Updates on Internal Fixation For Injuries of the Clavicle

An essay
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Chapter 1
INTRODUCTION

The clavicle or collar bone is a small bone that serves as a strut between the scapula and the sternum. The clavicle makes up part of the shoulder girdle (pectoral girdle). It receives its name from the Latin clavicula ("little key") because the bone rotates along its axis like a key when the shoulder is abducted.[1]

Fracture clavicle in **skeletally mature individuals** is not uncommon as it includes up to 5 % of all fractures. The incidence of clavicular fracture decreases from age 25 to 50 years, increasing again for age more than 70 years. For the older age groups, lower energy injuries become more common. Fracture is more common in men than women up to approximately age 50 years, at which point the incidence between the two genders approximately equilibrates.[2]

The incidence of each fracture type is somewhat unclear as there are few well-controlled epidemiologic studies and each study seems to rely on a different classification scheme. Some generalizations, however, can be made.[2]

Midshaft clavicular fractures are clearly the most common, with an incidence of 69.2% in Robinson's work and 76.2% in the study by Nordqvist and Petersson. Although the definitions of displacement differed between the studies, 47.5% of the midshaft fractures in the Malmo review and 72.7% of those seen by Robinson described to be displaced.[2]

Other important data can be gained from these studies; distal fractures were seen 21% to 28%, with an approximate nondisplaced ratio of 3:1. Medial fractures were extremely rare. Both studies found these injuries in less than 3% of the study population, and the bulk of them were nondisplaced.[3]

Undisplaced fractures of the clavicle have a high rate of union, and the functional outcomes are good after non-operative treatment. Non-operative treatment of displaced fractures may be associated with a higher rate of nonunion and functional deficits. However, it remains difficult to predict which patients will have these complications.[4]

Since a satisfactory functional outcome may be obtained after operative treatment of a clavicular nonunion or malunion, there is currently considerable debate about the benefits of primary operative treatment of these injuries. Displaced lateral-end fractures have a higher risk of nonunion after non-operative treatment than do shaft fractures. However, nonunion is difficult to predict and may be asymptomatic in elderly individuals. The results of operative treatment are more unpredictable than they are for shaft fractures.[4]

Acromioclavicular joint injuries or separations, as they are commonly described are common sports-related injuries resulting from falls or other direct forces on the superolateral aspect of the shoulder.[5]

The true incidence of AC injury is not known, as many affected persons do not seek treatment. Approximately 12% of all dislocations involving the shoulder affect the AC joint. Males sustain significantly more AC injuries due to larger participation

in high-risk activities. Younger patients (< 35 y) sustain more AC injuries due to higher participation in risky activities.[5]

Acromioclavicular joint injuries represent a spectrum of severity, ranging from a simple sprain of the acromioclavicular ligament with no displacement to widely displaced injuries associated with severe soft-tissue injury to the acromioclavicular ligament and the coracoclavicular ligament,. Treatment options vary according to the severity of the injury and logically reflect the associated soft-tissue involvement.[6]

Because only about 50% of the medial end of the clavicle articulates with the manubrium, the sternoclavicular joint (SCJ) has little inherent stability. Most of its strength and stability originates from the joint capsule and supporting ligaments, Sternoclavicular joint (SCJ) dislocations may follow direct trauma to the anteromedial aspect of the clavicle. Atraumatic dislocations can occur rarely.[7]

The incidence of sternoclavicular dislocation, based on the series of 1,603 injuries of the shoulder girdle reported by Cave et al is 3%.[8]

The management of clavicle injuries has dramatically changed over the last decade. Classic teaching suggested that even if both ends of the clavicle were widely separated it would go on to heal. However, longitudinal studies and recent experience throughout North America and Europe have suggested that this old teaching may not be accurate.[9-10]

Chapter2

Anatomy of the clavicle

(Clavicula; Collar Bone) [1]

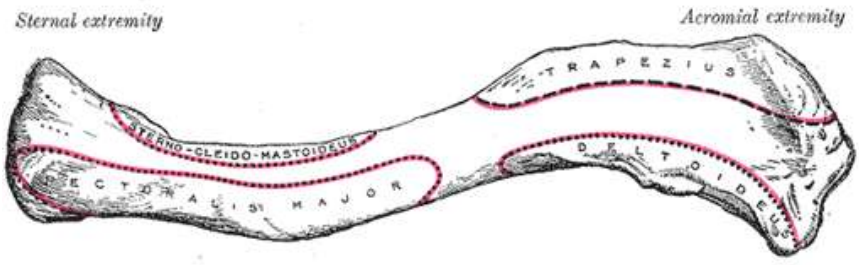

FIG.2-1: the upper surface of the clavicle

The **clavicle** forms the anterior portion of the shoulder girdle. It is a long bone, curved somewhat like the italic letter ***f***, and placed nearly horizontally at the upper and anterior part of the thorax, immediately above the first rib. It articulates medially with the manubrium sterni, and laterally with the acromion of the scapula. (It presents a double curvature, the convexity being directed forward at the sternal end, and the concavity at the scapular end. Its lateral third is flattened from above downward, while its medial two-thirds are of a rounded or prismatic form.

Lateral third. The lateral third has two surfaces, an upper and a lower; and two borders, an anterior and a posterior.

The **upper surface** is flat, rough, and marked by impressions for the attachments of the Deltoideus in front, and the Trapezius behind; between these impressions a small portion of the bone is subcutaneous.

The **under surface** is flat. At its posterior border, near the point where the prismatic joins with the flattened portion, is a rough eminence, the **coracoid tuberosity** (*conoid tubercle*); this is in the natural position of the bone, surmounts the coracoid process of the scapula, and gives attachment to the conoid ligament.

From this tuberosity an oblique ridge, the **oblique** or **trapezoid ridge,** runs forward and lateralward, and afford attachment to the trapezoid ligament.

The **anterior border** is concave, thin, and rough, and gives attachment to the Deltoideus. The **posterior border** is convex, rough, thicker than the anterior, and gives attachment to the Trapezius.

The medial two-thirds constitute the prismatic portion of the bone, which is curved so as to be convex in front, concave behind, and is marked by three borders, separating three surfaces.

The **anterior border** is continuous with the anterior margin of the flat portion. Its lateral part is smooth, and corresponds to the interval between the attachments of the Pectoralis major and Deltoideus; its medial part forms the lower boundary of an elliptical surface for the attachment of the clavicular portion of the Pectoralis major, and approaches the posterior border of the bone.

The **superior border** is continuous with the posterior margin of the flat portion, and separates the anterior from the posterior surface. Smooth and rounded laterally, it becomes rough toward the medial third for the attachment of the Sternocleidomastoideus, and ends at the upper angle of the sternal extremity.

The **posterior** or **subclavian border** separates the posterior from the inferior surface, and extends from the coracoid tuberosity to the costal tuberosity; it forms the posterior boundary of the groove for the Subclavius, and gives attachment to a layer of cervical fascia which envelops the Omohyoideus.

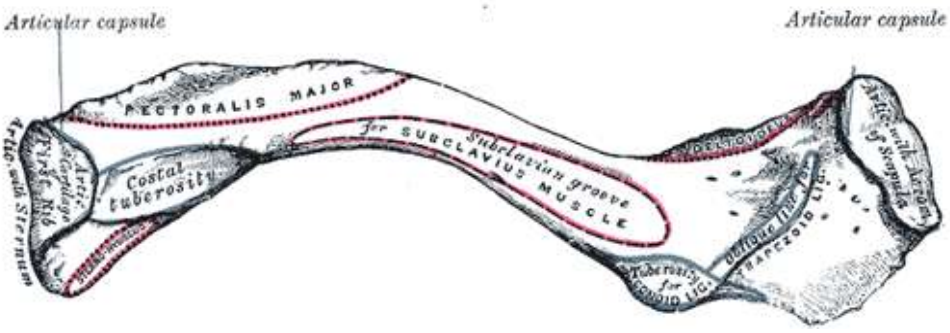

FIG.2-2: the under surface of the clavicle

The **anterior surface** is included between the superior and anterior borders. Its lateral part looks upward, and is continuous with the superior surface of the flattened portion; it is smooth, convex, and nearly subcutaneous, being covered only by the Platysma. Medially it is divided by a narrow subcutaneous area into two parts: a lower, elliptical in form, and directed forward, for the attachment of the Pectoralis major; and an upper for the attachment of the Sternocleidomastoideus.

The **posterior** or **cervical surface** is smooth, and looks backward toward the root of the neck. It is limited, above, by the superior border; below, by the subclavian border; medially, by the margin of the sternal extremity; and laterally, by the coracoid tuberosity. It is concave medio-laterally, and is in relation, by its lower part, with the transverse scapular vessels. This surface, at the junction of the curves of the bone, is also in relation with the brachial plexus of nerves and the subclavian vessels.