Prevalence and Imaging Findings of Accessory Head of the Biceps Brachii Tendon

Poster No.: P-0041  
Congress: ESSR 2014  
Type: Scientific Poster  
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Keywords: Congenital, Normal variants, MR, Musculoskeletal soft tissue, Extremities, Anatomy  
DOI: 10.1594/essr2014/P-0041

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Purpose

The biceps brachii is one of the most variable muscle of the body. It usually has two bellies: the short and the long head. Both tendons fuse in the upper arm and attach at the radial tuberosity as a single tendon. Multiple variants of the muscle bellies or of the tendons (anomalous origins, bifid appearance) have been described.

The long head of the biceps tendon (LHBT) is a structure that is nicely identified in its extrarticular portion in the intertubercular groove on conventional MRI. The appearance of a double tendon may be considered a sign of a split tear, but an accessory tendon may occur and should be considered in the differential diagnosis (1).

The purpose of this study is to evaluate the imaging findings of an accessory tendon of the LHBT on MRI as not to be misdiagnosed as a tear and to determine its prevalence.
Fig. 1: Normal anatomy of the shoulder in the axial plane. Long head of the biceps tendon (LHBT; yellow arrow) as single oval structure located in the intertubercular groove. The coracohumeral ligament (CHL; white arrow) shows a linear morphology covering anteriorly the LHBT entering the bicipital groove. Short head of the biceps tendon with its separate origin from the coracoid process (SHBT; white star)

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Methods and Materials

Study population

132 MRI examinations of the shoulder performed to 129 patients (3 bilateral examinations) in our institution from March 2013 to January 2014 were reviewed.

Images were acquired following the standard protocol we use in our institution: SE-T1, TSE-T2 and PD-SPIR in the coronal oblique; TSE-T2 in the sagital and PD-SPIR in the axial.

We set the exclusion criteria: Patients with clinical symptoms of biceps tendinopathy, tear or dislocation. Imaging findings on previous ultrasound examinations or MRI consistent with LHBT pathology: thickening, intratendinous signal abnormalities, subluxation or dislocation.

Image analysis

Images were interpreted by a musculoskeletal radiologist with 6 years of experience and a fellow in consensus.

Identification of a tendon slip adjacent to the LHBT in the intertubercular groove with anomalous origin and normal signal intensity was considered the diagnostic criterion of an accessory LHBT.

The following characteristics were analyzed:

Number of tendons

Morphology: rounded or flat
Size and position (related to each other)
Origin and distal insertion of the tendon: capsular, greater or lesser tuberosities and distal attachment by means of fusion with the LHBT or the tendon sheath.
Results

12 out of 132 examinations (9%) showed an accessory tendon on MRI. 4/12 (33%) were men and 8/12 (66%) women. In one patient, who both shoulders were scanned, a bilateral accessory tendon of similar morphology was demonstrated. The position and size of the tendon was: anterior and smaller than the LHBT in all cases (100%). The morphology of the tendon was flat in 8 cases (66%) (Fig. 2 on page 7), and 3 of them had a triangular morphology at their proximal origin (Fig. 3 on page 7). In 4 cases the tendon had a rounded appearance (33%). Fig. 4 on page 8 and Fig. 5 on page 8.

The proximal insertion was on the capsule in 5 cases (41%), on the greater tuberosity in 5 cases (41%) (Fig. 3 on page 7) and on the lesser tuberosity in 2 cases (16%). In 2 cases with proximal attachment at the greater tuberosity, it was difficult to depict if there were an additional capsular origin.

The distal insertion was at the anterior tendon sheath of the LHBT in 9 cases (75%) (Fig. 3 on page 7 and Fig. 5 on page 8) with a flat appearance in 9 cases (75%) (Fig. 2 on page 7) and rounded in 3 cases (25%) (Fig. 6 on page 9). In 4 cases (33%) the accessory tendon fused with the LHBT (Fig. 2 on page 7).

Discussion

Variations in the extrarticular portion of the long head of the biceps tendon are quite frequent. It is very important to identify them because they may lead to confusion with partial rupture of the LHBT on MRI studies of the shoulder.

These variations were first described by Greig et al in an anatomic study (1). They described and incidence approximately two fold compared with our results (9%). This fact suggests that subtle variations may not be detected with conventional MRI. The origin of the supernumerary tendons was not found to be proximal to the lesser tuberosity, in concordance with our findings that showed origins in the greater tuberosity, lesser tuberosity or the adjacent capsule. In none of the cases was the supernumerary tendon well developed, as it happened in all our cases.

Gheno et al (2) described the anatomic variations of the LHBT in the bicipital groove in a series of ten cadavers with MRI correlation. The morphology of the accessory head was flat and anteriorly located with respect to the LHBT in all cadavers who showed a supernumerary head (2 cases). We found similar morphology and position in 6 (50%) of our cases.
Rounded morphology was less frequently found in our study and can cause more frequent equivocal interpretations. Fusion with the LHBT sheath, which happened in 6 of our cases (50%), facilitates the correct diagnosis (Fig. 3 on page 7 and Fig. 6 on page 9).

Although only in a small percentage of cases bilateral exams of both shoulders were performed, one of them showed supernumerary tendons with the same morphology, size and distribution on both sides, similar to those describe by Gheeno (2).

The distal portion of the supernumerary tendon has been easily identified in the axial plane, but the proximal insertion has been more difficult due to the change in the orientation of the tendon when entering the joint. Probably MR-Arthrography would give more detail and precision because of the capsule distension.

There are several limitations of the study such as its retrospective nature and absence of arthroscopic examinations to correlate the imaging findings.
Fig. 2: Axial PD-SPIR images of a patient with an accessory tendon (red arrow). It shows a flat appearance from its origin in the greater tuberosity to the myotendinous juncton where joins the LHBT (orange arrow) and the SHBT (white star)

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**Fig. 3:** The accessory tendon (ACT; red arrow) has a flat and triangular morphology in the proximal intertubercular groove, deep with respect to the coracohumeral ligament (CHL; white arrow) and superficial to the LHBT (orange arrow). Distally it attaches to the anterior sheath of the LHBT before joining the short head (SHBT; white star)

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**Fig. 4:** Rounded appearance of the accessory tendon (red arrows), nicely depicted in the axial images, anterior to the LHBT (orange arrows) and in the coronal oblique plane.

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Fig. 5: Accessory tendon with a rounded appearance (red arrow), anterior and medial to the LHBT (orange arrow) and its attachment to the anterior sheath of the biceps tendon.

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Fig. 6: Axial and coronal PD-SPR images of the shoulder demonstrates a rounded accessory tendon (red arrow) in an anterior and medial position related to the LHBT (orange arrow) which has a flat morphology in the proximal intertubercular groove and rounded more distally. Fluid in the subdeltoid bursa delineates nicely the tendinous structures.

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Conclusion

Accessory tendon of the extrarticular LHBT is not a rare occurrence that appears in approximately 9% of population and it is of great importance to identify to avoid confusion with partial tear of the tendon on MRI.

Identification of a different origin, anterior location and smaller size of the accessory tendon with respect to the LHBT are the most helpful features to make the diagnosis.
References

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