Shoulder Pain

Review of Physical Exam and
An Approach To The Differential Diagnosis

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Disclosures

• No financial disclosures or conflicts of interest
Objectives

• Review pertinent anatomy and pathology associated with common causes of shoulder pain
• Review historical and physical exam findings that help differentiate common causes of shoulder pain
• Review imaging findings relevant to these causes of pain and discuss a rationale for appropriate use of diagnostic tests
• Review the best evidence available to the guide treatment of these conditions
<table>
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<th>Levels of Evidence</th>
<th>Types of Studies</th>
<th>Economic and Decision Analyses—Developing an Economic or Decision Model</th>
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</table>
| Level I           | Therapeutic Studies—Investigating the Results of Treatment | 1. Randomized controlled trial  
1. Significant difference  
2. No significant difference but narrow confidence intervals  
2. Systematic review of Level-I randomized controlled trials (studies were homogeneous) |
|                   | Prognostic Studies—Investigating the Outcome of Disease | 1. Prospective study  
2. Systematic review of Level-I studies |
| Level II          | Diagnostic Studies—Investigating a Diagnostic Test | 1. Testing of previously developed diagnostic criteria in series of consecutive patients (with universally applied reference "gold" standard)  
2. Systematic review of Level-I studies |
|                   | 1. Clinically sensible costs and alternatives; values obtained from many studies; multicriteria sensitivity analyses  
2. Systematic review of Level-I studies |
| Level III         | Therapeutic Studies—Investigating the Results of Treatment | 1. Prospective cohort study  
2. Poor-quality randomized controlled trial (e.g., <80% follow-up)  
3. Systematic review of Level-II studies  
4. Nonhomogeneous Level-I studies |
|                   | Prognostic Studies—Investigating the Outcome of Disease | 1. Retrospective study  
2. Study of untreated controls from a previous randomized controlled trial  
3. Systematic review of Level-II studies |
| Level IV          | Diagnostic Studies—Investigating a Diagnostic Test | 1. Development of diagnostic criteria on basis of consecutive patients (with universally applied reference "gold" standard)  
2. Systematic review of Level-II studies |
|                   | 1. Clinically sensible costs and alternatives; values obtained from limited studies; multicriteria sensitivity analyses  
2. Systematic review of Level-II studies |
| Level V           | Case series (no, or historical, control group) | 1. Case-control study  
2. Poor reference standard |
|                   | Case series | 1. Study of nonconsecutive patients (no consistently applied reference "gold" standard)  
2. Systematic review of Level-III studies |
|                   | No sensitivity analyses |
|                   | Expert opinion | 1. Limited alternatives and costs; poor estimates  
2. Systematic review of Level-III studies |
|                   | Expert opinion | Expert opinion |
|                   | Expert opinion | Expert opinion |
Syst. Reviews of RCT

Level I – Randomized Controlled Trials

Observational studies
- Level II – Prospective Cohort
- Level III – Case-Control or Retrospective Cohort

Level IV – Case studies

Level V – Anecdote and personal opinions
Anatomy Review

XR Review
AP Int. & Ext. Rotation & Axillary views
+/- Scapular-Y view
# Non-Arthritis Shoulder Pain

## Non-Operative
- Subacromial Impingement
- Subacromial Bursitis
- Adhesive Capsulitis
  - “Frozen Shoulder”
- Biceps Tendonitis

## Operative &/or Non-Op
- Rotator Cuff Tear
  - Acute, Known Injury
  - Chronic, Unknown Injury
- Proximal Biceps Tendon Tear
- Labral Tear
- Glenohumeral or AC Joint Arthritis
- AC Joint Sprain
  - “Separated Shoulder”
- Shoulder Instability
# Non-Arthritis Shoulder Pain

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Shoulder Pain Radiating Patterns

• Sternoclavicular Joint ➔ Up SCM/Front of Neck
• Acromioclavicular Joint ➔ Upper Trap/Lat. Neck
• Subacromial Space ➔ Lateral Brachium
• Biceps Tendons ➔ Anterior Brachium
Subacromial Impingement

**History**

- Pain radiates from superolateral shoulder to lateral brachium
- Pain with reaching
- No rest pain
  - Different than sleep/night pain... this will hurt
  - Rest = Sitting with hands in lap
- Usually insidious onset
- May be capped by an event or start some time after an event
- Primary or Secondary disorder
- No change in shoulder pain with Neck ROM

**Exam**

- Scapular dyskinesia on forward elevation (FE)
- Limited passive internal rotation (IR)
- PROM ≥ AROM
- Tender To Palpation at Coracoid
- Pain AND weakness on Empty-Can testing at 90° ABduction in scapular plane but NL at 30° and other Rot. Cuff/Shoulder/Arm muscle strength NL
- Pain AND Weakness resolve/improve with scapular retraction test
- Pain with Neer’s and Hawkins’ tests
Scapular Dyskinesis

http://www.youtube.com/watch?v=ROsiiDsjm2o
Empty-Can Test
Scapular Retraction Test

Kibler WB. Br J Sports Med 2010
Neer’s and Hawkins’ Tests for Impingement
Subacromial Impingement

Imaging
- 3-4 views of the Shoulder
  - AP Int. & Ext. Rotation & Axillary +/- Scapular-Y view
  - Usually normal
- Obtain these in setting of injury and/or to screen for calcific rotator cuff tendonopathy or osteoarthritis
- Neck XR only if reproducible radicular signs/symptoms

Treatment
- Rehab
  - Strengthen Scapular Stabilizers
    - Rhomboids, Middle Trapezius, Serratus Anterior
  - Stretch Tight Posterior Capsule and Pectoralis Minor
- Subacromial CS Injection
  - To improve tolerance for Rehab
- Subacromial Decompression only if conservative Tx fails
Calcific Rotator Cuff Tendonopathy
Calcific Rotator Cuff Tendonopathy Treatment

- U/S Guided Lavage & CS Injection; Debridement if too large or failed CSI

http://www.ultrasoundcases.info/files/Jpg/lbox_22380.jpg
http://www.nguyenthienhung.com/2012_09_01_archive.html
Subacromial Bursitis
Subacromial Bursitis

**History**

- Pain radiates from superolateral shoulder to lateral brachium
- Pain with reaching
- (+) Rest pain
  - Different than sleep/night pain... this will hurt
  - Rest = Sitting with hands in lap
- Usually rapid/sudden onset
  - 10/10 Pain out of “Clear Blue Sky”
- May start soon after an event or recent incr. in activity
- No change in shoulder pain with Neck ROM

**Exam**

- Scapular dyskinesis on fwd. elev. (FE)
- Limited passive internal rotation (IR)
- PROM ≥ AROM but pain in all planes of motion
- Tender To Palpation deep to acromion
- Pain AND weakness in all planes but esp. on Empty-Can testing; Biceps and Triceps usually NL
- Symptoms may improve with scapular retraction test
- Pain with Neer’s and Hawkins’ tests
Subacromial Bursitis

**Imaging**
- 3-4 views of the Shoulder
  - AP Int. & Ext. Rotation & Axillary +/- Scapular-Y view
  - Usually normal
- Obtain these in setting of injury and/or to screen for calcific rotator cuff tendinopathy or osteoarthritis
- Neck XR only if reproducible radicular signs/symptoms

**Treatment**
- Subacromial CS Injection
- PO NSAIDs +/- Narcotics
  - Ketorolac (Toradol)
- Rehab after pain improvement to address Impingement
- Subacromial Decompression +/- Bursectomy only if conservative Tx fails
Adhesive Capsulitis

Adhesive Capsulitis

History

- (+) Rest Pain
  - Rest = Sitting with hands in lap
- Pain worse with reaching
- Progressive Loss of Motion
  - IR ➔ ER & Abd ➔ FE
  - Motion returns in opposite sequence
- Most common in Females, 40-60 y/o
- May have autoimmune or chronic inflammatory etiology
  - Diabetes (25%), Hypothyroidism, IBD
- Usually insidious onset
- May be capped by event or the start some time after an event/trauma
- No change in pain w/ Neck ROM

Exam

- Limited passive IR > ER > Abd > FE
- PROM = AROM
- Diffusely Tender To Palpation
- Pain in all planes of motion may limit strength
- Limited motion can prohibit Neer’s and Hawkins’ tests
Adhesive Capsulitis

• Education & Expectations
• Average of 9-18 months to run its course
  – Stage 1 – Freezing
    • Pain at rest AND progressive loss of motion
      – Internal Rotation ➔ External Rotation and Abduction ➔ Forward Elevation
      – Motion returns in opposite sequence
  – Stage 2 – Frozen
    • Rest pain resolves but severely limited motion and pain with reaching
  – Stage 3 – Thawing
    • ROM returns (IR last) and Impingement symptoms predominate
  – Stage 4 – Shoulder function is back to normal
Adhesive Capsulitis

**Imaging**
- 3-4 views of the Shoulder
  - AP Int. & Ext. Rotation & Axillary +/- Scapular-Y view
    - Axillary view most difficult due to loss of motion
  - Usually normal

**Treatment**
- **Education and Expectations**
- **Glenohumeral CS Injection**
  - **Level I** – Superior to PO with fewer systemic effects; Repeat every 4-6 weeks in Stage 1 and early Stage 2
    - Lorbach O et al. J Shldr Elb Sg. 2010
- **Narcotics, Sleep Aids, NSAIDs**
- **Rehab only AFTER Rest Pain resolves**
- **Viscosupplementation**
  - **Level I** – Not Clinically Significant
    - Callis M. Rheumatol Int. 2006
- **Manipulation Under Anesthesia if conservative Tx fails**
Rotator Cuff Tear

Supraspinatus Rupture

Coracoacromial ligament
Coracoid process
Clavicle

Deltoid

Humeral head

Subscapularis Tendon
Supraspinatus Tendon
Teres major tendon
Biceps tendon

Normal rotator cuff

Bone

Torn rotator cuff

Fluid


orthop.washington.edu
Rotator Cuff Tear

**History**

- **Fall on outstretched arm**
  - Abduction in scapular plane = Supraspinatus +/- Infraspinatus
  - External Rotation = Subscapularis
- **c/o weakness > pain**
- **Acute**
  - Event after which c/o pain and weakness and disability
  - ≤ 2-3 months
- **Chronic**
  - Process/Gradual onset of weakness and pain
  - Event >3 months ago

**Exam**

- **Limited AROM 2/2 weakness > pain** but NL PROM
- **Supraspinatus** (70% of RCT)
  - Weak Empty Can at 30° & Drop Arm test
- **Infraspinatus** (20% of RCT)
  - Weak ER & ER Lag Sign
- **Subscapularis** (<1% of RCT)
  - Weak IR & Belly Press or Lift Off tests
Drop Arm Test

http://www.youtube.com/watch?v=qvwYEoeHPaA
Lag Sign and Belly Press Tests

- Infraspinatus/Teres Min. Tear
- Subscapularis Tear

**Figure 6** – The external rotation lag sign is performed by passively externally rotating the patient’s arm at the side. Inability to actively maintain external rotation is a positive result, signifying weakness or a tear of the infraspinatus tendon.

**Figure 8** – During the belly press test, the patient is asked to press the palm against the stomach while holding the elbow in the forward position. Inability to do so is a positive result, signifying a tear in the subscapularis tendon.
Rotator Cuff Tear

**Imaging**
- 3-4 views of the Shoulder
  - AP Int. & Ext. Rotation & Axillary +/- Scapular-Y view
  - Usually normal
  - May show high riding humeral head above center of glenoid
    - Loss of supraspinatus cap
- MRI if Acute RCT

**Treatment**
- **Acute Tear = RCT Repair**
- **Chronic Tear = Rehab**
  - Level II – 75% Return to NL Function & No Pain without Surgery at 2 yrs.
  - Subacromial CS Injection for Pain
- **Viscosupplementation**
  - Level I – Not Clinically Significant

Kuhn JE. J Shoulder Elbow Surg. 2013
Chou WY. J Shoulder Elbow Surg. 2010
Meloni F. Eur J Radiol. 2008
Biceps Tendonopathy

http://chiropracticdubai.files.wordpress.com/2012/06/bicep-tendonitis-image1.jpg
Biceps Tendonopathy

**History**
- Pain radiates from anterior shoulder to anterior brachium
- **Pain with biceps flexion**, especially with supinated wrist
- Usually insidious sudden onset
- May start soon after an event or recent incr. in activity
- Often accompanies Impingement
- No change in shoulder pain with Neck ROM

**Exam**
- Tender To Palpation overlying proximal biceps tendon at bicepital groove
- Pain with extension of the shoulder
- Pain with resisted supination of wrist and resisted biceps flexion
- Pain with Speed’s (resisted shoulder flexion with wrist supinated and elbow extended) and Yergason’s (resisted wrist supination with elbow at 60-90°) tests
Speeds’ and Yergason’s Tests
Biceps Tendonopathy

Imaging

• 3-4 views of the Shoulder
  – AP Int. & Ext. Rotation & Axillary +/- Scapular-Y view
  – Usually normal
• Consider MSK U/S
  – Usually used to confirm if Dx is unclear on exam or if using U/S for guided CS injection

Treatment

• Rehab
  – Eccentric Biceps exercises
  – Stretch Biceps in extension
• Tendon Sheath CS Injection
• Topical or PO NSAIDs or APAP
• Ionto/Phonophoresis
• Biceps Tenodesis if conservative Tx fails
Interim Summary

• Was there an injury/event? Or was it a process?
  – Injury/Event – Rot. Cuff Tear, Subacromial Bursitis, AC or GH Dislocation
  – Process – Impingement, Frozen Shoulder, Biceps Tendonitis, DJD

• Do they have “Rest Pain”?
  – No – Impingement, Rotator Cuff Tear (after initiating pain), Prox. Biceps Tear
  – Yes – Subacromial Bursitis (rapid), Frozen Shoulder (gradual), DJD (constant), AC or GH Dislocation (acute)

• Where does it hurt? Where does the pain go? What causes it?
  – Tendonopathy hurts with palpation, stretch, and contraction

• Appropriate XR will adequately address most shoulder pain
  – Always include an A/P Int./Ext. Rotation views with an Axillary view
  – If Acute Rotator Cuff Tear suspected ➔ MRI
  – If Glenohumeral Instability ➔ Scapular-Y

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Thank You
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  - Acute, Known Injury – Surgery
  - Chronic, Unknown Injury – Non-Op
- Proximal Biceps Tendon Tear
- Labral Tear
- Glenohumeral or AC Joint Arthritis
- AC Joint Sprain
  - “Separated Shoulder”
- Shoulder Instability
Proximal Biceps Tendon Tear

Proximal

Distal

Ruptured Biceps Tendon in the Shoulder with "Popeye Deformity"

Biceps Muscle

http://images.ookaboo.com/photo/m/Biceps tendon 10_m.jpg

http://images.rheumatology.org

www.eastbaysportsmed.com
Proximal Biceps Tendon Tear

**History**
- Pain and/or pop at anterior shoulder but usually not painful after initial event
- May have bruising at anterior shoulder that tracks distally

**Exam**
- "Popeye Deformity" with defect proximal and bulge distal
- ROM usually normal
- May be Tender To Palpation at site of tear
- Weakness on elbow flexion with hand in supinated position
- Usually normal strength with hand at neutral or pronated
Proximal Biceps Tendon Tear

Imaging
- None required unless history of trauma
  - If trauma, XR to r/o fracture
  - MRI usually does not change management

Treatment
- Reassurance
- Surgery if
  - Relative strength deficit is intolerable or affects work/play
  - Deformity is cosmetically unacceptable
Shoulder Arthritis

- Inflammatory Arthritides
- Osteoarthritis
- Posttraumatic Arthritis
- Rotator Cuff Arthropathy
- Capsulorraphy Arthropathy
- Neuropathic Arthritis
- Osteonecrosis
- Infection
Glenohumeral DJD

History

• Pain deep in the shoulder that is constant; worse with reaching
  – “Hopeless” pain

• (+) Rest Pain
  – Different than sleep/night pain... this will hurt
  – Rest = Sitting with hands in lap

• Usually insidious onset

• No change in shoulder pain with Neck ROM

Exam

• Limited P/AROM on IR/ER > FE
• PROM = AROM
• Often have scapular dyskinesis
• Usually NL Strength but may have Pain AND weakness onEmpty-Can testing at 90° ABduction in scapular plane
  – May be weak w/ Rot. Cuff Arthropathy
• Pain AND Weakness may resolve/improve with scapular retraction
Glenohumeral DJD Imaging

- 3-4 views of the Shoulder
  - AP Int. & Ext. Rotation & Axillary +/- Scapular-Y view
  - Joint space narrowing, osteophytes, and humeral head and/or glenoid flattening
Glenohumeral DJD Treatment

Non-Operative

• Physical Therapy
• Pain Medicine
  – NSAIDs
  – Tylenol (APAP)
  – Narcotics
• Steroid Injections
• Viscosupplementation
  – **Level I** – Not Clinically Significant
    Blaine T et al. JBJS Am 2008
  – **Level II** – **Helps with Rotator Cuff Arthropathy**
    Tagliafico A. Eur Radiol. 2011

Operative

• Non-Joint Replacement
• Partial Joint Replacement
• Total Joint Replacement
• Reverse Total Joint Replacement
**Glenohumeral DJD Treatment**

**Non-Operative**
- Physical Therapy
- Pain Medicine
  - NSAIDs
  - Tylenol (APAP)
  - Narcotics
- Steroid Injections
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Glenohumeral DJD Treatment

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Glenohumeral DJD Treatment

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Operative

• Non-Joint Replacement
• Partial Joint Replacement
• Total Joint Replacement
• Reverse Total Joint Replacement
AC Joint DJD

www.shouldersurgery.com.au
AC Joint DJD

History
- Pain radiates from superior shoulder to lateral neck and upper trapezius
- Pain with reaching, especially across body
- Pain with pushups, bench press, and overhead lifting
- Aching rest pain
- Usually insidious onset
- No change in shoulder pain with Neck ROM

Exam
- Tender To Palpation at AC joint
- Pain with Cross-Arm Adduction test
- Likely will have secondary Impingement signs
  - Scapular dyskinesis
  - Limited passive internal rotation (IR)
  - Symptoms resolve/improve with scapular retraction test
  - Pain with Neer’s and Hawkins’ tests
Cross-Arm Adduction Test

Arm is forced in ADDuction towards other shoulder.
Elbow is flexed.

http://i3.ytimg.com/vi/fV97PjxXJQg/default.jpg

http://www.massagetherapy.com/ce/content/images/664.jpg
AC Joint DJD

**Imaging**
- 3-4 views of the Shoulder
  - AP Int. & Ext. Rotation & Axillary +/- Scapular-Y view
  - Joint space narrowing and osteophytes
- Neck XR only if reproducible radicular signs/symptoms

**Treatment**
- AC joint CS Injection
- Topical or PO NSAIDs and Ice
- **Rehab**
  - Addressing Impingement mechanics off loads the AC joint
    - Strengthen Scapular Stabilizers
    - Stretch Tight Posterior Capsule and Pectoralis Minor
- Distal Clavicle Excision if conservative Tx fails
AC Joint Sprain
AC Joint Sprain

History

- Fall onto/Blow to superolateral shoulder with ADducted arm
- Pain radiates from superior shoulder to lateral neck and upper trapezius
- Pain with reaching, especially across body
- Pain can prohibit pushups, bench press, and overhead lifting
- Aching rest pain
- No change in shoulder pain with Neck ROM

Exam

- Tender To Palpation at AC joint
- May have step off at AC Joint
- Pain with Cross-Arm Adduction test
- Likely won’t have secondary Impingement signs unless they present late
AC Joint Sprain

**Imaging**

- 3-4 views of the Shoulder
  - AP Int. & Ext. Rotation & Axillary +/- Scapular-Y view
  - Degree of Separation determines type of dislocation

**Treatment**

- Type I and II – Non-Op
  - Sling initially and Ice
  - PO NSAIDs or APAP or Narcs (rare)
  - AC joint CS Injection
  - Rehab
    - Avoid developing Impingement

Type III – Non-Op or Surgery

- If distal clavicle overrides acromion on Cross Arm ADduction test → Surgery

Type IV-VI - Surgery

- AC Joint Reconstruction

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AC Joint Sprain XR

Grade 2

Grade 3

Grade 4

Grade 5
Glenohumeral Instability

http://www.imageinterpretation.co.uk/shoulder.html
http://emcow.files.wordpress.com/2012/09/shoulder-disloc1.jpg
http://www.intechopen.com/source/html/40393/media/image6_w.jpg
Glenohumeral Instability

History

• Subluxation
  – Popped back in w/o specific Tx

• Dislocation
  – Someone else reduces or specific technique used to relocate joint

• Direction of Instability follows humeral head
  – ABduction-ER = Anterior (90%)
  – Abduction = Inferior
  – Forward Elevation = Posterior

Exam

• Arm hanging limp at side
• Inability to reach across body
• Inability to externally rotate arm
• Anterior Instability
  – Apprehension/Relocation tests
    • Sensitive & Specific for Fear, Not Pain
• Inferior Instability
  – Sulcus on Traction tests
• Posterior Instability
  – Posterior Jerk test
Anterior Instability

Apprehension and Relocation Tests

FIGURE 2. To perform the apprehension test (A), the examiner abducts the patient’s arm 90° and externally rotates it 90°. The test is positive if the patient senses the shoulder slipping out of the joint, not just pain. To perform the relocation test (B), the examiner posteriorly directs force on the anteriorly subluxated humeral head. The test is positive if the humeral head relocates in the joint.

http://www.chiro.org/LINKS/FULL/Shoulder_Dislocation_in_Young_Athletes.html
Posterior & Inferior Instability

Posterior Jerk Test

Sulcus Sign with Traction Test

http://i1.ytimg.com/vi/gPuCikFKUzE/maxresdefault.jpg

http://o.quizlet.com/Y8H2wK5l mz4g0bpp.9v3Pw_m.jpg
Glenohumeral Instability

Imaging

• 4 views of the Shoulder
  – AP Int. & Ext. Rotation & Axillary & Scapular-Y view
  • Axillary view prevents missing a posterior dislocation

• Classification

FREQUENCY
  Solitary – “1 Episode”
  Occasional – “2-5 Episodes”
  Frequent – “>5 Episodes”

ETIOLOGY
  Traumatic – History of injury
  Atraumatic – No history of injury

DIRECTION (PRIMARY) Determined by provocative testing
  Anterior
  Inferior
  Posterior

SEVERITY
  Subluxation – Reduced without help
  Dislocation – Required help to reduce

Treatment

• Reduce Dislocated Joint
  – Level I – Intra-articular lidocaine is preferred to IV sedation
    • Same success; Less complications (0.9 vs. 16.4%)
    Fitch RW, Kuhn JE. Acad Emerg Med 2008

• Sling Immobilization
  – Level I & II – Ext. Rot. may reduce recurrence; Req. 3 wks. (1/4 studies)
    Itoi et al. JBJS 2007

• Sling vs. Surgery (No studies Rehab vs. Sx)
  – Level I – Non-Op Tx has higher risk of recurrence (47 vs. 16%)
    Kirkley et al. Arthroscopy 1999

Final Summary

• Was there an injury/event? Or was it a process?
  – Injury/Event – Rot. Cuff Tear, Subacromial Bursitis, AC or GH Dislocation
  – Process – Impingement, Frozen Shoulder, Biceps Tendonitis, DJD

• Do they have “Rest Pain”?
  – No – Impingement, Rotator Cuff Tear (after initiating pain), Prox. Biceps Tear
  – Yes – Subacromial Bursitis (rapid), Frozen Shoulder (gradual), DJD (constant), AC or GH Dislocation (acute)

• Where does it hurt? Where does the pain go? What causes it?
  – Tendonopathy hurts with palpation, stretch, and contraction

• Appropriate XR will adequately address most shoulder pain
  – Always include an A/P Int./Ext. Rotation views with an Axillary view
  – If Acute Rotator Cuff Tear suspected ➔ MRI
  – If Glenohumeral Instability ➔ Scapular-Y
Questions or Comments
Thanks Again!