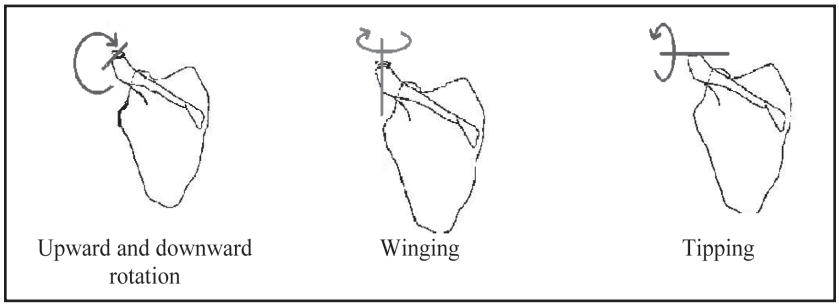

Figure 5-25. Axis of motion at the AC.

Table 5-10

OSTEOKINEMATICS OF THE ACROMIOCLAVICULAR JOINT

FUNCTIONAL JOINT	Diarthrotic, triaxial
STRUCTURAL JOINT	Synovial, plane
CLOSE-PACKED POSITION	Humerus abducted to 90 degrees
RESTING POSITION	Humerus resting by side in normal physiologic position
CAPSULAR PATTERN	Pain at extreme ROM, especially horizontal adduction and full elevation

Medial and lateral tilting (internal and external rotation) also occurs at the AC joint around the vertical axis. In medial tilting, the glenoid fossa faces more anteriorly, and in lateral tilting, the glenoid faces more laterally (Houglum & Bertoti, 2012; Levangie & Norkin, 2011). The scapula tilts medially in early elevation and laterally past 90 degrees (McClure et al., &, 2001; Teece et al., 2008). Medial and lateral tilting ensure that the scapula remains in contact with the thorax and that the glenoid fossa remains congruent with the humeral head (Levangie & Norkin, 2011).

Osteokinematics

The AC joint is a gliding joint with three degrees of freedom in three axes of motion. Movements of this articulation are seen as two different types: (1) a gliding motion of the clavicle and the acromion and (2) rotation of the scapula on the clavicle (Goss, 1976). Because the articulating surfaces of this articulation are small and there are wide individual variations, there are inconsistencies in identifying the movements and axes of motion for this joint (Ludewig & Borstad, 2011). Rotation of the scapula is the primary motion of the AC, with contributions of anterior and posterior tilting, which is 30 to 90 degrees of GH abduction (Hartley, 1995). Sahara, Sugamoto, Murai, and Yoshikawa (2007) determined that, in shoulder abduction, the clavicle retracts 30.6 degrees, elevates 7.3 degrees, and rotates posteriorly 33.2 degrees. The scapula protects 15.6 degrees, upwardly rotates 21.5 degrees, and tilts posteriorly 22.2 degrees in abduction relative to the clavicle (Sahara et al., 2007). A summary of the osteokinematics of the AC joint is shown in Table 5-10.

Arthrokinematics

Movements at the AC joint involve the convex portion on the lateral end of the clavicle and a concave facet on the acromion (Table 5-11). The movements of tilting and rotation of the scapula and the clavicle are in the same direction. For example, if the scapula rotates downward, then the clavicle also rotates in a downward direction. Houglum and Bertoti (2012) note that there is much variability in the convexity and concavity of the joint surfaces and often the surfaces are flat, prohibiting rolling and sliding.

Supporting Structures

The AC joint is primarily stabilized by the AC, coracoacromial, and coracoclavicular ligaments (Table 5-12). The weak joint capsule is reinforced by the superior and inferior AC ligaments that restrict anteroposterior horizontal movements of the joint. The AC ligament is supported by the strong coracoclavicular ligament. While there are no muscles that directly cross this joint, the upper trapezius and deltoid muscles add to the stability of the superior portion of the joint (Neumann, 2010).

The joint is reinforced superiorly by the AC ligament, which acts to restrain axial rotation and posterior translation of the clavicle (Jordan et al., 2012). The AC ligament, directed horizontally, is instrumental in providing horizontal stability. It is palpable as a shallow depression between the end of the clavicle and the acromion. The superior AC ligament is a very important ligament in stabilizing the AC joint for normal activities (Fukuda, Craig, An, Cofield, & Chao, 1986).

The coracoclavicular ligament binds the clavicle to the coronoid process and serves as the suspensory ligament of the upper extremity (Fukuda et al., 1986). It is a vertically directed ligament (Figure 5-26) that is strong but not stiff (Veeger & vanderHelm, 2007). It serves as a link between the scapula and clavicle and connects the coracoid process to the inferior surface of the clavicle. It is the primary stabilizer of the AC joint. The coracoclavicular ligament has two parts: the conoid and trapezoid ligaments.

The conoid ligament is the most important structure, preventing significant injuries and anterior and superior rotation and displacement of the clavicle from the scapula. A triangular-shaped ligament, it runs between the posterior surface of the coracoid and attaches on the conoid tubercle on the posterior clavicle and base of the coracoid. It aids in producing the motions of protraction and retraction by producing posterior rotation of the clavicle.