

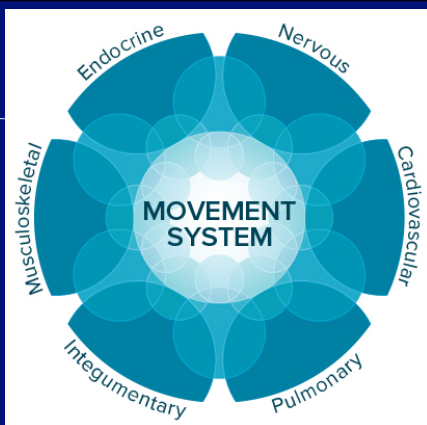
Rehabilitation for Treatment of Shoulder Impingement in Athletes

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 and Athletic Trauma
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Presentation Goals

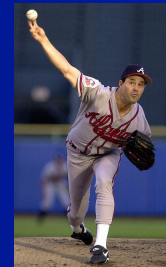
- What is shoulder impingement?
- What are the different types?
- How do we treat it?
 - What's the evidence say?
- Keys to success
- How do we prevent it?



What Are The Types of Impingement

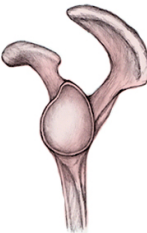
Impingement Types

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

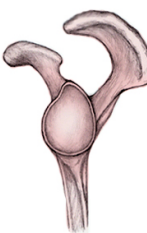


Pathoanatomy: Overhead

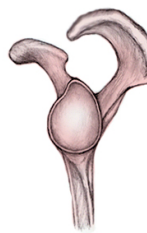
Type I - Flat




Type II - Curved



Type III - Hooked



Tangtrakulwanich B, Kapkird A. Analyses of possible risk factors for subacromial impingement syndrome.. World J Orthop. 2012 Jan



Pathoanatomy: Overhead Athletes

Secondary Impingement

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



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

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
- Symptoms include:
 - Posterior arm pain
 - Loss of velocity
 - “Dead arm” sensation

Full Abd & ER

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.

Coracoclavicular ligament

Coracoid process

Acromion process

Supraspinatus

Coracohumeral ligament

Glenohumeral joint capsule

Tendon of biceps brachii

Roche SJ, et al. Coracoid impingement syndrome: a treatable cause of anterior shoulder pain. Ir J Med Sci. 2006 Jul-Sep; 175(3):57-61.

Recent Literature (2016)

LASER Acupuncture Treatment Improves Pain and Functional Status in Patients with Subacromial Impingement Syndrome: A Randomized, Double-Blind, Sham-Controlled Study. Kibar S, et al. Pain Med. 2016 Nov 5.

The comparative efficacy of **KINESIO TAPING** and local injection therapy in patients with subacromial impingement syndrome. Göksu H, et al. Acta Orthop Traumatol Turc. 2016 Oct;50(5):483-488.

Extracorporeal Shockwave Therapy Combined With Isokinetic Exercise More Effective Than **EXTRACORPOREAL SHOCKWAVE** Therapy Alone for Subacromial Impingement Syndrome? A Randomized Clinical Trial. Santamato A, et al. J Orthop Sports Phys Ther. 2016 Sep;46(9):714-25.

EXERCISE THERAPY after ultrasound-guided corticosteroid injections in patients with subacromial pain syndrome: a randomized controlled trial. Ellegaard K, et al. Arthritis Res Ther. 2016 Jun 4;18(1):129.

PLATELET-RICH PLASMA VERSUS STEROID INJECTION for subacromial impingement syndrome. Say F, et al. J Orthop Surg. 2016 Apr;24(1):62-6.

ACUPUNCTURE treatment of shoulder impingement syndrome: A randomized controlled trial. Rueda Garrido JC, et al. Complement Ther Med. 2016 Apr;25:92-7.

Rehabilitation Guidelines For Shoulder Impingement

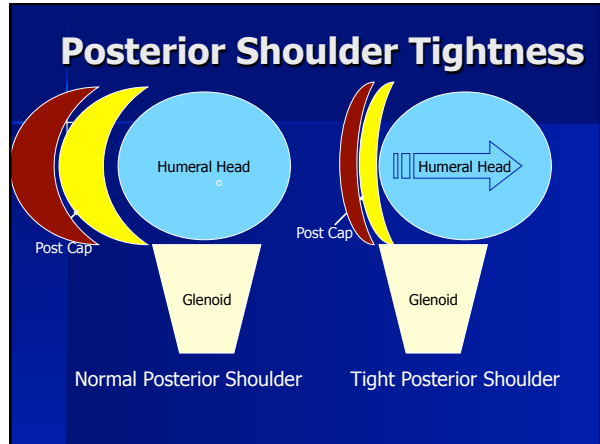
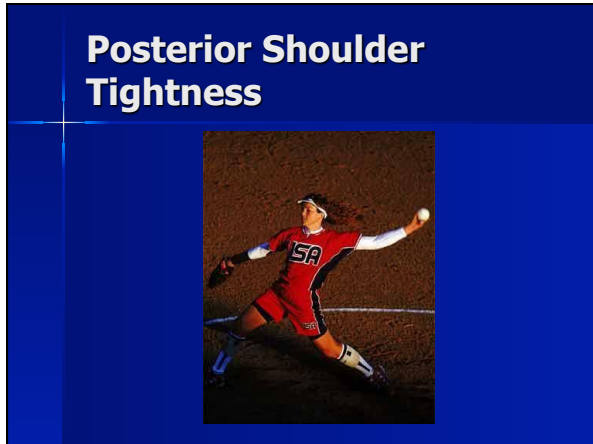
Time Frame	Clinical Progression	Activities
Weeks 0-1	Modalities PRN for pain	
	Gentle pendulum circles	
	Elbow AROM for flexion and extension	
Weeks 1-4	Wrist strengthening	Progressive resistive exercise
	Elbow strengthening with shoulder stabilized	Contraindicated with superior labral repair
	Submaximal isometrics @ 0° abduction	Manual resistance
	SC, AC, and Scapulothoracic mobilization Scapular stabilization	Manual mobilization Manual resistance

Rehabilitation Goals

- Centralizing humeral head in glenoid fossa
- Restoring normal tissue tension
 - GH, SC, AC, Scap-Thor Jts.
- 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
- Scapulohumeral rhythm



Posterior Capsulorrhaphy on PROM

- Gerber et al. *JBJS 85A (1), 2003*
- GH capsular plication (8 cadavers)
 - Total posterior plication
 - Limited IR by $>20^\circ$ ($p < 0.0001$)

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

Posterior Capsulorrhaphy on Patients

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

Measuring The Posterior Shoulder Tightness

- Cross chest adduction
- Sidelying Measurement
- Posterior glide

Cross Chest Adduction



Starting Position



Tyler et al., Posterior capsule tightness and motion loss in patients with shoulder impingement. American Journal of Sports Medicine, 2000.

Finishing Position

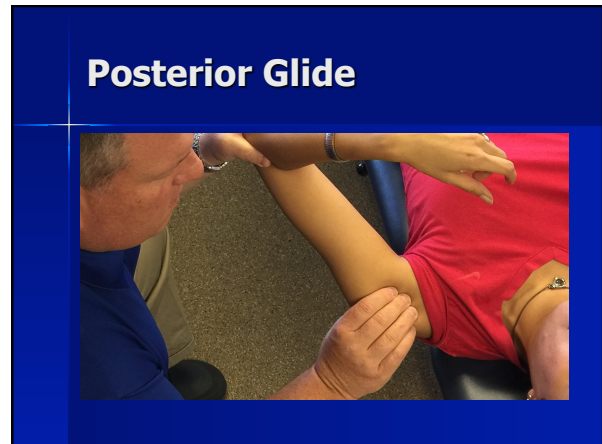




Advantages of Method

- 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

Kibler WB, et al., Am J Sports Med, 1996
Magnusson P, et al., Med Sci Sports Exer, 1994

Research

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

<i>Movement Deficits</i>	<i>Controls</i>	<i>Pts.</i>	<i>P</i>
ER	5±5	8±9	.16
IR	-11±9	-20±13	.03
Post Shld	-1±2cm	-4±4cm	.03

Correction of Posterior Shoulder Tightness Is Associated With Symptom Resolution in Patients With Internal Impingement

Timothy F. Tyler,^{1,2} PT, ATC, Stephen J. Nicholas,³ MD, Steven J. Lee,² MD, Michael Mullaney,¹ PT, and Malachy P. McHugh,¹ PhD
From ¹PRO Sports Physical Therapy, Scarsdale, New York, and the ²Nicholas Institute of Sports Medicine and Athletic Trauma, New York, New York



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

2009 SPTS Excellence in Research Award
Tyler et al AJSM 2010

Physical Therapy Intervention

- TIW 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

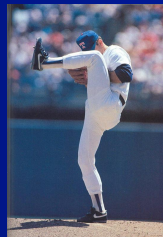
- Treatment Effective
 - Symptom Relief (Simple Shoulder Test)
 - Decreased Posterior Shoulder Tightness
 - Decreased GIRD
- Symptom Relief
 - Associated with Improvement Posterior Shoulder Tightness
 - NOT Associated with Improvement GIRD

Posterior Shoulder Summary

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

Turgut E et al. Stretching Exercises for Shoulder Impingement Syndrome: Effects of 6-Week Program on Shoulder Tightness, Pain and Disability Status. J Sport Rehabil. 2017 Jan 17:1-20.

Dynamic Posterior Rotator Cuff Stability



Research

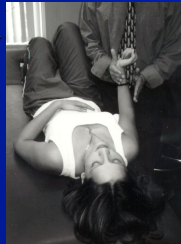
- *Cain PR et al. AJSM, 1987*
 - Anterior stability of GH joint
 - Cadaveric model
 - Rotator cuff muscles Deltoid muscle not examined
 - Infraspinatus & teres minor
 - Most effective in controlling stress on IGH
 - Cocking position

Research

- *Litchfield R. Progressive strengthening exercises for subacromial impingement syndrome. Clin J Sport Med. 2013 Jan;23(1):86-7.*
 - 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
 - Contant-Murley score
 - VAS scores.
 - Fewer subsequently chose surgery

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

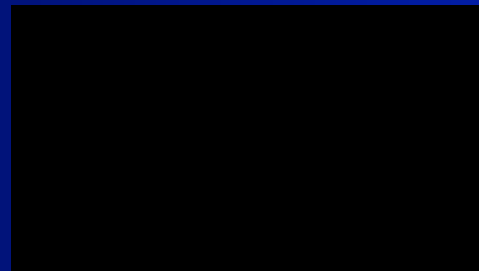


Continuum of ER Positioning

- 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

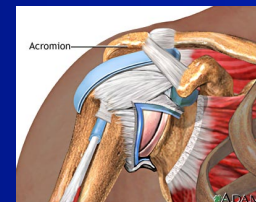
- Impingement
- Anterior instability
- Rotator cuff tears



Kibler WB, McMullen J. Scapular dyskinesis and its relation to shoulder pain. J Am Acad Orthop Surg. 2003 Mar-Apr;11(2):142-51

Link To Pathology

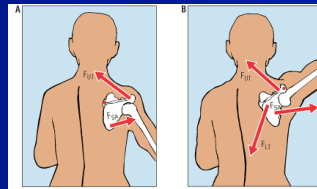
- Impingement
- Anterior instability
- Rotator cuff tears



Hallstrom E & Karrholm J. Shoulder kinematics in 25 patients with impingement and 12 controls. Clin Orthop Relat Res. 2006 Jul;448:22-7.

Can We Measure Scapulohumeral Rhythm?

- In the lab we can !!!!!!!!!!!!!!!!!!!!!
- Flock of birds
- **Hebert LJ**
Scapular behavior in shoulder impingement syndrome. Arch Phys Med Rehabil. 2002 Jan;83(1):60-9

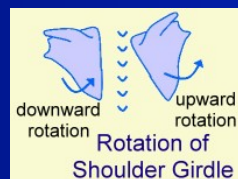


The Lab Evidence Shows

- McClure PW, Michener LA, Karduna AR. Shoulder function and 3-dimensional scapular kinematics in people with and without shoulder impingement syndrome. Phys Ther. 2006 Aug;86(8):1075-90.
- Ebaugh DD, McClure PW, Karduna AR. Scapulothoracic and glenohumeral kinematics following an external rotation fatigue protocol. JOSPT. 2006 Aug;36(8):557-71.

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

What's The Alternative ?

Dynamic Evaluation

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

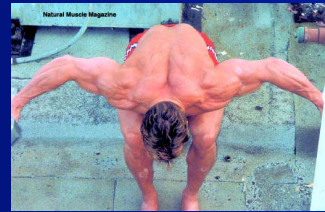


Dynamic Evaluation

Maybe as simple as

YES or NO

How Does This Effect Our Therapeutic Exercise Choice?



Therapeutic Exercise

- It DOESNT
- Scapular Program is the same
- Exception
 - Serratus Weakness




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



Decker MJ et al. Serratus Anterior Muscle Activity During Selected Rehabilitation Exercise. *Am. J. Sports Med.*, Nov 1999; 27: 784 - 791.



McCabe et al. Selective Activation of the Lower Trapezius Muscle in Patients with Shoulder Impingement. *NAJSPT*, 2007

Late Scapular Exercises



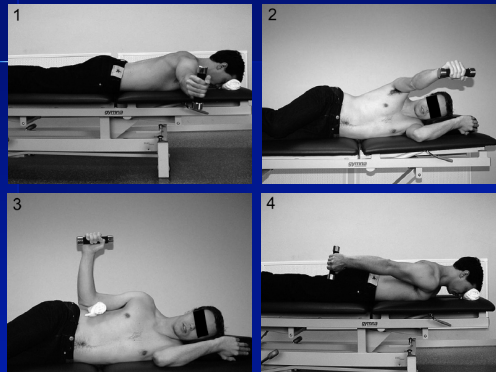
DeMey et al. AJSM 2012

- **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



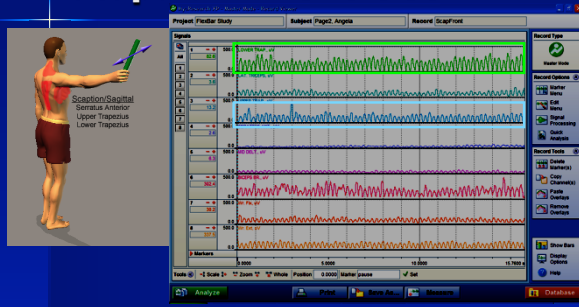
Results

- 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

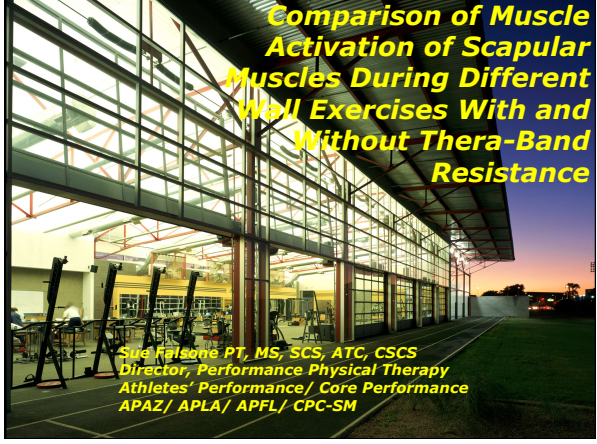
- **Cools et al (2007)**
 - Selected 4 exercise to rehabilitate scapular muscle balance in healthy subjects based on EMG data supporting *low UT/MT and UT/LT ratios*
 - Sidelying forward flexion, sidelying external rotation, prone horizontal abduction with external rotation, prone extension
- **Michener 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**

Preferential Recruitment Scapular Exercises



Page P et al. CSM 2004. Muscle activity of the upper extremity during oscillation exercise using the Thera-Band® FlexBar (Abstract).

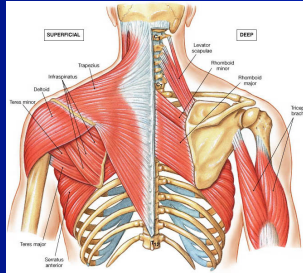
Comparison of Muscle Activation of Scapular Muscles During Different Wall Exercises With and Without Thera-Band Resistance



Sue Raime PT, MS, SCS, ATC, CSCS
 Director, Performance Physical Therapy
 Athletes' Performance / Core Performance
 APAA / APLA / APFL / CPC-SM

Methods

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



Wall Side- With Tubing



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** infrapinatus 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

THANK YOU

