Acta orthop. scand. *50*, 73–77, 1979

MEDIAL DISLOCATION OF THE TENDON OF THE LONG HEAD OF THE BICEPS BRACHII

PÄR SLÄTIS & KARI AALTO

Division of Orthopaedic Surgery and Traumatology, Surgical Hospital, University Central Hospital, Helsinki, Finland

Medial displacement of the long tendon of the biceps brachii muscle is a rare condition associated with degenerative or traumatic ruptures of the rotator cuff. This condition was recorded in nine shoulders during 45 reconstructive procedures on the rotator cuff. Five of the displacements were complete, leaving the tendon medially displaced in a fascial sling; four were incomplete, allowing a to-and-fro medial displacement of the tendon out of the intertubercular groove.

Anatomical dissections on eight shoulders showed that the coracohumeral ligament is the key ligament which keeps the biceps tendon aligned in the sulcus: transection of the medial part of the ligament allows the tendon to be medially displaced.

There was no pathognomonic clinical sign of the luxation or subluxation. Since abnormal movement of the tendon in the sulcus may be an important cause of shoulder pain, the condition should be carefully looked for during reconstructive procedures on the rotator cuff. Tenodesis of the displaced tendon is recommended, either as the sole procedure or in combination with other reconstructive measures.

Key words: shoulder joint; tendon injuries; ligaments

Accepted 6.vii.78

In 1926, Meyer observed among 286 anatomical specimens of shoulder joints, four instances of complete medial displacement of the tendon of the long head of the biceps brachii. He attributed this lesion to destruction of the anterior portion of the rotator cuff caused by forcible abduction and lateral rotation. Later, Meyer (1928) described subluxations of the tendon, and drew attention to the high incidence of accompanying degenerative changes and fraying of the tendon which predisposed to subsequent rupture of the tendon's intra-articular portion. Abbott & Saunders (1939) reported the first six clinical cases of medial dislocation of the tendon of the long head of the biceps brachii. Later studies showed that medial dislocation of the tendon of the long head of the biceps is often associated with degenerative and traumatic ruptures of the rotator cuff (DePalma 1963). Heikel (1968) observed two medial dislocations of the tendon of the long head of the biceps in 22 patients operated on for cuff tears; Godsil & Linschied (1970) three dislocations in 79 shoulders. Wolfgang (1974) noted two luxations and six subluxations in 65 shoulders; in 27 of the 65, arthrotomy revealed definite concomitant changes in the biceps tendon.

During reconstructive operative procedures on the rotator cuff in 45 shoulders we observed five cases of total medial displacement and four cases of subluxation of the tendon of the long head of the biceps brachii.

0001–6470/79/010073–05$02.50/0

Prompted by these observations, we dissected anatomical specimens to try to elucidate the mechanics of the lesion. Because in reconstructive procedures of the rotator cuff recognition of this lesion is obviously important, we report here the results of the anatomical study and the features of the lesion.

MATERIAL AND METHODS

Anatomical dissections. At the Department of Forensic Medicine, University of Helsinki, eight shoulders in six cadavers were dissected. The cause of death was severe trauma or suicide, and the victims were all in the third to sixth decade. The anatomical dissection focused on the interrelationship between the structures of the rotator cuff and the tendon of the long head of the biceps. By transecting, one by one, the ligaments that enclose the tendon along its course in the intertubercular groove, we identified the ligament, which when transected, permitted dislocation of the tendon. The depth of the sulcus was not measured.

Patient series. The series comprised eight men and one woman, from 26 to 62 years of age. All had a definite history of trauma to the affected shoulder 2 to 48 months preoperatively. In three patients a fall from a height had caused a forcible abduction and external rotation of the humerus; in one an anterior dislocation of the humeral head was the initial lesion; in one, weight-lifting had stretched the shoulder in hyperextension; in one, a lateral impact on the shoulder was inflicted in a car accident; and in three patients the lesion was initiated by a fall on the outstretched hand. Indications for surgery in all patients were persistent pain in the shoulder, combined in five patients with an inability to elevate the extremity to the horizontal plane, and in four patients, with a painful snapping sensation in the shoulder on abduction and external rotation.

RESULTS

Anatomical observations

In the supratubercular area, the tendon is guided along its course by the stout coracohumeral ligament, which arises at the base of the coracoid process and inserts both medially on to the lesser tubercle and laterally on to the greater tubercle of the humerus (Figure 1). The coracohumeral ligament fills the space between the superior border of the subscapularis muscle and the anterior border of the tendon of the supraspinatus muscle. The ligament is an integrating part of the rotator cuff with which it blends. and con only be distinguished by sharp dissection from the tendinous junctions bordering it.

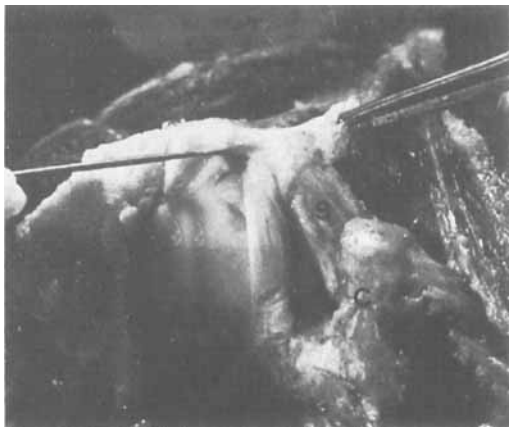

Figure 1. Cranial view of the head of the left humerus in an anatomical specimen showing the intra-articular portion of the tendon of the long head of the biceps, and the coracohumeral ligament held away, by forceps, from its severed attachment to the coracoid process. Note the tunnel formed in the supratubercular area by the two insertions of the ligament. S = tendon of the subscapularis muscle, C = coracoid process.

In the intact specimen we were unable to dislocate the tendon medially over the lesser tubercle. Transection of the intertubercular tranverse ligament allowed for no appreciable lateral or medial movement of the tendon. However, when the portion of the rotator cuff above the lesser tubercle was additionally transected, the tendon could easily be displaced medially over and beyond the lesser tubercle, taking a new course across the tendon of the subscapular muscle (Figure 2).

Further anatomical dissection showed that the key ligament guiding the course of the

Figure 2. Excision of the supratubercular medial insertion of the coracohumeral ligament allows medial displacement of the tendon of the long head of the biceps. Symbols as in Figure 1.

tendon of the long head of the biceps in the intertubercular groove was the medial portion of the coracohumeral ligament close to its insertion in the lesser tubercle. When this ligament was transected, the tendon could easily be displaced medially.

Peroperative findings

In five patients, arthrotomy revealed a complete tear in the tendon of the supraspinatus muscle. In all cases the rupture extended anteriorly and medially into the coracohumeral ligament; in two of the five patients the tear further extended posteriorly into the tendon of the infraspinatus muscle. In all patients, the biceps tendon was mediallly displaced over the lesser tubercle, and lay on the ventral aspect of the tendon of the subscapularis muscle (Figure 3). The sulcus was abnormally flattened due to a wearing down of the lesser tubercle by the attrition of the luxating tendon and to a shallowing of the sulcus by scar tissue. The tendon itself was usually frayed and thick, but easily movable sidewards. In four patients the tendon of the long head of the biceps was subluxated with only a limited simultaneous lesion to the rotator cuff. In these cases the tendon was located in the bicipital groove, but could easily be displaced medially into a fascial sling, formed from the ruptured edge of the medial portion of the coracohumeral ligament.

Operative procedures

All five complete medial displacements and three of the four subluxations of the tendon of the long head of the biceps were treated by tenodesis. The tendon was severed from its supraglenoidal attachment and sutured to a cancellous bed in the greater trochanter close to the bicipital groove (Crenshaw & Kilgore 1966). In the remaining patient, a weight-lifter, the tendon was replaced in its anatomical location after the sulcus had been deepened with care taken to preserve the gliding surface of the floor of the groove.

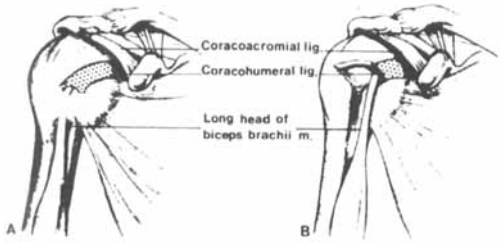

Figure 3A. Diagram of the anterior aspect of the right glenohumeral joint showing the coracohumeral ligament (stippled area), the tendon of the long head of the biceps muscle and the subscapularis muscle.

Figure 3B. Diagram of the peroperative finding in five patients with medial displacement of the tendon of the long head of the biceps muscle. Rupture of the coracohumeral ligament in the supratubercular area permitted dislocation of the tendon over the lesser tubercle on to the tendon of the subscapularis muscle. The lesion was associated with degenerative changes in the rotator cuff, varying from a local avulsion of the medial insertion of the coracohumeral ligament to an extensive rupture of the rotator cuff.

In cases with severe simultaneous rupture of the rotator cuff, the intra-articular portion of the tendon above the tenodesis was interposed between the retracted edges of the ruptured cuff. This enabled closure of the tear without tension. When the associated lesion to the cuff was limited, the portion of the tendon above the site of the tenodesis was resected.

After the operation, a Velpeau dressing was kept on for 3 weeks, and active exercises were begun from the third postoperative week. In the one patient who was treated by replacement of the tendon in the groove, the tendon ruptured 3 weeks after the operation and a tenodesis was performed.

All patients were eventually relieved of their shoulder pain. Of those in whom the torn rotator cuff was reconstructed, function was good in two, fair in two and poor in one. All patients treated with tenodesis, in whom the rotator cuff had been only partly affected, regained good function in the shoulder joint.

DISCUSSION

Two anatomical features in the human glenohumeral joint may predispose to medial displacement of the long tendon of the biceps muscle. Firstly, because the human thoracic cage is flattened, the shoulder is more outwardly rotated in man than in other primates. Hence, the bicipital groove faces ventrally, and the bicipital tendon, even in the normal position, is pressed against the medial wall of the intertubercular sulcus. Secondly, the medial wall of the bicipital groove is often inadequately developed, with a slanting wall that offers only a tiny fulcrum for the tendon during its course from the supraglenoidal attachment above to the muscle belly below (Hitchcock & Bechtol 1948).

Pathological changes in the adjacent ligaments and tendinous attachments must occur, however, before the tendon can dislocate out of the groove. The results of this study indicate that the key ligament which keeps the tendon down in the sulcus and guides its movements in the upper aperture of the sulcus is the medial portion of the coracohumeral ligament. Rupture of this ligament, either because of degenerative disease or trauma, makes pathological medial excursions of the tendon possible. Degenerative ruptures initiate a traumatic synovitis in the synovial pouch around the tendon, which provokes subsequent adhesions, fraying of the tendon, a susceptibility to medial subluxation and, finally, a persistent medial displacement of the tendon. A severe trauma may rupture the anterior part of the rotator cuff and cause an immediate medial displacement. In both instances the peroperative finding is similar: the tendon is located in a newly formed fascial sling on the ventral aspect of the subscapularis tendon. The medial wall of the sulcus is eventually worn down by attrition and the sulcus becomes filled with scar tissue.

Clinically, there is no pathognomonic sign of a medial dislocation of the long head of the biceps brachii. A history of trauma seems to be common, especially a forcible abduction and external rotation of the arm, as may occur when adjacent solid structures are grasped at during a free fall. Our anatomical study showed that such a movement stretches the coracohumeral ligament; a forcible overstretch can obviously cause a tear in the anterior part of the rotator cuff, including the coracohumeral ligament. Abbott & Saunders (1939) noted that some patients experienced a snapping sensation as the tendon slipped in and out of the groove; four of our patients experienced similar sensations. Lippmann (1943) and Crenshaw & Kilgore (1966) regard bicipital synovitis as a clinical entity, in which there is local tenderness in the bicipital groove.

The role of the long tendon of the biceps muscle in the puzzling problem of shoulder pain is still poorly understood. Current clinical observations indicate that pathological changes in the tendon are common and may be of prime aetiological importance. Ruptures of the rotator cuff are often accompanied by

fraying and thickening of the tendon, by synovitis and adhesions in the intertubercular groove, as well as by pathological medial excursions of the tendon. During reconstructive procedures on the shoulder capsule these changes should be carefully looked for and evaluated. Medial displacement of the tendon is easily recognized, and should be treated either by tenodesis alone or in combination with other reconstructive procedures on the rotator cuff.

REFERENCES

Abbott, L. C. & Saunders, J. B. de C. M. (1939) Acute traumatic dislocation of the tendon of the long head of the biceps brachii. *Surgery* **6,** 817–840.

Crenshaw, A. H. & Kilgore, W. E. (1966) Surgical treatment of bicipital tenosynovitis. *J. Bone Jt Surg.* **48**-A, 1496–1502.

DePalma, A. F. (1963) Surgical anatomy of the rotator cuff and the natural history of degenerative periarthritis. *Surg. Clin. N. Amer.* **43,** 1507–1520.

Godsil, R. D. Jr. & Linschied, R. L. (1970) Intratendinous defects of the rotator cuff. *Clin. Orthop.* **69,** 181–188.

Heikel, H. V. A. (1968) Rupture of the rotator cuff of the shoulder. *Acta orthop. scand.* **39,** 477–492.

Hitchcock, H. H. & Bechtol, C. O. (1948) Painful shoulder. *J. Bone Jt Surg.* **30**-A, 263–273.

Lippmann, R. K. (1943) Frozen shoulder; periarthritis; bicipital tenosynovitis. *Arch. Surg.* **47,** 282–296.

Meyer, A. W. (1926) Spontaneous dislocation of the tendon of the long head of the biceps brachii. *Arch. Surg.* **13,** 109–119.

Meyer, A. W. (1928) Spontaneous dislocation and destruction of tendon of long head of biceps brachii. *Arch. Surg.* **17,** 493–506.

Wolfgang, G. L. (1974) Surgical repair of tears of the rotator cuff of the shoulder. *J. Bone Jt Surg.* **56**-A, 14–26.

Correspondence to: Pär Slätis, M.D., Surgical Hospital, Kaserngatan 11–13, 00130 Helsinki 13, Finland.