Updated Anatomy and MR Arthrographic Evaluation of the Biceps pulley and Rotator interval

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Outline

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Treatment

Embryology

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Pathology and interpretation

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Introduction

Biceps pulley
‘Direct’ fibers of the Superior glenohumeral ligament (SGHLD) & Subscapularis
Biceps pulley lesions are a cause of anterosuperior shoulder pain
Isolated superior glenohumeral ligament injuries can progress to rotator cuff tears
Treatment of pulley lesions

Arthroscopic prevalence of pulley lesions in 1007 consecutive patients

Bernd Baumann, MD, Kathrin Genning, MD, Dirk Böhm, MD, Olaf Rolf, MD, and Frank Gohlke, PhD, Würzburg, Germany

Biceps pulley lesions can be treated
Treatment of pulley lesions

Incidence = 7%
Pulley lesions are progressive
Early surgical treatment available
   Electrothermal treatment
   Primary reconstruction
   Long head biceps tenodesis

SGHld = Superior Glenohumeral ligament, direct. LHBT = Long Head Biceps Tendon
Embryology

Mesenchyme surrounds the humeral head

Rotator cuff tendons propagate through the mesenchyme to reach humerus

Mesenchyme matures to become the capsular ligaments

Biceps pulley - anatomy

Superior Glenohumeral Ligament, oblique
Supraglenoid tubercle >> rotator cable

Biceps pulley - anatomy

Superior Glenohumeral Ligament, direct
Anterosuperior labrum >> humerus

Biceps pulley - anatomy

Coracohumeral ligament
Coracoid >> rotator cable
Blends loosely with the direct component of the superior glenohumeral ligament at mid-interval and continues to the rotator cable, not the humerus

Biceps pulley - anatomy

Subscapularis

Supports the Superior glenohumeral ligament and forms the transverse humeral ligament

Biceps pulley and rotator interval

Biceps pulley = ‘direct’ component of the superior glenohumeral ligament & Subscapularis. The coracohumeral ligament blends loosely with the SGHL direct and continues to insert into the rotator cable. I.e. NOT a primary component of the biceps pulley.

Biceps pulley – anatomy; medial

Superior glenohumeral ligament is discrete

Arises from the anterosuperior labrum and spirals under the biceps
Biceps pulley – anatomy; lateral

Superior glenohumeral ligament spirals under the longhead of biceps tendon
Coracohumeral ligament inserts into the rotator cable, not the humerus
Biceps pulley – ‘pulley concept’

The pulley prevents anteroinferior translation of the biceps
Biceps pulley – arthrogram

Superior glenohumeral ligament, direct component
Critical and visible
Biceps pulley – injury and diagnosis

Lesions of the Biceps Pulley: Diagnostic Accuracy of MR Arthrography of the Shoulder and Evaluation of Previously Described and New Diagnostic Signs

Biceps pulley – injury and diagnosis

Displacement sign;
Mid-point of lesser tubercle in sagittal plane
  Biceps tendon displaces inferiorly
Three readers; Sensitivity = 86%, 82%, 75%. Specificity = 96%, 98%, 90%.

Subluxation of biceps tendon on axial images;
  Three readers; Sensitivity = 36%, 50%, 64%. Specificity = 100%, 98%, 96.
Pulley injuries – Habermeyer type I

Superior glenohumeral ligament

Pulley injuries – Habermeyer type II

Superior glenohumeral ligament + Supraspinatus

Pulley injuries – Habermeyer type III

Superior glenohumeral ligament + Subscapularis

Pulley injuries – Habermeyer type IV

Superior glenohumeral ligament + supraspinatus + subscapularis

Rotator interval – capsular laxity

Capsular laxity and Multidirectional instability

- Width greater than 15.2 mm (Subscapularis to supraspinatus)
- Depth greater than 6.4 mm (Humeral head to roof of interval)

Sensitivity = 81%, 92%, 79%, 94%. Specificity = 66%, 72%, 62%, 66%.

Rotator interval – interval tear

Widened interval
Contrast contacting the posterior coracoid cortex
Rotator interval - adhesive capsulitis

Interval obliterated
Loss of normal subcoracoid fat signal on T1 (non-Fat sat)
Summary

Understanding the rotator interval = ability to identify various pathology;
- Pulley lesions
- Capsular laxity and Multidirectional instability
- Rotator interval tears
- Adhesive capsulitis

‘Biceps pulley’ refers to the ‘direct’ component of the superior glenohumeral ligament and leading edge of the subscapularis

Coracohumeral ligament blends into the rotator cable

Isolated repair of the direct superior glenohumeral ligament can lead to improved clinical outcomes