THE CORACOHUMERAL LIGAMENT

ANATOMY OF A SUBSTANTIAL BUT NEGLECTED STRUCTURE

J. G. EDELSON, C. TAITZ, A. GRISHKAN

From Poriya Government Hospital, Tiberias, and Sackler School of Medicine, Tel Aviv

We dissected 60 shoulders to demonstrate the anatomy of the coracohumeral ligament. The role of this structure in clinical problems of the shoulder is discussed.

From the time of Bankart (1938) the area of greatest interest as regards problems of shoulder stability has been the inferior capsule and the inferior glenohumeral ligament (Perkins 1953; Moseley and Övergaard 1962; Protzman 1980; Turkel et al 1981). However, Gagey et al (1987) have recently emphasised the intricate and necessary relationship of the inferior glenohumeral ligament to the coracohumeral ligament, which forms a substantial superior partner.

The role of this strategically placed superior structure is becoming better appreciated, particularly in problems of inferior (Basmajian and Baouz 1959; Ovesen and Nielsen 1985) and multidirectional instability (Nobuhara and Iked a 1987; Helmic et al 1988), but also in posterior (Ovesen and Sejbjerg 1986), recurrent anterior (Rowe and Zarins 1981) and even bicipital instabilities (Släts and Aalto 1979; Björkem et al 1988).

However, many orthopaedic surgeons do not consider the role of the coracohumeral ligament because they do not see it. As Rowe and Zarins point out (1981), this area is not easily visualised in the standard approaches to the shoulder. Nor does arthroscopic examination help, since the coracohumeral ligament is extra-articular.

This paper aims to demonstrate the structure and relations of the coracohumeral ligament and to discuss its clinical relevance.

MATERIALS AND METHODS

Both shoulders of 10 cadavers were examined within 24 hours of death. Another 40 shoulders were examined in bodies preserved for dissection at the Sackler Medical School of Tel Aviv University, Israel. The age range at death varied from three to 74 years. In addition to gross anatomical observations, sections of the coracohumeral ligament, the coraco-acromial ligament, and the shoulder capsule were harvested and sent for histological examination. These specimens were fixed in 10% neutral buffered formalin, sectioned in paraffin and stained with haematoxylin-eosin and Masson’s trichrome.

Exposure. The coracohumeral ligament is surrounded and obscured by fatty fibrous tissue and bursae (above it is the subacromial bursa and below is the subcoracoid bursa) which we teased away or excised. The coracohumeral ligament is closely overlaid by the coraco-acromial ligament; this also was removed or partially detached to gain exposure. It was then possible in fresh specimens to demonstrate the coracohumeral ligament by traction on the arm or through sutures placed in the rotator cuff, but we usually divided the acromion and lateral clavicle in order to gain full exposure (Figs 1 to 5).

FINDINGS

The coracohumeral ‘ligament’ is not a true ligament. On gross examination it has no superficial sheen nor the taut feel of a true bone-to-bone structure such as the coraco-acromial ligament which overlies it. On microscopic examination we confirmed the findings of Hollinshead (1982), that the coracohumeral ligament is part of the capsule of the shoulder with the typical layered pattern of sheets and bundles of collagenous tissue interspersed with strands of loose connective tissue and vascular channels (Fig. 6a). This is characteristic of the shoulder.
THE CORACOHUMERAL LIGAMENT

Dissection and diagram of antero-superior views of the right shoulder to show the relationship of the coracohumeral ligament to the rotator cuff. The acromion, distal clavicle, coraco-acromial ligament and conjoint tendon have been removed. C, coracohumeral ligament; c, coracoid process; s, supraspinatus; ss, subscapularis; b, biceps tendon; g, glenoid; o, rotator interval between subscapularis and supraspinatus.

Figure 3 – The left shoulder of a 40-year-old man. The acromion and distal clavicle have been osteotomised and the coraco-acromial ligament has been turned back. Figure 4 – The left shoulder of a 24-year-old man. This was the least robust of the coracohumeral ligaments found in our study. Figure 5 – Same specimen as Figure 3 with the bicipital tendon exposed by an incision in the overlying coracohumeral ligament. C, coracohumeral ligament; b, biceps tendon; ca, coraco-acromial ligament; c, coracoid; s, supraspinatus; ss, subscapularis.

Figure 6a – Section of the coracohumeral 'ligament', showing the typical appearance of joint capsule. Layered bundles of collagenous tissues are interspersed with loose connective tissue and vascular channels; note the size and shape of the nuclei. Figure 6b – The coraco-acromial ligament of the same patient. There are relatively acellular parallel bundles of connective tissue; the flattened and elongated nuclei are characteristic of the fibroblastic cells of true ligaments. (Both stained with haematoxylin and eosin, × 200.)
capsule (Schwartz et al. 1989) and that of other joints. Specimens of the coraco-acromial ligament demonstrated a quite different pattern characteristic of a true ligamentous structure (Fig. 6b).

The coracohumeral ligament is a substantial, somewhat trapezoidal structure, arising from the lateral aspect of the coracoid process from its root to about 1 cm from its tip (Figs 1 and 2). The ligament then passes over the top of the shoulder, joining the capsule, and is inserted into the humerus at the greater and lesser tuberosities, on either side of and over the bicipital groove (see Fig. 5).

The coracohumeral ligament begins to blend with the capsule of the shoulder at the base of the coracoid, but is then lifted away from it more distally because of the forward-jutting shape of the coracoid process. As a result, the ligament forms a bridge-like anterior leading edge (Figs 3 and 4) over the ‘rotator interval’, that is, the considerable gap between the subscapularis and the supraspinatus parts of the rotator cuff (see Fig. 2).

In agreement with Hollinshead (1982) we found that the coracohumeral ligament is “the most important and most constant thickening of the fibrous capsule of the shoulder”. It was present in all specimens at all ages, but there was individual variation in its breadth and thickness. The least robust of the ligaments in relation to the other structures of the shoulder was found in a 24-year-old accident victim (Fig. 4), but even in this case the ligament was a substantial and clearly defined structure. There was no great variation between the left and right sides in individual cadavers.

When the 20 fresh shoulder specimens were put through a clinical range of movement, the coracohumeral ligament was taut in flexion and external rotation, and also in the anatomical ‘suspended’ position at the side of the body. Similarly, the ligament tightened with attempts at anterior or posterior translation of the humeral head in the sagittal plane. It tended to become slack in medial rotation and in pure coronal abduction of the shoulder.

DISCUSSION

The coracohumeral and the inferior glenohumeral ligaments have been compared to the cruciate ligaments of the knee in regard to the intricate and co-ordinated way in which they guide and stabilise movements of the joint (Gagey et al. 1987). We suggest that a more appropriate analogy is with the capsular ligaments of the hip and that the coracohumeral ligament corresponds to the iliofemoral ligament. Like the coracohumeral ligament, the iliofemoral ligament is not a typical ligament but rather a strong superficial layer of the capsule running over a deeper layer of capsular fibres which are more circular in orientation (Hollinshead 1982). Like the coracohumeral ligament the iliofemoral ligament has a trapezoidal shape. It arises from the inferior iliac spine, which is analogous in the pelvis to the coracoid in the shoulder. The iliofemoral ligament passes down to its insertion from trochanter to trochanter across the femur; this is similar to the manner in which the coracohumeral ligament bridges the tuberosities of the humerus.

The iliofemoral ligament is overlaid in its Y-shaped part by the reflected head of the rectus femoris. The analogous structure in the shoulder is the long head of the biceps. Indeed, Testut (1932) points out that, in its evolution, the biceps tendon is extra-articular like the rectus femoris. DePalma (1983) confirms this, showing photographs of specimens in which the biceps tendon lies over the capsule, outside the joint. The long head of the biceps tendon seems to have ‘dropped down’ through the coracohumeral ligament to become intra-capsular before its attachment to the superior glenoid, whereas the reflected head of the rectus femoris remains extracapsular in its course to the superior rim of the acetabulum.

Such parallels are not exact, but are useful in drawing attention to the strength and importance of the coracohumeral ligament. It is accepted that the iliofemoral ligament is “one of the strongest in the body” (Hollinshead 1982); it is the passive stabiliser against which we sometimes stand. Similarly, the coracohumeral ligament, by virtue of its strength and its strategic position, is a central element in the suspension of the humerus.

Although not fully appreciated at present and difficult to approach, the coracohumeral ligament may well become relevant to clinical practice. Indeed, Nobuhara and Ikeda (1987) report 101 cases of shoulder instability in which good results were obtained by closing the ‘rotator interval’ and reinforcing this repair with the coracohumeral ligament. Other surgeons have also reported closing any areas of capsular weakness in the rotator interval when repairing shoulder instability, even though they do not specifically mention the coracohumeral ligament (Neer and Foster 1980; Rowe and Zarins 1981; Cofield, Kavanagh and Frassica 1985).

The coracohumeral ligament may need to be released to regain mobility in reconstructive operations (Flatow et al. 1989) or in recalcitrant frozen shoulders (Leffert 1985). However, it is possible that too vigorous release of this key suspensory ligament might lead to instability.

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REFERENCES


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