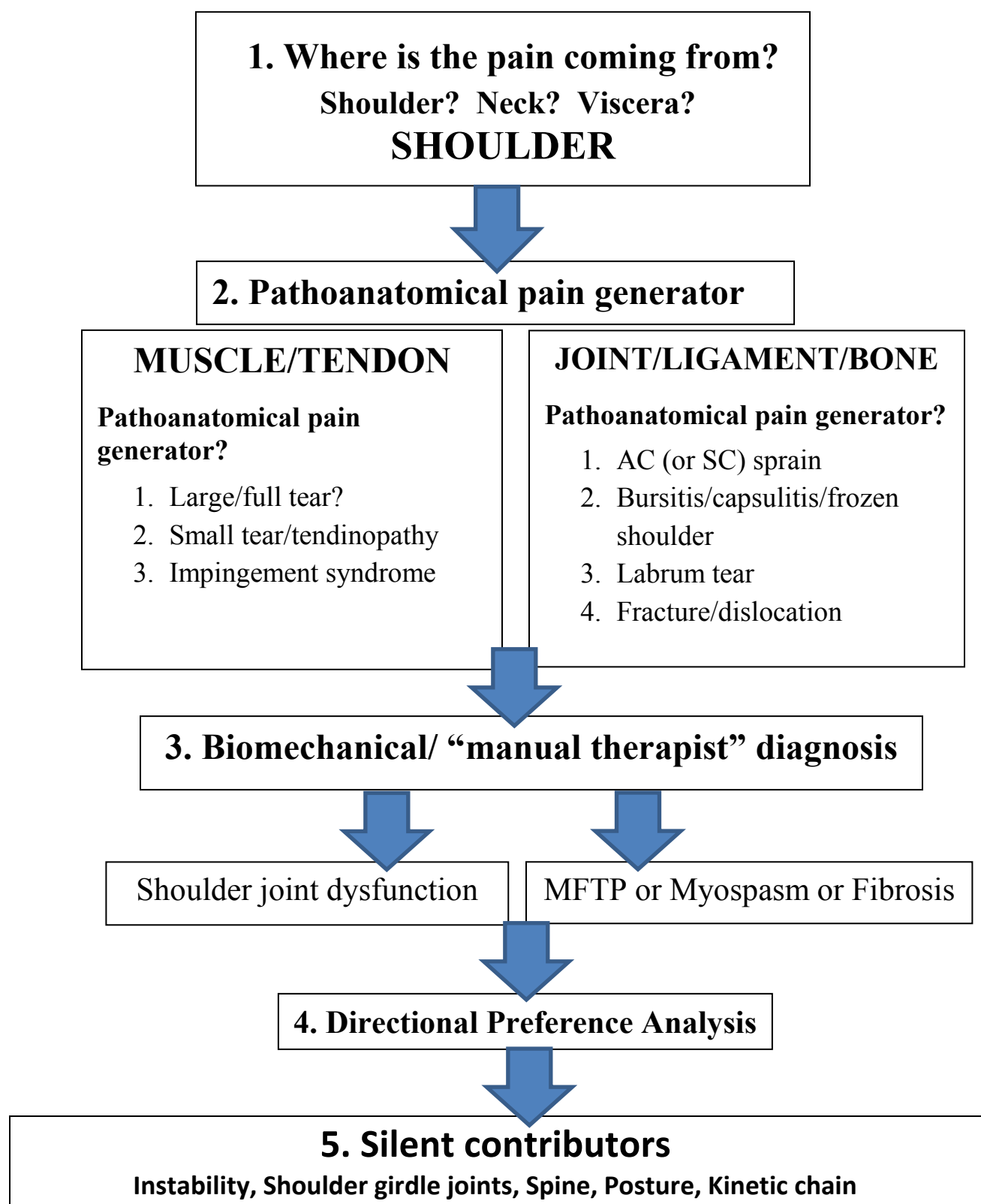
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APPENDIX II: Shoulder Directional Preference Assessment

Directional preference assessment is purely empirical and is not based on determining a formal diagnosis or identifying a pain generator. Through a series of maneuvers which repetitively load the glenohumeral joint all the way to end range, the practitioner attempts to discover a therapeutic direction which decreases symptoms, improves range of motion, or centralizes the territory of pain.

Here are the key steps:

- Assess flexion, extension, abduction, horizontal adduction, and internal rotation, first actively, then passively with end-range loading. *Consider starting with the direction that is most limited due to pain, but NEVER flexion or abduction. All three of the major shoulder patterns have a loss of flexion or abduction (see below), but they are not motions the patients would perform repetitively.*
- Test each direction with up to 10 repetitions, gently taking the tissue to end range with overpressure until a direction which is therapeutic is discovered or all of the directions fail to help the patient.
- Responses are expected to be rapid.
- Besides monitoring for an immediate change in pain, repeat baseline findings (e.g., change in a painful ROM or painful response to a particular muscle test).
- If a directional preference is identified, have the patient perform 10 reps throughout the day (every 2-3 hours).
- As the patient improves, decrease to 4 sets per day, *increasing the amount of overpressure.*

There are three common directional preference patterns that have been identified. In each case, flexion and/or adduction is limited. What distinguish the patterns from each other are the other ROM limitations.

Pattern 1 (most common)

- Decreased flexion or abduction
- Decreased extension or internal rotation
- There may be some external rotation muscle weakness

The majority of these patients will respond to extension or internal rotation, so start with the *most restricted* motion of the two.



In doing the assessment the patient may be restricted in both motions so a starting point would be picking the most restricted. The patient may initially need internal rotation but then switch to extension. The patient may not be able to position themselves for internal rotation, so in that case they have to start with extension.

Pattern 2 (second most common)

- Decreased flexion or abduction
- No loss of extension or internal rotation
- Decreased horizontal adduction

The majority of these patients will respond to horizontal adduction. Note: Vary the angle of flexion while performing the horizontal adduction to accommodate patient comfort.



Combined pattern 1 and 2

Sometimes there is only a partial response with extension or internal rotation, then they hit a plateau. You may need to add horizontal adduction for a full reduction.

Pattern 3

- Decreased flexion or abduction
- Decreased extension or internal rotation – but they are WORSE with repetition in extension or internal rotation (the other has no effect)

These patients will respond to first positioning the shoulder in 90 degrees of flexion supported on a table and then performing repetitive end range external rotation.



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SWIMMERS SHOULDER

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