Shoulder Girdle
Clarification of Terms

• **Shoulder girdle** = scapula and clavicle

• **Shoulder joint (glenohumeral joint)** = scapula and humerus

• What is the purpose (or function) of the shoulder and entire upper extremity?

• The glenohumeral joint is the most mobile joint in the body.

• However, when we talk about shoulder motion, we must realize that motion occurs at three other joints as well.
Clarification of Terms...cont

• The Shoulder Complex:
  • Is a term that is used to include all of the structures involved with shoulder motion
  • It consists of the following bones:
    • Scapula
    • Clavicle
    • Sternum
    • Humerus
    • Rib cage
  • It consists of the following joints:
    • Glenohumeral (GH joint)
    • Sternoclavicular (SC joint)
    • Acromioclavicular (AC joint)
    • Scapulothoracic
Clarification of Terms... cont

- **Scapulothoracic Joint:**
  - Not a joint in the pure sense of the word
  - The scapula and thorax do not have a point of fixation (the scapula and thorax are not directly attached, but are connected indirectly by the clavicle and several muscles)
  - But, the scapula DOES move over the rib cage of the thorax, providing motion and flexibility
Osteology of the Shoulder Girdle (Bones)

• **Scapula**
  • Triangular shaped bone
  • Located superficially on the posterior side of the thorax
  • Slightly concave anteriorly
  • Located between the second and seventh ribs with the vertebral border 2-3 inches away from the spinous processes
  • Spine of the scapula level with spinous process of T3-T4

• **Clavicle**
  • S-shaped bone

• **Sternum**
  • Flat bone
  • Located in the midline of anterior thorax
  • Divided into manubrium, body and xiphoid process

Lippert, p116-117
Osteology of the Shoulder Girdle (Bones)

- **Scapula:**
  - Superior angle
  - Inferior angle
  - Vertebral border
  - Axillary border
  - Spine
  - Coracoid process
  - Acromion process
  - Glenoid fossa
Vertebral

Axillary
Osteology of the Shoulder Girdle (Bones)

- **Clavicle:**
  - Sternal end
  - Acromial end
  - body
The Clavicle
Osteology of the Shoulder Girdle (Bones)

- **Sternum:**
  - Manubrium
  - Body
  - Xiphoid process
Osteology of the Sternum

- Jugular notch
- Clavicular notch
- Manubrium
- Body
- Xiphoid Process

< Sternum: Ant. View >  < Sternum: Lat. View >
Joint Structure & Movement of the Shoulder Girdle

- Sternoclavicular (SC) joint
  - Structure
  - Movement
  - Supporting Structures (Ligaments, etc)

- Acromioclavicular (AC) joint
  - Structure
  - Movement
  - Supporting Structures (Ligaments, etc)

- Scapulothoracic joint
Joint Structure & Movement of the Shoulder Girdle...cont

- **Sternoclavicular (SC) Joint Structure**
  - Joint created by the articulation of the medial aspect of the clavicle with the sternum
  - This joint provides the only direct attachment of the upper extremity to the axial skeleton
  - Synovial joint – saddle joint with concave and convex surfaces on each of the joint’s articular surfaces
  - This allows the clavicle to move in all three planes (3 degrees of freedom!)
  - In essence, all movements of the shoulder girdle originate at the SC joint. Therefore, a fused SC joint would significantly limit movement of the clavicle and scapula, and the entire shoulder.

Mansfield, p54
Joint Structure & Movement of the Shoulder Girdle...cont

- **Sternoclavicular (SC) Joint Movement**
  - Elevation and Depression of the SC joint
  - Protraction and Retraction of the SC joint
  - Axial Rotation of the clavicle

Mansfield, p55
**Joint Structure & Movement of the Shoulder Girdle...cont**

- **Sternoclavicular (SC) Joint Supporting Structures**
  - **Sternoclavicular Ligament**
    - Connect clavicle to manubrium
  - **Interclavicular Ligament**
    - Spans jugular notch, connecting the superior medial aspects of the clavicles
  - **Costoclavicular Ligament**
    - Clavicle to costal cartilage of first rib
  - **Joint Capsule**
    - Surrounds entire SC joint
  - **Articular Disk**
    - Acts as shock absorber between clavicle and sternum

*Mansfield, p55*
Joint Structure & Movement of the Shoulder Girdle...cont

- **Acromioclavicular (AC) Joint Structure and Movement**
  - Joint created by the articulation of the acromion process of the scapula with the lateral end of the clavicle
  - Synovial joint – plane shaped joint
  - The AC joint allows motion in all 3 planes:
    - Upward and downward rotation
    - Rotation in the horizontal plane
    - Rotation in the sagittal plane
  - These motions allow the scapula to maintain firm contact with the posterior thorax

Mansfield, p58
Joint Structure & Movement of the Shoulder Girdle...cont

- **Acromioclavicular (AC) Joint Supporting Structures**
  - **Acromioclavicular Ligament**
    - Joins clavicle to acromion, prevents dislocations of the scapula
  - **Coracoclavicular Ligament**
    - Connects coracoid process of the scapula to the clavicle
  - **Coracoacromial Ligament**
    - Connects the coracoid process to the acromion process
    - Attached on both ends to the same bone!
    - Creates a roof that protects the head of the humerus

Lippert, p
Joint Structure & Movement of the Shoulder Girdle...cont

- **Scapulothoracic Joint Structure and Movement**
  - The junction between the anterior aspect of the scapula and the posterior thorax
  - Movements include
    - Elevation and depression
    - Protraction and retraction
    - Upward and downward rotation
    - Scapular tilt

Lippert, p
Scapular Elevation & Depression
Their scapulae are protracted…
The inferior angle of the scapula can be visualized in “A” in a neutral position. It moves up and out as the UE are flexed and ABDucted as indicated by the arrow in “B.”

The reference points are the inferior and superior angles of the scapula.
Scapular Tilt

- Occurs when the glenohumeral joint goes into hyperextension
- The superior end of the scapula tilts anteriorly and the inferior end tilts posteriorly
- Examples: “windup” phase of a softball pitch, a bowling delivery, or a racing dive in swimming

Lippert, p119
Joint Structure & Movement of the Shoulder Girdle...cont

• **Companion Motions of the Glenohumeral Joint and Shoulder Girdle**
  
  • When there is movement of the glenohumeral joint, there is also movement of the scapulothoracic joint

Lippert, p 120
Joint Structure & Movement of the Shoulder Girdle...cont

- **Companion Motions of the Glenohumeral Joint and Shoulder Girdle**
  - The table below summarizes the shoulder girdle motions that **must occur** during various glenohumeral joint motions:

<table>
<thead>
<tr>
<th>Glenohumeral Joint</th>
<th>Shoulder Girdle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>Upward rotation, protraction</td>
</tr>
<tr>
<td>Extension</td>
<td>Downward rotation, retraction</td>
</tr>
<tr>
<td>Hyperextension</td>
<td>Scapular tilt</td>
</tr>
<tr>
<td>Abduction</td>
<td>Upward rotation</td>
</tr>
<tr>
<td>Adduction</td>
<td>Downward rotation</td>
</tr>
<tr>
<td>Medial rotation</td>
<td>Protraction</td>
</tr>
<tr>
<td>Lateral rotation</td>
<td>Retraction</td>
</tr>
<tr>
<td>Horizontal abduction</td>
<td>Retraction</td>
</tr>
<tr>
<td>Horizontal adduction</td>
<td>Protraction</td>
</tr>
</tbody>
</table>
Joint Structure & Movement of the Shoulder Girdle...cont

- **Scapulohumeral Rhythm**
  - The first 30 degrees of shoulder joint motion is pure glenohumeral joint motion
  - After that, for every 2 degrees of shoulder flexion or abduction that occurs, the scapula must upwardly rotate 1 degree
  - This 2:1 ratio is known as scapulohumeral rhythm

Lippert, p120
Myology of the Shoulder Girdle (Muscles)

- There are 5 muscles primarily responsible for moving the scapula:
  - Trapezius
  - Levator scapula
  - Rhomboids
  - Serratus anterior
  - Pectoralis minor

- Muscle Descriptions provided:
  - O: Origin (proximal attachment)
  - I: Insertion (distal attachment)
  - A: Action (joint motions in which it is a prime mover)
  - N: Nerve Innervation

Lippert, p121
# Myology of the Shoulder Girdle

## Upper Trapezius

<table>
<thead>
<tr>
<th>Origin</th>
<th>Occiput, nuchal ligament on cervical vertebrae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Lateral third of the clavicle</td>
</tr>
<tr>
<td>Action</td>
<td>Scapular elevation &amp; upward rotation</td>
</tr>
<tr>
<td>Innervation</td>
<td>Spinal accessory n. (Cranial n. XI)</td>
</tr>
</tbody>
</table>

Lippert, p122
### Middle Trapezius

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Nuchal ligament, spinous processes of C7-T5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Medial aspect of acromion process</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Scapular retraction</td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td>Spinal Accessory n. (Cranial n. XI)</td>
</tr>
</tbody>
</table>

*Lippert, p122*
### Lower Trapezius

<table>
<thead>
<tr>
<th>Origin</th>
<th>Spinous processes T6-T12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Base of the spine of the scapula</td>
</tr>
<tr>
<td>Action</td>
<td>Scapular depression, upward rotation and retraction of the scapula</td>
</tr>
<tr>
<td>Innervation</td>
<td>Spinal accessory n., Cranial n. XI</td>
</tr>
</tbody>
</table>

Lippert, p122
# Myology of the Shoulder Girdle

<table>
<thead>
<tr>
<th>Levator Scapula</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Origin</strong></td>
<td>Transverse processes of C1-C4</td>
</tr>
<tr>
<td><strong>Insertion</strong></td>
<td>Vertebral border of the scapula between the superior angle and the base of the spine</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Scapular elevation, downward rotation</td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td>Dorsal Scapular n., (spinal nerves C3-C5)</td>
</tr>
</tbody>
</table>

Lippert, p123
### Rhomboids

<table>
<thead>
<tr>
<th><strong>Origin</strong></th>
<th>Nuchal ligament and spinous processes C7-T5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Insertion</strong></td>
<td>Vertebral border of the scapula from the base of the scapular spine to the inferior angle</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Scapular retraction &amp; elevation, downward rotation</td>
</tr>
<tr>
<td><strong>Innervation</strong></td>
<td>Dorsal scapular n.</td>
</tr>
</tbody>
</table>

Lippert, p124
# Myology of the Shoulder Girdle

## Serratus Anterior

<table>
<thead>
<tr>
<th>Origin</th>
<th>External surface of the lateral first 9 ribs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Vertebral border of the scapula near the inferior angle, on the anterior surface of scapula</td>
</tr>
<tr>
<td>Action</td>
<td>Scapular protraction, upward rotation, holds the scapula against the posterior thorax</td>
</tr>
<tr>
<td>Innervation</td>
<td>Long thoracic n.</td>
</tr>
</tbody>
</table>

---

**Scapular Winging**

(2° to weak serratus anterior)

Lippert, p124
### Pectoralis Minor

<table>
<thead>
<tr>
<th>Origin</th>
<th>Anterior aspect of ribs 3-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion</td>
<td>Coracoid process of the scapula</td>
</tr>
<tr>
<td>Action</td>
<td>Scapular depression, downward rotation, anterior tilt</td>
</tr>
<tr>
<td>Innervation</td>
<td>Medial pectoral n.</td>
</tr>
</tbody>
</table>

Lippert, p125
Myology of the Shoulder Girdle (Muscles)...cont

- **Prime Movers of the Shoulder Girdle**

<table>
<thead>
<tr>
<th>Action</th>
<th>Muscles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retraction</td>
<td>Middle trapezius, rhomboids</td>
</tr>
<tr>
<td>Protraction</td>
<td>Serratus anterior, pectoralis minor</td>
</tr>
<tr>
<td>Elevation</td>
<td>Upper trapezius, levator scapulae, rhomboids</td>
</tr>
<tr>
<td>Depression</td>
<td>Lower trapezius, pectoralis minor</td>
</tr>
<tr>
<td>Upward Rotation</td>
<td>Upper and lower trapezius, serratus anterior</td>
</tr>
<tr>
<td>Downward Rotation</td>
<td>Rhomboids, levator scapula, pectoralis minor</td>
</tr>
<tr>
<td>Scapular Tilt</td>
<td>Pectoralis minor</td>
</tr>
</tbody>
</table>

Lippert, p
Myology of the Shoulder Girdle (Muscles)...cont

- **Anatomical Relationships**
  - All 5 shoulder girdle muscles originate on the trunk
  - 3 are located posteriorly, 1 laterally, 1 anteriorly
  - Of the three posterior muscle, the trapezius is the most superficial
  - The right and left upper, middle and lower trapezius covers most of the back in the shape of a diamond.
  - Remove the trapezius, and the rhomboids and levator scapula lie directly underneath
  - Pectoralis minor is anterior and deep to the pectoralis major
  - Serratus anterior crosses the lateral chest wall
Myology of the Shoulder Girdle (Muscles)...cont

- **Anatomical Relationships**
Myology of the Shoulder Girdle (Muscles) ... cont

• **Force Couple**
  • A force couple is defined as muscle pulling in different directions to accomplish the same motion

• **Upward Rotation of the Scapula**
  • the upper trapezius pulls up, the lower trapezius pulls down and the serratus anterior pulls outward.

• **Downward Rotation of the Scapula**
  • The pectoralis minor pulls down, the rhomboid muscles pull in and the levator scapula pulls up

Lippert, p126
Myology of the Shoulder Girdle (Muscles)...cont

- **Summary of Muscle Innervation:**

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve</th>
<th>Spinal Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trapezius</td>
<td>Cranial Nerve XI</td>
<td>C3, C4</td>
</tr>
<tr>
<td>Levator Scapula</td>
<td>Dorsal Scapular</td>
<td>C3, C4, C5</td>
</tr>
<tr>
<td>Rhomboids</td>
<td>Dorsal Scapular</td>
<td>C5</td>
</tr>
<tr>
<td>Serratus Anterior</td>
<td>Long Thoracic</td>
<td>C5, C6, C7</td>
</tr>
<tr>
<td>Pectoralis Minor</td>
<td>Medial Pectoral</td>
<td>C8, T1</td>
</tr>
</tbody>
</table>
Which muscles can you identify?
References