Shoulder Functional Anatomy

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April 23, 2016
Shoulder Anatomy

• 3 Bones
  – Scapula
  – Clavicle
  – Humerus

• 4 Functional Areas
  – 2 Bursal zones
    • Subacromial
    • Scapulothoracic
  – 2 Articulations
    • Glenoid-humeral
    • Acromion-clavicle
Gleno-Humeral & Thoracic Relationship

- Glenoid retroversion: $4^\circ - 12^\circ$
- Humeral retroversion
- Greater tuberosity
- Bicipital groove
- Lesser tuberosity: $25^\circ - 30^\circ$
Shoulder Suspension System

Acromioclavicular Joint

Acromio-clavicular ligament

Clavicle

Coraco-acromial ligament

Acromion

Coraco-clavicular ligament

Coracoid process

Scapula

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Distal third Clavicle Fracture: Very Unstable
AC Separation: Type 3+
Think about the Shoulder “Backwards”

Superficial muscles
- Trapezius
- Deltoid

Deep muscles
- Levator scapulae
- Rhomboid minor
- Rhomboid major
- Supraspinatus
- Infraspinatus
- Teres minor
- Teres major
- Triceps brachii long head

Superior border of the scapula
Spine of the scapula
Medial border of the scapula
The head of the humerus
Rib cage
Spine
Muscles of the Rotator Cuff

- Subscapularis
- Supraspinatus
- Infraspinatus
- Teres minor
Rotator Cuff Function

• Principal function
  – Compresses GH joint
  – Improves stability
    • Midrange of motion
      – When passive restraints are lax
  – Dynamizes capsular ligaments
    • RC tendons blend with joint capsule
    • Resists sliding & translation of H on G
  – Provides rotation in all major axes
  – Susceptible to;
    • Inflammation or Tendinitis
    • Tearing (traumatic and degenerative)
Greater Tuberosity Fx: RC disruption
Fracture Dislocation of GH joint & Dislocation GH in Adults > Rotator Cuff compromise
Cuff Injury Spectrum

- Multiple etiology
  - Degenerative v. Traumatic
    - Combined
  - Impingement
  - Associate injury & Conditions
    - Osteoarthritis

- Diagnostic Challenge
  - Accurately assessment;
    - Understand anatomic disruption
    - Correlate functional compromise

- Therapeutic Challenge
  - Rx the pain
  - Restore Anatomy
  - Restore Function
Cuff Tear Progression
Retraction & Atrophy

• Natural history
  – Increase in size
  – Retractions
  – Tissue scarring
  – Muscle atrophy
  – Irreversible
    • Rate
      – Age
        » Chronologic
        » Pathologic

• Exam
  – Atrophic supraspinatus fossa
  – Unable to lift arm
Shoulder “Arthritis” Spectrum

Cuff Tear Arthropathy  
Gleno-humeral OA  
Acromio-clavicular OA
Shoulder – Anterior View

- Acromion
- Coracoid process
- Greater tubercle
- Biceps brachii tendon (long head)
- Anterior humeral circumflex artery
Tendonitis and Impingement

Shoulder Tendonitis

- Tendons Affected by Rotator Cuff Tendonitis
  - Supraspinatus
  - Subscapularis
  - Teres Minor
  - Infraspinatus (behind, not shown)

Bicep Tendonitis

Biceps muscle

Acromioclavicular Osteoarthritis

Glenohumeral joint
Scapula

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The Shoulder: complex & unique

- Gleno-humeral joint is relatively unconstrained

- Multiplanar range is result of motion at multiple “joints”:
  - Forward Flexion: 180°
  - Abduction: 90°
  - Adduction: 45°
  - Internal rotation: 90°
  - External rotation: 90°
  - Translation on Thorax: 45° & 45°
Stiffness is the enemy of Joints

• A stiff joint is a painful joint
  – Frozen shoulder
  – Osteoarthritis
  – Post-traumatic
    • Peri-articular fractures
    • Surgical “over-tightening”
  – Aging

• Loss of tissue gliding & function
  – Principal cause of “impingement”

• As a rule...
  – Examine for ROM (Active & Passive)
  – Limit immobilization of joints
Neurologic Function Rotator Cuff
PT & Shoulder Surgery

- ROM, ROM, ROM
  - Stiffness is the enemy of Joints
- Posture, Posture, Posture
  - Sling shoulder
- Recover time line
  - Phases
- Instability and mechanical pain
  - “Align the tires”
- Avoid the nature degeneration
  - “Brush your teeth”
- Balanced distribution of forces
  - “Red card”
Questions & Discussion