

A full-page photograph of a woman with short, dark hair, shown in profile from the chest up. She is looking towards the right. Her right hand is raised, with fingers resting on the top of her head. She is wearing a light-colored, ribbed tank top. Her accessories include a thin gold chain necklace, a small gold hoop earring, and several rings on her fingers. There are small, dark tattoos on her neck and upper arm. The background is a plain, light-colored wall.

SCAPULOHUMERAL RHYTHM

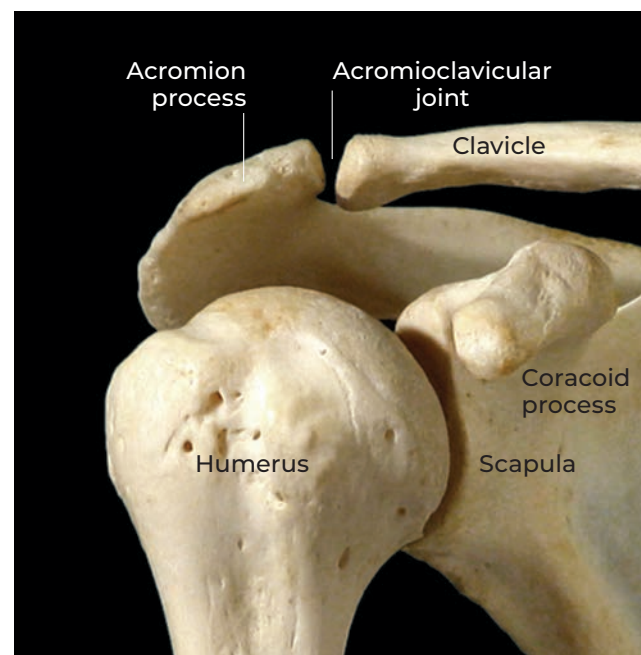
By Dr. Joe Muscolino

Kinematic Chain of Elements

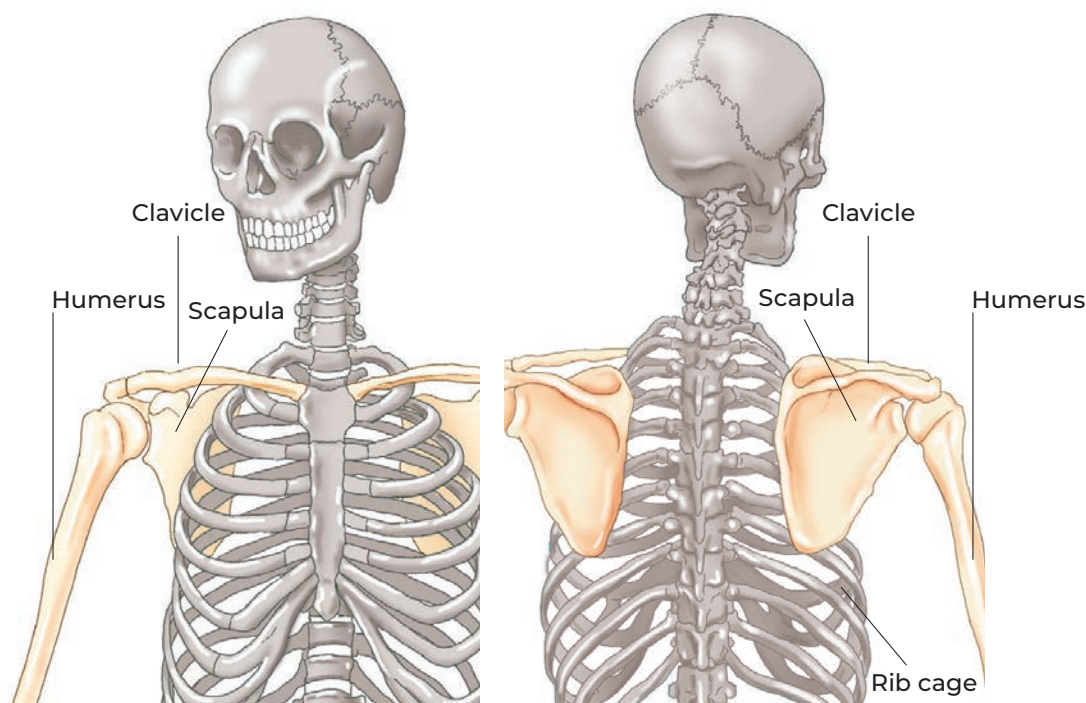
When working with clients who have a shoulder condition, our first thought might be to assess and treat the myofascial tissues across the glenohumeral (GH) joint (Image 1). The deltoid and rotator cuff muscles might spring to mind.

Although these muscles, and other muscles of the GH joint, might be involved, the movement patterns involved with movement of the shoulder extend well beyond the GH joint to involve the entire shoulder girdle, along with its connection to the trunk. In other words, the kinematic chain of elements involved with the shoulder joint complex extends beyond the humerus to include the scapula and clavicle, as well as their articulations with the rib cage and sternum of the axial body.

The idea that there is a coupling of movements between the arm at the GH joint and the shoulder girdle relative to the trunk is called scapulohumeral rhythm.



1 Anterior view of the glenohumeral (GH) joint on the right side of the body. *Permission Dr. Joe Muscolino. Photography by Dr. David Eliot.*



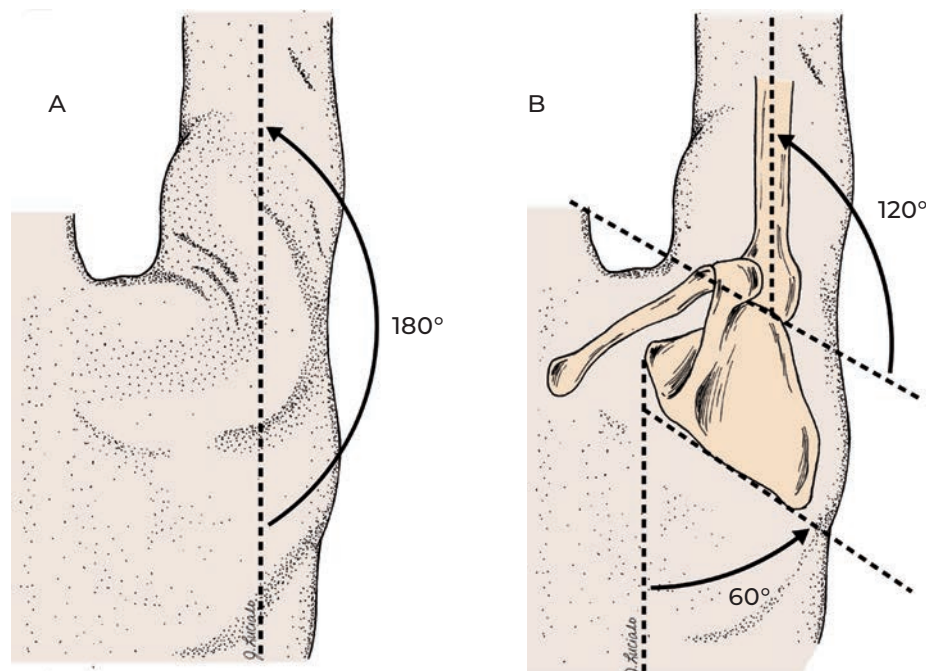
2 Anterior and posterior views of the shoulder complex region.
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In other words, there is a rhythm between movements of the scapula and the humerus. Even though this term is excellent in that it expands our view of the functioning of the shoulder, it actually is not expansive enough. A better term for this coupled rhythm would be *claviculoscapulohumeral rhythm* because the clavicle also plays a crucial role in shoulder movement (Image 2). In fact, movement of the clavicle at the sternoclavicular joint may be the most underappreciated motion of the human body.

To better understand the concept of scapulohumeral rhythm, we need to appreciate the fact that the primary purpose of the upper extremity is to place the hand in the positions necessary to work with and manipulate the world. Therefore, whatever joint motions are necessary to accomplish hand placement will work in concert toward this end.

HUMERUS COUPLING WITH THE SCAPULA

The best example of scapulohumeral coupling of motions is probably frontal-plane abduction of the arm. It is usually stated that the arm can abduct 180 degrees so that the arm is straight up in the air (Image 3A). However, the GH joint does not allow for 180 degrees of abduction. The GH joint itself allows only 120 degrees of humeral abduction, only two-thirds of the 180 degrees that is stated as full arm abduction. The other 60 degrees, the other one-third of this motion, is actually generated by upward rotation of the scapula relative to the rib cage of the thoracic body wall at the scapulocostal (ScC) joint (also known as the scapulothoracic joint). Upward rotation of the scapula is a movement of the scapula at the ScC joint relative to the rib cage such that the glenoid fossa of the scapula orients upward. This affords the head of the humerus the ability to continue rolling upward until the arm is vertical at 180 degrees relative to the trunk of the body (Image 3B).



3 (A) 180 degrees of abduction of the arm. (B) Abduction of the arm involves humeral motion and scapular motion.
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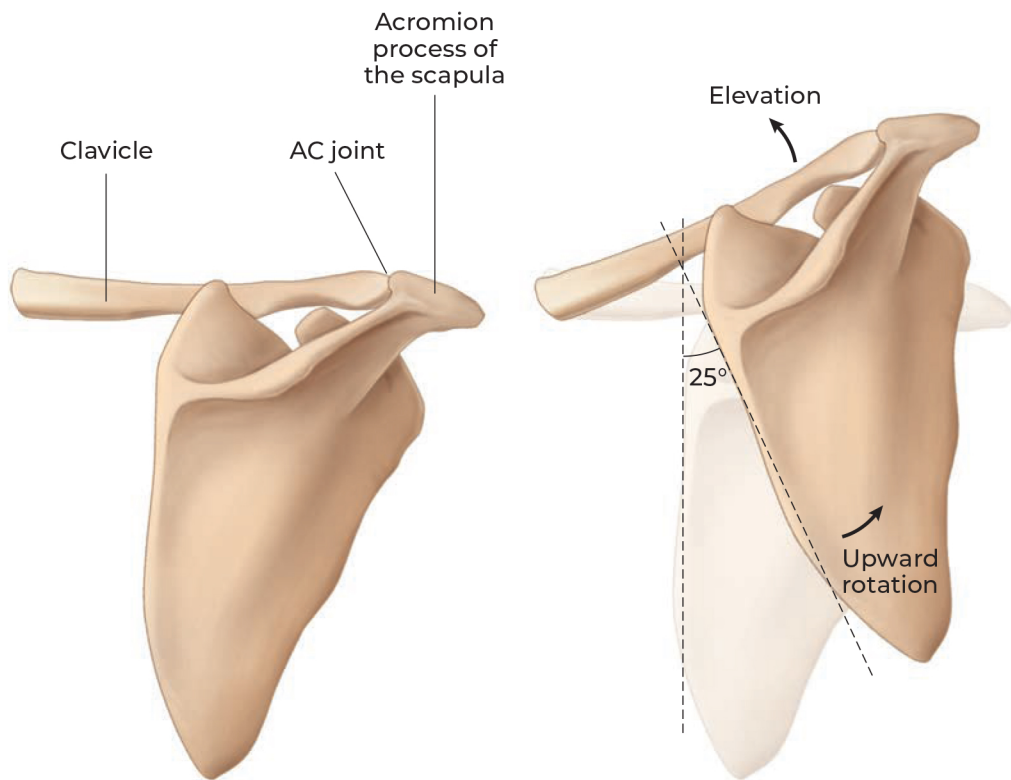
So, we see that movement of the arm/humerus is strongly dependent upon coupled movement of the scapula. But, as we have mentioned, the clavicle must be included in this conversation as well. There is a rhythm between scapular movement and clavicular movement. In fact, much of the movement of the scapula at the ScC joint is driven by movement of the clavicle. In our example of scapular upward rotation of 60 degrees to accompany full humeral abduction, half of that scapular upward rotation occurs because the clavicle elevates at the sternoclavicular (SC) joint relative to the sternum, and as the clavicle elevates, the scapula is brought along with it such that it changes its position relative to the rib cage. We could say that the scapula passively “goes along for the ride.”

So, even though there are muscles that can actively move the scapula into upward rotation, the scapula can also be passively moved into upward rotation by accompanying elevation of the clavicle. For example, during the first 90 degrees of arm abduction, 60 degrees are due to GH joint humeral motion, and 30 degrees would be due to scapular upward rotation at the ScC joint. Of these 30 degrees of scapular upward rotation, 25 degrees occur as the scapula is passively moved by clavicular motion (Image 4A). There are another 5 degrees of scapular upward rotation created by the scapula actively upwardly rotating relative to the clavicle at the acromioclavicular (AC) joint (Image 4B) (see Scaption sidebar, page 54).

So, the question might be: Is this just anatomy geek information, or is there an application for manual therapists and movement professionals? To answer this question, let’s look at a potential case study.

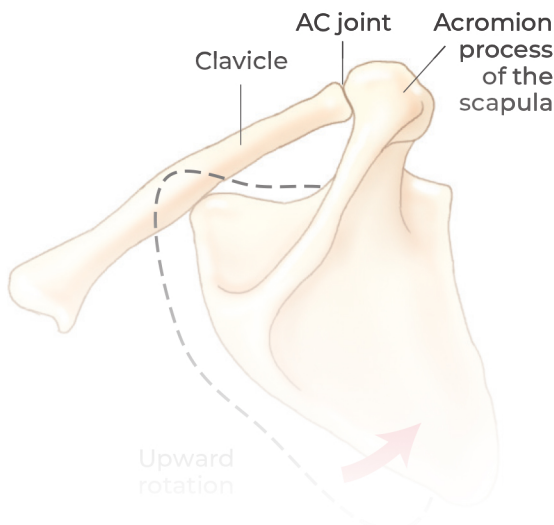
POTENTIAL CASE STUDY

A client presents with decreased abduction



4A

When the clavicle elevates, the scapula moves with the clavicle and is passively upwardly rotated. *Dr. Joe Muscolino. Artwork by Giovanni Rimasti.*



4B

The scapula can also actively upwardly rotate relative to the clavicle at the AC joint. *Dr. Joe Muscolino. Kinesiology—The Skeletal System and Muscle Function, 3rd ed. (Elsevier 2017)*

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