Chapter 5
The Shoulder Joint

Manual of Structural Kinesiology
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The Shoulder Joint

• 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

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

- multiaxial ball-
  &-socket
- enarthrodial

Glenohumeral Joint

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

Glenohumeral Joint

- 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

Glenohumeral Joint

- 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

Glenohumeral Joint

- 70 to 90 degrees of internal & external rotation

Glenohumeral Joint

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

Glenohumeral Joint

- 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

Movements

- 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

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

### Muscles

- **Superior**
  - Deltoid
  - Supraspinatus

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

### 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

### 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
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

Deltoid Muscle

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

Middle fibers:
- abduction

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

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.)

- 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
- Weak 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
Anatomy & Physiology Tutorials
www.gwc.maricopa.edu/class/bio201/index.htm
Radiologic Anatomy Browser
  – This site has numerous radiological views of the musculoskeletal system.
University of Arkansas Medical School Gross Anatomy for Medical Students
http://anatomy.uams.edu/htmlpages/anatomy.html/gross.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 study of human anatomy.

Web Sites
Virtual Hospital
www.vh.org
  – Numerous slides, patient information, etc.
The Dynamic Human version 2.0 CD-ROM: The Visual Guide to Anatomy & Physiology
www.mhhe.com/biosci/ap/dynamichuman2/
  – Web site that accompanies the CD-ROM