Scapular Injuries

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Objectives

Discuss Scapular Injuries
Discuss Scapular Functional Anatomy
Discuss Scapular Mechanics
Discuss Rehabilitation of Scapular Injuries
Scapular Injuries
Scapular Injuries

**Fractures**
- Direct and Indirect
- Clavicle, ribs, etc

**Joint Injury**
- GH/labrum
- AC
- SC

**Muscular Injury**
- Rotator cuff
- Muscular detachment

**Functional Disturbance**
- Scapular Dyskinesia
- SICK Scapula
- GIRD
Anatomy
B  Right shoulder girdle
Superior view.

Illustrator: Karl Wesker  pp. 210-211

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A  Bones of the right shoulder girdle in their normal relation to the skeleton of the trunk

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Lateral view.
Anatomy

[Image of a skeletal structure with labeled parts: Acromion, Glenoid cavity, Medial border, Scapula, Serratus anterior, Inferior angle, Coracoid process, First through ninth ribs, Trapezius muscle with Upper, Middle, and Lower fibers.]
Fractures
Scapula, Clavicle, Ribs
Direct: Scapular Fractures

- Present in 1% of blunt trauma cases
- 0.4-1% of all bone fractures
- 80-90% with concomitant injuries
  - Clavicle fracture (23%) → “Floating Shoulder”
  - Shoulder dislocation
  - Pulmonary Contusion/Pneumothoax (23%)
    - Also flail chest and tension pneumo
  - Brachial plexus
  - Axillary artery injury
  - Rib fractures
- CT scan often required to determine severity

http://www.wheelessonline.com/ortho/scapular_fractures
Direct: Scapular Fractures

- **Site**
  - **Body/Neck**
    - 2/3 of scapular fractures
    - Usually impacted and extraarticular
    - Good prognosis
  - **Surgical Indications**
    - > 1cm medial displacement
    - > 40° angulation
- **Glenoid Lip**
  - Usually associated with dislocation
  - Surgery - > 10mm displacement or 25% intraarticular
- **Glenoid Fossa**
  - Uncommon (< 10%). Surgery if > 5mm displacement

http://www.wheelessonline.com/ortho/scapular_fractions
Indirect: Clavicle and rib fractures

- Alone
  - Disruption often leads to abnormal protraction of the scapula
- Floating Shoulder\(^1,^2\)
  - Concomitant Scapular fracture
  - Scapular Suspensory System
    - Superior (SSSS)
    - Lateral (LSSS)
- Ribs
  - Often lead to dyskinesis

Joint Injuries
Glenohumeral/labral, Acromioclavicular, Sternoclavicular
Scapular Relation:

- Multidirectional instability (MDI)
- Labral Tear
- 15/85

• “Torn loose” vs “Born loose”
Scapular Relation:

- Multidirectional instability (MDI)
- Labral Tear
Scapular Relation: Unstable Base

AC injury
SC injury
Muscular Injury
Rotator Cuff, Muscle Detachment
Scapular Relation:
- Impingement
- Rotator Cuff Tears

- Very Broad Term
- Local Problems
  - RC, Long head biceps
  - Bursitis
  - Labral pathology
- Distant Problems
  - Scapular dyskinesisis
  - Kinetic chain disruption
- Chicken or the egg???
  - Either way, treat the scapula!
- Lower trap and rhomboids
  - Detach from medial scapular border
- Uniform presentation
  - Early post-traumatic onset of localized intense pain along the medial scapular border
  - Major limitations in forward flexion or overhead
- Localized tenderness
  - Palpable soft tissue defect
- Altered scapular resting position
  - Dynamic dyskinesia
  - Positive SRT
- MRI CT not helpful
- PT first but occasional surgery
Functional Injury
Scapular Dyskinesis/GIRD/Upper Crossed Syndrome
Scapular Motions

- Upward/Downward Rotation
- Internal/External Rotation
- Anterior/Posterior Tilt
- Upward/Downward Glide

In isolation, these are clinically limited
External Rotation  
Posterior Tilt  
Upward Rotation  
Medial Translation

Internal Rotation  
Anterior Tilt  
Downward Rotation  
Lateral Translation

Upward Translation  
Anterior Tilt  
Internal Rotation

Retraction

Protraction

Shrug

Clinical Implications
Composite, Coupled Motion

Functional Anatomy

Clinical Implications
Composite, Coupled Motion
Protraction/Retraction
Shrug
Scapular Dyskinesia - Definition

- Kibler 2001
- “An observable alteration of the position and motion of the scapula relative to the thoracic cage”
- “The requirement of high levels of scapular muscle activation to stabilize the scapulothoracic articulation and optimally position the glenoid to maximize glenohumeral congruity”
“SICK” Scapula

- Scapular malposition
- Inferior medial border prominence
- Coracoid pain
- Dyskinesia
  - Tight pec minor/biceps
  - Lowered throwing shoulder
GIRD

- > 20°
- Tight posterior capsule
  - PIGHL
- Leads to “Wind-up”
  - Increased protraction
  - Kinetic chain disruption
Upper Crossed Syndrome
Scapular Implications in Shoulder Injuries
The Scapula in Sports
Scapular Kinematics
Scapular Kinematics:
Swimming: Dyskinesia/GIRD?
Scapular Kinematics:
Throwing Athletes
Overhead Athletes:
Dyskinesis/GIRD?
Clinical Evaluation
Clinical Evaluation: Goals

- Identify Abnormal scapular motion
- Determine relations between dyskinesia and symptoms
- Identify causative factors for dyskinesia
Clinical Evaluation

- Evaluate Dyskinesis
- Examine Surrounding Tissues
  - Scapular Stabilizer Muscle Testing
  - Posture
  - Muscle “tightness” evaluation
Key Muscles

- Serratus Anterior
- Upper Trapezius
- Middle/Lower Trapezius
Balance
Posture

- Forward head posture
- Increased thoracic kyphosis
- Shortened pectoralis minor
- Posterior shoulder tightness
- Upper Crossed Syndrome evaluation
Posture

- Pec Minor
- Posterior Capsule
  - PIGHL
Clinical Evaluation: Dynamic Scapular Dyskinesis Tests

- LST (Lateral Scapular Slide Test)
- SAT (Scapular Assistance Test)
- SRT (Scapular Retraction Test)
LST- Lateral Scapular Slide Test

- Static Measurement
- ILA Scapula → Spinous Process
SAT – Scapular Assistance Test

Reduction or abolition of pain = positive

http://www.youtube.com/watch?v=I9Dzze57EWM
SRT – Scapular Retraction Test

http://www.youtube.com/watch?v=Tm_q2ipA0_o
Kibler Classification

Type I

Type II

Type III

Inferior Angle

Medial Border

Superior Angle

Yes or No? Type?
Scapular Evaluation: Pitfalls

• Laboratory studies with 3D tracking\textsuperscript{1,2,3}
  • Gold Standard
  • Practicality?
• Clinical inter-rater reliability questioned \textsuperscript{3,5}
  • Conflicting evidence

\textsuperscript{2}Konda et al. Scapular rotation to attain the peak shoulder external rotation in tennis serve. Med Sci Sports Exerc. 2010;42:1745-1753
\textsuperscript{3}McClure et al. Direct 3-dimensional measurement of scapular kinematics J Shoulder Elbow Surg. 2001;10:269-277
\textsuperscript{5}Ellenbecker et al. Reliability of scapular classification in examination of professional baseball players. Clin Ortho Relat Res. 2012. 470:1540-44
Scapular Evaluation: Pitfalls

• LST- Lateral Scapular Slide Test

• Validity questioned
  • Unable to differentiate between symptomatic and asymptomatic shoulders
Scapular Evaluation: Pitfalls

SRT – Scapular Retraction Test

Validity questioned by Kibler et al 2006 (AJSM)

- Found increased strength regardless of symptoms

http://www.youtube.com/watch?v=Tm_q2ipA0_o
Kinetic Chain: Evaluation
Kinetic Chain: Evaluation

- Core
  - Planks
  - Single leg squat
  - Muscle recruitment patterns
  - Hip flexor/Rectus femoris tension
Treatment: Rehabilitation is Paramount

Identify causative factors
Causative Factors

Neurologic
- Nerve Palsy (long thoracic/spinal accessory)

Joint Derangement*
- Labral injury
- GH instability
- Biceps tendinitis
- AC separation

Bone*
- Clavicle fractures
- Scapular fractures

Inflexibility
- GIRD
- Total ROM deficits
- Pec minor inflexibility

Muscular
- Lower trap weakness
- Serratus anterior weakness
- Upper trap hyperactivity
- Scapular muscle detachment

Kinetic Chain
- Hip/leg weakness
- Core weakness

* May need surgical correction before appropriate rehab can begin
Patient Example
Key Rehabilitation Concepts

- Activation Sequencing
- Forced Couple Activation
- Concentric/Eccentric Emphasis
- Strength
- Endurance
- Avoidance of Unwanted Patterns
What’s the Evidence?
EMG Studies MT/LT/SA

Scapular Clock
Wall Washers
Inferior Glide
Low Row
Lawn Mower
The Robbery
Sleeper Stretch

• Goal is to maximize MT/LT/SA and minimize upper trap
• Cools\(^1\) De Mey\(^2\) protocols
  • Change *activation patterns*
• Validated by De Mey\(^3\) 2012
  • Mild impingement syndrome
  • 6 week home rehabilitation
  • Significant *reduction in pain* with exercise alone

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\(^{1}\)Cools AM et al. Rehabilitation of scapular muscle balance: which exercise to prescribe? AJSM 2007;35(10):1744-1751
\(^{2}\)De Mey K et al. Trapezius muscle timing during selected shoulder rehabilitation exercises. JOSPT 2009;39(10):743-752
\(^{3}\)De Mey et al. Scapular muscle rehabilitation exercises in overhead athletes with impingement syndromes. AJSM 2012;40(8):1906-1915
De May/Cools Protocol
Manual Therapy

• Intuitively it makes sense
• Evidence?
• Sucher\(^1\) found correction of pec minor shortening
  • US Measurement
  • Case study
• Rosa\(^2\) et al found no effect of manipulation on scapular rhythm
  • EMG study
  • Asymptomatic patients
  • Seated HVLA

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\(^1\)Sucher. Ultrasound-guided OMT for a patient with thoracic outlet syndrome. JAOA. 2011;111:543-547
\(^2\)Rosa et al. Effect of seated thoracic manipulation on changes in scapular kinematics. J Manipulative Physio ther. 2013;Sep 5. *epub*
Dyskinesis present in high percentage of shoulder injuries

Exact role of dyskinesia unknown
  - Create or exacerbate?

Shoulder impingement particularly affected by dyskinesia

Dyskinesis viewed as potential impairment to shoulder function

Recognition of dyskinesia improves treatment outcome

Reliable clinical evaluation method for dyskinesia exists

Rehab programs should encompass correction of dyskinesia

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Thank You!

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