Rehabilitation for Treatment of Shoulder Impingement in Athletes

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Presentation Goals
- What is shoulder impingement?
- What are the different types?
- How do we treat it?
- What’s the evidence say?
- Keys to success
- How do we prevent it?

What Is Shoulder Impingement?

 Anything that is pinched in the shoulder joint anywhere.

What Are The Types of Impingement

- Primary Impingement
- Secondary impingement
- Internal Impingement
- Coracoid Impingement

What Are The Types of Impingement

Impingement Types
- Primary Impingement
- Secondary impingement
- Internal Impingement
- Coracoid Impingement
Pathoanatomy: Overhead Athletes

Primary Impingement

- Bone spur

Pathoanatomy: Overhead Athletes

Secondary Impingement

- Ball NOT Centered
  - Anterior/Superior Migration
    - On shoulder elevation/ER
      - Impingement

Pathoanatomy: Overhead Athletes

Internal Impingement

- Arm in full Abd & ER
  - Rotator cuff pinches against posterior superior labrum
  - Will occur to some extent in normal subject
  - Abnormal anterior translation →
    - Worsening of internal impingement

Pathoanatomy: Overhead Athletes

Coracoid Impingement

- Subscapularis tendon impinges between the coracoid process and lesser tuberosity of the humerus.
- Anterior shoulder joint pain in activities involving forward flexion, adduction and internal rotation.
Recent Literature (2016)


Rehabilitation Guidelines For Shoulder Impingement

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<th>Time Frame</th>
<th>Clinical Progression</th>
<th>Activities</th>
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<td>Weeks 0-1</td>
<td>Modalities PEN for pain</td>
<td>Gentle pendulum circles</td>
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<td>Elbow AROM for flexion and extension</td>
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<td>Weeks 1-4</td>
<td>Wrist strengthening</td>
<td>Progressive resistive exercise</td>
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<td>Elbow strengthening with shoulder stabilized</td>
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<td>Contraindicated with superior labral repair</td>
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<td></td>
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<td>Submaximal isometrics at 0° abduction</td>
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<td>Manual resistance</td>
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<td>SC, AC, and Scapulothoracic mobilization</td>
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<td></td>
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<td>Manual resistance</td>
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<td>Scapulothoracic rhythm</td>
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Rehabilitation Goals

- Centralizing humeral head in glenoid fossa
- Restoring normal tissue tension
- Normalizing Scapulohumeral rhythm
- Addressing Thoracic Spine
- Posterior Shoulder Extensibility

Rehabilitation Focus (Keys to Success)

- Posterior shoulder tightness
  - Capsule
  - Muscle
- Dynamic posterior rotator cuff strength
  - External rotators
  - Muscle balance
- Scapulothoracic rhythm
Posterior Shoulder Tightness

Posterior Shoulder Tightness

Posterior Capsulorrhaphy on PROM
- Gerber et al. JBJS 85A (1), 2003
- GH capsular plication (8 cadavers)
  - Total posterior plication
  - Limited IR by >20° (p<0.0001)

Posterior Capsulorrhaphy on Patients
- Yoenda et al. Arthroscopy 2007
- Isolated posterior capsule release
- A group of throwers
- Impingement
- All had complete resolution of symptoms

Harryman et al., Translation of the humeral head on the glenoid with passive glenohumeral motion. JBJS 72A, 1990.
Measuring The Posterior Shoulder Tightness

- Cross chest adduction
- Sidelying Measurement
- Posterior glide

Cross Chest Adduction

Starting Position

Finishing Position

Advantages of Method
- Reproducibility
- Monitor scapula
- Glenohumeral detection
- Quantitative measure

Tyler et al, JOSPT, 1999; 29: 262-274
Posterior Shoulder Tightness =

Muscle & capsule

Capsule

Posterior Glide

Late Posterior Glide

Posterior Shoulder Stretch
Posteriorinferior Shoulder Stretch

The relationship between a tight posterior capsule and IR ROM

The Relationship in Throwers

- Influence
  - Range of motion adaptations
- Extremity athletes
  - IR range of motion
  - ER range of motion

Research

- Myers et al. Glenohumeral ROM Deficits & Posterior Shoulder Tightness in throwers with Pathologic Internal Impingement. AJSM 2006
- 11 Throwers Vs. Controls

<table>
<thead>
<tr>
<th>Movement Deficits</th>
<th>Controls</th>
<th>Pts.</th>
<th>P</th>
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<tbody>
<tr>
<td>ER</td>
<td>5±5</td>
<td>8±9</td>
<td>.16</td>
</tr>
<tr>
<td>IR</td>
<td>-11±9</td>
<td>-20±13</td>
<td>.03</td>
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<tr>
<td>Post Shld</td>
<td>-1±2cm</td>
<td>-4±4cm</td>
<td>.03</td>
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</table>
Correction of Posterior Shoulder Tightness Is Associated With Symptom Resolution in Patients With Internal Impingement

Subjects
- 22 patients
  - 11 men
  - 11 women
  - Age 41±3 yr
  - Diagnosed with internal impingement
  - 6 SLAP repairs
    - >6 mo post-op
  - 16 non-surgical

Sports
- 8 Tennis
- 7 Golf
- 1 Ice hockey, figure skating, baseball (1B), basketball, swimming, snowboarding

Physical Therapy Intervention
- TSW 6 weeks max (range 3-6 wk)
- Home Program Daily
  - Posterior Shoulder Stretching
  - Mobilization
  - Passive stretch
  - Sleeper Stretch
  - Strengthening
  - External Rotators
  - Scapular Stabilizers

Results Summary
- Treatment Effective
  - Symptom Relief (Simple Shoulder Test)
  - Decreased Posterior Shoulder Tightness
  - Decreased GIRD

Symptom Relief
- Associated with Improvement Posterior Shoulder Tightness
- NOT Associated with Improvement GIRD
Posterior Shoulder Summary

- Non-Operative Treatment
  - Aggressive glides immediately
  - Restore Mobility
    - iR stretching AFTER throwing
    - Address thoracic spine


Dynamic Posterior Rotator Cuff Stability

Research

- *Cain PR et al. AJSM, 1987*
  - Anterior stability of GH joint
  - Cadaveric model
  - Rotator cuff muscles
  - Infraspinatus & teres minor
  - Most effective in controlling stress on IGH
  - Cocking position

  - Randomized controlled trial with 3 months of follow-up
  - Sample size 97
  - PT strengthening exercise program superior in impingement syndrome than general strengthening program.
  - Treatment was successful
    - DASH
    - Constant-Murley score
    - VAS scores.
  - Fewer subsequently chose surgery

Research
**ER Strengthening**

- Provide dynamic stability - centralize head
  - Rhythmic stabilization - IR/ER
- Isometric ER

**Cuff Strengthening**

- Townsend et al, AJSM, 1991
  - Best exercise to activate infraspinatus & teres minor
  - EMG shld mm-rehab exercises
  - ER in sidelying
  - 80-88% of MVC
- Theraband Use

**Continuum of ER Positioning**

- Shoulder Rotation
  - 0°
  - Scapular plane
  - 45°
  - 90°

**ER@ 90/90**
Dynamic Stability Summary

- Non-Operative Treatment
  - Start with Rhythmic stabilization- IR/ER
  - Continuum of ER
  - Address posterior cuff
  - 3 sets of theraband in 90/90 position to fatigue

Scapulohumeral Rhythm

Link To Pathology

- Impingement
- Anterior instability
- Rotator cuff tears


Can We Measure Scapulohumeral Rhythm?

- In the lab we can

  - Flock of birds


The Lab Evidence Shows


The Evidence

- MORE ANTERIOR TILTING

- Provides scientific evidence to focus rehabilitation protocols toward a restoration of posterior tilting.

That’s great in the lab.

But how do you & I do it in the clinic?
QUALITATIVE CLINICAL EVALUATION OF SCAPULAR DYSFUNCTION: A RELIABILITY STUDY

KIBLER WB, UHL TL ET AL, J SHOULDER ELBOW SURGERY 11:550-556, 2002

MEDIAL BORDER DYSFUNCTION

- MOST COMMON IN PATIENTS WITH INSTABILITY

INFERIOR BORDER DYSFUNCTION

Superior Scapular
So What Are We To Do?

Baseball Research

- Ellenbecker et al., Clin Orthop Relat Res 2012
  - Reliability of scapular classification in pro pitchers
  - 71 players
  - 5 Reps video taped
  - 4 testers
- Poor reliability

Dynamic Evaluation

- 1- Scapular takes off @ 30°
- 2- Scapular oscillation on humeral elevation
- 3- Scapular drops rapidly on humeral return

What’s The Alternative?
**Dynamic Evaluation**

Maybe as simple as

YES or NO

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**How Does This Effect Our Therapeutic Exercise Choice?**

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**Therapeutic Exercise**

- It DOESN'T
- Scapular Program is the same
- Exception
  - Serratus Weakness

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**Muscle Balance**

- Two Upward/Outward rotators
  - Serratus Anterior
  - Lower Traps
- Upper Trap atrophy?
Scapular Stabilizer Training

- How to train?
- Normal force-couple
  - Activate
  - Inhibit
- Milestone - Restore rhythm

Neuromuscular Re-education of ST Jt

- Sidelying
  - Neuromuscular Re-ed
  - Isometrics
    - Elevation/depression
    - Protraction/retraction

Early Scapular Exercises


Late Scapular Exercises

DeMey et al. AJSM 2012

- **Title**: Scapular Muscle Rehabilitation Exercises in Overhead Athletes With Impingement Symptoms: Effect of a 6-week Training Program on Muscle Recruitment and Functional Outcome
- **Purpose**: To evaluate the effect of a 6 week exercise program utilizing 4 clearly defined **scapular exercises** in a population of overhead athletes with mild impingement symptoms.
- **Study design**: Case series; Level 4 evidence

Methods: Participants

- **Subjects**: 47 (25 men and 22 women)
- **Age**: 24.6 (7.81) years
- **Subjects performed a 6-week daily HEP consisting of 4 exercises**
  - Strict guidelines were present for exercise intensity, progression, periodization, and pain allowance

Exercises

1. [Image 1]
2. [Image 2]
3. [Image 3]
4. [Image 4]
Results

- This study demonstrated that previously selected exercises:
  - (1) Improve pain and function based on SPADI scores
  - (2) Reduce relative trapezius muscle activation
  - (3) Improves UT/SA ratios

New Directions

  - Selected 4 exercise to rehabilitate scapular muscle balance in healthy subjects based on EMG data supporting low UT/MT and UT/LT ratios
    - Sidelying forward flexion, sidelying external rotation, prone horizontal abduction with external rotation, prone extension
- Michener LA, et al. (2009)
  - EMG data revealed a disruption in coordination between the LT and SA and the UT and LT during an arm elevation task in patients with subacromial pain syndrome.
  - The LT was part of both altered ratios, indicating the relative importance of the LT.

SELECTIVE ACTIVATION AND INHIBITION
Methods

- 10 healthy subjects
- Surface Electrode pairs:
  a) anterior deltoid
  b) posterior deltoid
  c) upper trapezius
  d) lower trapezius
  e) serratus anterior
  f) Infraspinatus

Summary

- Using Thera-Band during the Wall Walk or Wall Slide exercises demonstrated:
  - To decrease anterior deltoid and upper trapezius activity
  - To increase posterior deltoid and lower trapezius activity
  - To increase infraspinatus activity
  - To have no effect on serratus activity

STJ Conclusions

- Clinical identification of scapulohumeral rhythm
  - Simple as YES or NO
- Emphasize
  - Lower traps
  - Serratus anterior
  - Restoration of posterior tipping
- Choose exercises that Increase SA/LT and Decrease UT activity
Take Home Message

- Check !!!!!!!!
  - Posterior Shoulder Tightness
  - Scapulohumeral Rhythm
  - External Rotation Strength