Chapter 5
The Shoulder Joint

The Shoulder Joint

• Shoulder joint is attached to axial skeleton via the clavicle at SC joint
• Scapula movement usually occurs with movement of humerus
  – Humeral flexion & abduction require scapula elevation, rotation upward, & abduction
  – Humeral adduction & extension results in scapula depression, rotation downward, & adduction
  – Scapula abduction occurs with humeral internal rotation & horizontal adduction
  – Scapula adduction occurs with humeral external rotation & horizontal adduction

Wide range of motion of the shoulder joint in many different planes requires a significant amount of laxity
• Common to have instability problems
  – Rotator cuff impingement
  – Subluxations & dislocations
• The price of mobility is reduced stability
• The more mobile a joint is, the less stable it is & the more stable it is, the less mobile

Bones

• Scapula, clavicle, & humerus serve as attachments for shoulder joint muscles
  – Scapular landmarks
    • supraspinatus fossa
    • infraspinatus fossa
    • subscapular fossa
    • spine of the scapula
    • glenoid cavity
    • coracoid process
    • acromion process
    • inferior angle
Bones

- Scapula, clavicle, & humerus serve as attachments for shoulder joint muscles
  - Humeral landmarks
    - Head
    - Greater tubercle
    - Lesser tubercle
    - Intertubercular groove
    - Deltoid tuberosity

Glenohumeral Joint

- multiaxial ball-&-socket
- enarthrodial

- Glenoid labrum slightly enhances stability

Bones

- Key bony landmarks
  - Acromion process
  - Glenoid fossa
  - Lateral border
  - Inferior angle
  - Medial border
  - Superior angle
  - Spine of the scapula
Glenohumeral Joint

- Glenohumeral ligaments provide stability
  - especially anteriorly & inferiorly
  - inferior glenohumeral ligament

- Ligaments are quite lax until extreme ranges of motion reached due to wide range of motion involved
  - Stability is sacrificed to gain mobility

Glenohumeral Joint

- Determining exact range of each movement is difficult due to accompanying shoulder girdle movement

- 90 to 95 degrees abduction
  - 0 degrees adduction, 75 degrees anterior to trunk
Glenohumeral Joint

- 40 to 60 degrees of extension
- 90 to 100 degrees of flexion

- 70 to 90 degrees of internal & external rotation

Glenohumeral Joint

- 45 degrees of horizontal abduction
- 135 degrees of horizontal adduction

- Frequently injured due to anatomical design
  - shallowness of glenoid fossa
  - laxity of ligamentous structures
  - lack of strength & endurance in muscles
  - anterior or anteroinferior glenohumeral subluxations & dislocations – common
  - posterior dislocations – rare
  - posterior instability problems somewhat common
Glenohumeral Joint

- Rotator cuff is frequently injured
  - Subscapularis, supraspinatus, infraspinatus, & teres minor muscles
  - attach to the front, top, & rear of humeral head
  - point of insertion enables humeral rotation
  - vital in maintaining humeral head in correct approximation within glenoid fossa while more powerful muscles move humerus through its wide range of motion

Pairing of shoulder girdle & shoulder joint movements

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Movements

- Abduction
  - upward lateral movement of humerus out to the side, away from body
- Adduction
  - downward movement of humerus medially toward body from abduction

- Flexion
  - movement of humerus straight anteriorly
- Extension
  - movement of humerus straight posteriorly
** Movements **

- **Horizontal adduction (transverse flexion)**
  - movement of humerus in a horizontal or transverse plane toward & across chest
- **Horizontal abduction (transverse extension)**
  - movement of humerus in a horizontal or transverse plane away from chest

** Movements **

- **External rotation**
  - movement of humerus laterally around its long axis away from midline
- **Internal rotation**
  - movement of humerus medially around its long axis toward midline

** Movements **

- **Diagonal abduction**
  - movement of humerus in a diagonal plane away from midline of body
- **Diagonal adduction**
  - movement of humerus in a diagonal plane toward midline of body

** Muscles **

- **Intrinsic glenohumeral muscles**
  - Originate on scapula & clavicle
  - Deltoid, Coracobrachialis, Teres major
  - Rotator cuff group
    - subscapularis, supraspinatus, infraspinatus, & teres minor
- **Extrinsic glenohumeral muscles**
  - latissimus dorsi & pectoralis major
Muscles

- **Anterior**
  - Pectoralis major
  - Coracobrachialis
  - Subscapularis

- **Superior**
  - Deltoid
  - Supraspinatus

Nerves

- All shoulder joint muscles are innervated from the brachial plexus
- Lateral pectoral nerve arising from C5, C6, & C7
  - Pectoralis major (clavicular head)
- Medial pectoral nerve arising from C8 & T1
  - Pectoralis major (sternal head)
- Thoracodorsal nerve arising from C6, C7, & C8
  - Latissimus dorsi

Muscles

- **Superior**
  - Deltoid
  - Supraspinatus

- **Posterior**
  - Latissimus dorsi
  - Teres major
  - Infraspinatus
  - Teres minor

Nerves

- Axillary nerve branching from C5 & C6
  - Deltoid
  - Teres minor
  - Sensation to lateral patch of skin over deltoid region of arm
- Upper subscapular nerves arising from C5 & C6
  - Subscapularis
Nerves

- Lower subscapular nerve arising from C5 & C6
  - Subscapularis
  - Teres major
- Suprascapula nerve originating from C5 & C6
  - Supraspinatus
  - Infraspinatus

Nerves

- Musculotaneous nerve branching from C5, C6, & C7
  - Coracobrachialis
  - Sensation to radial aspect of forearm

Deltoid Muscle

Anterior fibers:
- Abduction, flexion, horizontal adduction, & internal rotation

Middle fibers:
- Abduction

Posterior fibers:
- Abduction, extension, horizontal abduction, & external rotation

Pectoralis Major Muscle

Upper fibers (clavicular head):
- Internal rotation, horizontal adduction, flexion, abduction (once arm is abducted 90 degrees, upper fibers assist in further abduction), & adduction (with arm below 90 degrees of abduction)

Lower fibers (sternal head):
- Internal rotation, horizontal adduction, extension, & adduction
Latissimus Dorsi Muscle
- Adduction
- Extension
- Internal rotation
- Horizontal abduction

Coracobrachialis Muscle
- Flexion
- Adduction
- Horizontal adduction

Rotator cuff muscles
- **Supraspinatus**
  - attach to greater tubercle from above (Abduct)
- **Infraspinatus**
  - attach to greater tubercle posteriorly (Ext. Rot.)
- **Teres Minor**
  - attach to greater tubercle posteriorly (Ext. Rot.)
- **Subscapularis**
  - attach to lesser tubercle anterior (Int. Rot.)

Rotator cuff muscles
- not very large
- must possess strength & muscular endurance
- conducting repetitious overhead activities (throwing, swimming, & pitching) with poor technique, muscle fatigue, or inadequate warm-up & conditioning leads to failure of rotator cuff muscle group in dynamically stabilizing humeral head in glenoid cavity
- leads to further rotator cuff problems such as tendinitis & rotator cuff impingement within subacromial space
Subscapularis Muscle

- Internal rotation
- Adduction
- Extension

Stabilization of the humeral head in the glenoid fossa

Supraspinatus Muscle

- Abduction

Stabilization of the humeral head in the glenoid fossa

Infraspinatus Muscle

- External rotation
- Horizontal abduction
- Extension

Stabilization of humeral head in the glenoid fossa

Teres Minor Muscle

- External rotation
- Horizontal abduction
- Extension

Stabilization of humeral head in the glenoid fossa
Teres Major Muscle

- Extension, particularly from the flexed position to the posteriorly extended position
- Internal rotation
- Adduction, particularly from the abducted position down to the side & toward midline of body

Glenohumeral Flexion

- Agonists
  - Anterior Deltoid
  - Upper Pectoralis Major

Glenohumeral Extension

- Agonists
  - Teres Major
  - Latissimus Dorsi
  - Lower Pectoralis Major

Glenohumeral Abduction

- Agonists
  - Deltoid
  - Supraspinatus
  - Upper Pectoralis Major
Glenohumeral Adduction
- **EX. Lat. Pull** - pull down weights
- **Agonists**
  - Latissimus Dorsi
  - Teres Major
  - Lower Pectoralis Major

Glenohumeral Internal Rotation
- **Agonists**
  - Latissimus Dorsi
  - Teres Major
  - Subscapularis
  - Pectoralis Major
- **All attach anteromedially on humerus**

Glenohumeral External Rotation
- **Agonists**
  - Infraspinatus
  - Teres Minor
- **Both attach posteriorly on greater tubercle**

Glenohumeral Horizontal Abduction
- **Agonists**
  - Posterior Deltoid
  - Middle Deltoid
  - Infraspinatus
  - Teres Minor
Glenohumeral Horizontal Adduction

- Agonists
  - Anterior Deltoid
  - Pectoralis Major
  - Coracobrachialis

Glenohumeral Diagonal Abduction

- Agonists
  - Posterior Deltoid
  - Infraspinatus
  - Teres Minor
  - Triceps Brachii (Long Head)

Glenohumeral Diagonal Adduction

- Agonists - both low & high
  - Anterior Deltoid
  - Coracobrachialis
  - Biceps Brachii (short head)
  - Pectoralis Major - Upper & Lower

Web Sites

Radiologic Anatomy Browser
http://radinxt1.usuhs.mil/rad/long/index.html
- This site has numerous radiological views of the musculoskeletal system.

University of Arkansas Medical School Gross Anatomy for Medical Students
http://anatomy.uams.edu/anatomyhtml/grossresources.html
- Dissections, anatomy tables, atlas images, links, etc.

Loyola University Medical Center: Structure of the Human Body
www.meddean.luc.edu/lumen/MedEd/GrossAnatomy/GA.html
- An excellent site with many slides, dissections, tutorials, etc., for the study of human anatomy

Wheeless' Textbook of Orthopaedics
www.wheelessonline.com/
- This site has an extensive index of links to the fractures, joints, muscles, nerves, trauma, medications, medical topics, lab tests, and links to orthopedic journals and other orthopedic and medical news.
Web Sites

Premiere Medical Search Engine
http://www.medsite.com/Default.asp?bhcp=1
- This site allows the reader to enter any medical condition and it will search the net to find relevant articles.

Arthroscopy.Com
www.arthroscopy.com/sports.htm
- Patient information on various musculoskeletal problems of the upper and lower extremity

Virtual Hospital
www.vh.org
- Numerous slides, patient information, etc.

Medical Multimedia Group
www.healthpages.org/AHP/LIBRARY/HLTHTOP/CTD/
- A Patient's Guide to Cumulative Trauma Disorder (CTD)

Baseball Almanac
www.baseball-alamanc.com/chapters/cap-ch8.shtml
- Coaching Adult Pitchers

Lecture Topics in Kinesiology
http://moon.ouhsc.edu/thompson/namics/shoulder.htm
- Shoulder articulations, movements, and muscles that are within the shoulder girdle

The Physician and Sportsmedicine
- Detecting and Treating Shoulder Impingement Syndrome: The Role of Scapulothoracic Dyskinesis

Southern California Orthopedic Institute
www.scoi.com/sholanat.htm
- Anatomy of the Shoulder

FamilyDoctor.org
http://familydoctor.org/268.xml
- Shoulder Pain

MedlinePlus
www.nlm.nih.gov/medlineplus/tutorials/shoulderarthroscopy/htm/
index.htm
- Shoulder arthroscopy interactive tutorial

MedlinePlus
- Rotator cuff injuries interactive tutorial

American Physical Therapy Association
www.apta.org/AM/Template.cfm?Section=Home&TEMPLATE=/CM/HTMLDisplay.cfm?CONTENTID=20446
- Taking Care of Your Shoulder

American Academy of Orthopaedic Surgeons
http://orthoinfo.aaos.org/category.cfm?topcategory=Shoulder
- Patient Education Library on the Shoulder

Orthopedic Research Institute
- Several web pages, text, and graphics on glenohumeral instability

American Sports Medicine Institute
www.asmi.org/aso/web/impressions/mmp.htm
- Biomechanics of the Shoulder during Throwing

American Sports Medicine Institute
- Throwers Ten Exercises

Washington Musculoskeletal Tumor Center
- Shoulder girdle surgery