Chapter 4
The Shoulder Girdle

Manual of Structural Kinesiology
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Bones

- Scapula & clavicle
  - Move as a unit
  - Clavicle’s articulation with sternum is only bony link to axial skeleton

Bones

- Key bony landmarks
  - Manubrium
  - Clavicle
  - Coracoid process
  - Acromion process
  - Glenoid fossa
  - Lateral border
  - Inferior angle
  - Medial border

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

From Seeley RR, Stephens TD, Tate P; anatomy and physiology, ed 7, New York, 2006, McGraw-Hill
Joints

- Shoulder girdle (scapulothoracic)
  - scapula moves on the rib cage
  - joint motion occurs at sternoclavicular joint & to a lesser amount at the acromioclavicular joint

Joints

- Sternoclavicular (SC)
  - (multiaxial) arthrodial classification
  - Movements
    - anteriorly 15 degrees with protraction
    - posteriorly 15 degrees with retraction
    - superiorly 45 degrees with elevation
    - inferiorly 5 degrees with depression

Joints

- Sternoclavicular (SC)
  - Ligamentous support
    - anteriorly by the anterior SC ligament
    - posteriorly by the posterior SC ligament
    - costoclavicular & interclavicular ligaments provide stability against superior displacement

Joints

- Acromioclavicular (AC)
  - arthrodial classification
  - 20- to 30-degree total gliding & rotational motion accompanying other shoulder girdle & shoulder joint motions
  - supported by
    - Coracoclavicular ligaments
    - Superior acromioclavicular ligament
    - Inferior acromioclavicular ligament
  - often injured
Joints

- Scapulothoracic
  - not a true synovial joint
  - does not have regular synovial features
  - movement depends on SC & AC joints which allows the scapula to move
    - 25-degrees abduction-adduction
    - 60-degrees upward-downward rotation
    - 55-degrees elevation-depression
  - supported dynamically by its muscles
  - no ligamentous support

Movements

- Focus on specific bony landmarks
  - inferior angle
  - glenoid fossa
  - acromion process
- Shoulder girdle movements = scapula movements

Movements

- Abduction (protraction)
  - scapula moves laterally away from spinal column
- Adduction (retraction)
  - scapula moves medially toward spinal column

Movements

- Downward rotation
  - returning inferior angle inferomedially toward spinal column & glenoid fossa to normal position
- Upward rotation
  - turning glenoid fossa upward & moving inferior angle superolaterally away from spinal column
Movements

• Depression
  – downward or inferior movement, as in returning to normal position
• Elevation
  – upward or superior movement, as in shrugging shoulders

Movements

• Shoulder joint & shoulder girdle work together in carrying out upper extremity activities
• Shoulder girdle movement is not dependent upon the shoulder joint & its muscles

Movements

• Shoulder girdle muscles
  – Stabilize scapula so the shoulder joint muscles will have a stable base from which to exert force for moving the humerus
  – Contract to maintain scapula in a relatively static position during shoulder joint actions
  – Contract to move shoulder girdle & to enhance movement of upper extremity when shoulder goes through extreme ranges of motion

Movements

• For some shoulder girdle movements, scapula must rotate or tilt on its axis
• Lateral tilt (outward tilt)
  – during abduction
  – scapula rotates about its vertical axis resulting in posterior movement of medial border & anterior movement of lateral border
• Medial tilt (return from lateral tilt, inward tilt)
  – during extreme adduction
  – scapula rotates about its vertical axis resulting in anterior movement of medial border & posterior movement of lateral border
Movements

• Anterior tilt (upward tilt)
  – rotational movement of scapula about frontal axis occurring during glenohumeral hyperextension
  – superior border moving anteroinferiorly & inferior angle moving posterosuperiorly
• Posterior tilt (downward tilt)
  – rotational movement of scapula about frontal axis occurring during glenohumeral hyperflexion
  – superior border moving posteroinferiorly & inferior angle moving anterosuperiorly

• Synergy with muscles of glenohumeral joint
  – As shoulder joint goes through more extreme ranges of motion, scapular muscles contract to move shoulder girdle so that its glenoid fossa will be in a more appropriate position from which the humerus can move
  – Without the accompanying scapula movement, humerus can only be raised into approximately 90 degrees of total shoulder abduction & flexion

Movements

• Synergy with muscles of glenohumeral joint
  – This works through the appropriate muscles of both joints working in synergy to accomplish the desired action of the entire upper extremity
  – Ex: to raise our hand out to the side laterally as high as possible, the serratus anterior & trapezius (middle & lower fibers) muscles upwardly rotate scapula as supraspinatus & deltoid initiate glenohumeral abduction
  – This synergy between scapula & shoulder joint muscles enhances movement of entire upper extremity
Muscles

- 5 muscles primarily involved in shoulder girdle movements
  - All originate on axial skeleton & insert on scapula and/or clavicle
  - Do not attach to humerus & do not cause shoulder joint actions
  - Essential in providing dynamic stability of the scapula so it can serve as a relative base of support for shoulder joint activities such as throwing, batting, & blocking

Shoulder Girdle Muscles

- Trapezius - upper, middle, lower
- Rhomboid - deep
- Levator scapula
- Serratus anterior
- Pectoralis minor - deep

Shoulder Girdle Muscles

- Location & action
  - Anterior
    - Pectoralis minor – abduction, downward rotation, & depression
    - Subclavius – depression
  - Posterior & laterally
    - Serratus anterior – abduction & upward rotation

Shoulder Girdle Muscles

- Location & action
  - Posterior
    - Trapezius
    - Upper fibers – elevation & extension of the head
    - Middle fibers – elevation, adduction, & upper rotation
    - Lower fibers – adduction, depression, & upper rotation
    - Rhomboid – adduction, downward rotation, & elevation
    - Levator scapulae – elevation
Nerves

- Shoulder girdle muscles primarily innervated by cervical & brachial plexus
  - Cervical plexus
  - Brachial plexus
- Branches of C3 & C4
  - Trapezius
  - Levator scapula
- Spinal accessory nerve
  - Trapezius
- Dorsal scapula nerve
  - Levator scapula
  - Rhomboid
- Long thoracic nerve originating from C5, C6, & C7
  - Serratus anterior
- Medial pectoral nerve originating from C8 & T1
  - Pectoralis minor
**Trapezius muscle**

Upper fibers: elevation of scapula, extension & rotation of head

Middle fibers: elevation, upward rotation, & adduction

Lower fibers: depression, adduction, & upward rotation

**Levator scapulae muscle**

Elevates the medial margin of the scapula

**Rhomboid muscles - major & minor**

Rhomboid major & minor muscles work together
Adduction (retraction): draw scapula toward spinal column

Downward rotation: from upward rotated position they draw scapula in downward rotation
Elevation: slight upward movement accompanying adduction

**Serratus anterior muscle**

Abduction (protraction): draws medial border of scapula away from vertebrae

Upward rotation: longer, lower fibers tend to draw inferior angle of scapula farther away from vertebrae, thus rotating scapula upward slightly
Pectoralis minor muscle

- Abduction (protraction): draws scapula forward & tends to tilt lower border away from ribs
- Downward rotation: as it abducts, it draws scapula downward
- Depression: when scapula is rotated upward, it assists in depression

Subclavius muscle

- Stabilization & protection of sternoclavicular joint

Scapula Abduction

- Scapula move laterally away from spinous processes without rotation
- EX. Push-up & bench press
- Agonists
  - Pectoralis minor
  - Serratus anterior

Scapula Adduction

- Return from abduction
- Occurs with retractions
- Agonists
  - Middle Trapezius
  - Rhomboids
Scapula Upward Rotation

- Lateral & upward movement
- Agonists
  - Middle Trapezius
  - Lower Trapezius
  - Serratus anterior

Scapula Downward Rotation

- Downward & Medial Movement
- Glenoid Fossa is rotated downward when downward movement of shoulder joint occurs
- EX. Lat Pulls - pulling wt. down
- Agonists
  - Pectoralis Minor
  - Rhomboid

Scapula Elevation

- Lifting scapula without rotation in anatomic position
- Shoulder Shrug
- Agonists
  - Levator Scapula
  - Upper Trapezius
  - Rhomboid

Scapula Depression

- EX. Dip
- Agonists
  - Lower Trapezius
  - Pectoralis Minor
Web Sites

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/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.

Baseball Almanac
www.baseball-almanac.com/chapters/cap-ch18.shtml
- Coaching Adult Pitchers

Lecture Topics in Kinesiology
http://moon.ouhsc.edu/dthomps0/namics/shoulder.htm
- Shoulder articulations, movements, and muscles that are within the shoulder girdle.

Premiere Medical Search Engine
www.medsite.com
- This site allows the reader to enter any medical condition and it will search the net to find relevant articles.

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

Scapulothoracic Positions and Motion
www.orthop.washington.edu/uw/scapulothoracic/tabID_3376/ItemID_212/Articles/Default.aspx
- Scapula movements and movies

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

The Physician and Sportsmedicine
www.physportsmed.com/issues/2001/11_01/johnson.htm
- Acromioclavicular Joint Injuries: Identifying and Treating 'Separated Shoulder' and Other Conditions

The Physician and Sportsmedicine
www.physportsmed.com/issues/1999/02_99/williams.htm
- Posterior Sternoclavicular Joint Dislocation