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Predictive factors of long head of the biceps tendon disorders—the bicipital groove morphology and subscapularis tendon tear

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Background: Disorders of the long head of the biceps (LHB) tendon contribute to anterior shoulder pain. Although LHB tendon disorders are associated with rotator cuff disease, distinguishing between biceps and rotator cuff pathology is difficult. The objective was to identify the predictors of LHB tendon disorders associated with a supraspinatus tear.

Methods: In 55 patients (average age, 65 years) undergoing arthroscopic rotator cuff repair, bicipital groove morphology were assessed using computed tomography, and subscapularis tear and bicipital groove effusion were assessed using magnetic resonance imaging, retrospectively. The LHB tendon was evaluated arthroscopically according to the Lafosse classification. Univariate and multivariate ordinal logistic regression analyses were conducted for injury grade with all covariates.

Results: The arthroscopic evaluation of the LHB tendon showed that there were 23 shoulders classified as grade 0, 15 as grade 1, and 17 as grade 2. Univariate logistic regression analysis showed that the width and depth, a medial spur of the bicipital groove, and a subscapularis tear were significantly associated with LHB tendon disorders. Multivariate ordinal logistic regression analysis identified a medial spur and subscapularis tear as significant predictors of LHB tendon disorders.

Conclusions: The preoperative computed tomography and magnetic resonance images, notably the presence of a spur on the bicipital groove or a subscapularis tear, were useful for identifying LHB tendon disorders. When these are found in preoperative images, the clinician should evaluate the patient for the presence of an LHB tendon disorder as a pain generator.

Level of evidence: Level II; Retrospective Design; Prognosis Study

Keywords: long head biceps tendon; shoulder pain; multivariate ordinal logistic regression; bicipital groove morphology; subscapularis tendon; rotator cuff tear

Disorders of the long head of the biceps (LHB) tendon contribute to anterior shoulder pain.[7,21] Biceps tendon pathology is often associated with rotator cuff disease. Distinguishing between biceps and rotator cuff pathology is sometimes difficult. Previous studies have reported that physical examination

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Table I Demographic data

LHB tendon disorder	Total	Grade 0	Grade 1	Grade 2
Patients (n)	55	23	15	17
Age		61.9 ± 8.9	67.8 ± 9.0	68.0 ± 6.8
Sex, No.				
Male	27	9	11	7
Female	28	14	4	10
Dominant	39	14	9	16
Smoking	11	6	2	3
Diabetes mellitus	11	2	5	4
Subscapularis tear	13	3	1	9
Suprasupinatus tear	52	23	14	15
Tear size				
Partial thickness tear	12	6	5	1
Small	3	2	1	NA
Medium	17	9	5	3
Large	9	3	3	3
Massive	14	3	1	10

is unreliable in the diagnosis of LHB tendon disorders.[3,6,11] Bennett[6] demonstrated that the Speed test is a nonspecific but sensitive test for macroscopic biceps pathology. These reports have shown the importance of the combination of a preoperative physical examination and diagnostic imaging for providing a correct diagnosis of the pathology of LHB tendon disorders. However, standard noncontrast magnetic resonance imaging (MRI) of the shoulder has limitations for detecting the LHB tendon.[9] Although preoperative physical examination and diagnostic imaging can accurately identify patients with biceps pathology, arthroscopic findings are valuable in the diagnosis and treatment of biceps disorders.[3]

Several articles have reported that the bicipital morphology affects the biceps tendon disorders.[20,22] Biometric and morphologic analysis of dry bone shows that bony abnormalities may be associated with biceps tendon lesions.[22] A cadaveric study revealed that degenerative changes in the tendon occur mainly in the distal bicipital groove and near the origin of the tendon from the superior part of the glenoid labrum.[20]

The purpose of this study was to use multivariate ordinal logistic regression analysis of information obtained from preoperative computed tomography (CT) and MRI to try to identify the predictors of LHB tendon disorders with a conjunction of a supraspinatus tear.

Materials and methods

Patients

Between April 2010 and April 2013, a consecutive series of 55 shoulders in 55 patients (27 men and 28 women) with a rotator cuff tear underwent arthroscopic rotator cuff repair. All patients were evaluated and treated by 1 of 2 surgeons (T.F. or A.U.). Patients were a mean age of 65 years (range, 42–79 years) at the time of the operation. Thirty-seven diseased shoulders involved the right side. Patients were given a preoperative questionnaire that included requests for demographic information, history of present illness, and social history. Their demographic data are reported in Table I.

The inclusion criteria were a rotator cuff tear diagnosed by physical examination findings and noncontrast MRI. We found arthroscopically 12 partial tears, 3 small tears, 17 medium tears, 9 large tears, and 14 massive tears. The exclusion criteria included instability of the glenohumeral joint, acromioclavicular arthritis, a history of shoulder fracture, or previous shoulder surgery.

Measurement of bicipital groove morphology using CT and subscapularis tears using MRI

We used CT to assess the bicipital groove morphology as the width, depth, and size of medial wall spurs in the bicipital groove, which were measured using the method reported previously[1] (Fig. 1). To minimize variability, each measurement was taken twice for each image. Subscapularis tears and bicipital groove effusion were assessed using MRI. Binomial data, positive or negative, were used in the current study. Disorders of the subscapularis and the presence of bicipital groove effusion were defined as positive.

Shoulder arthroscopy

All patients underwent shoulder arthroscopy in the beach chair position under general anesthesia; 30° and 70° arthroscopy was used for visualization. After standard diagnostic arthroscopy with assessment of all intra-articular structures and the rotator cuff tendon using anterior and posterior portals, attention was turned to the intra-articular appearance of the LHB tendon. A probe was used to pull the extra-articular portion of the LHB tendon into the glenohumeral joint as much as possible. We used the grading system for the arthroscopic