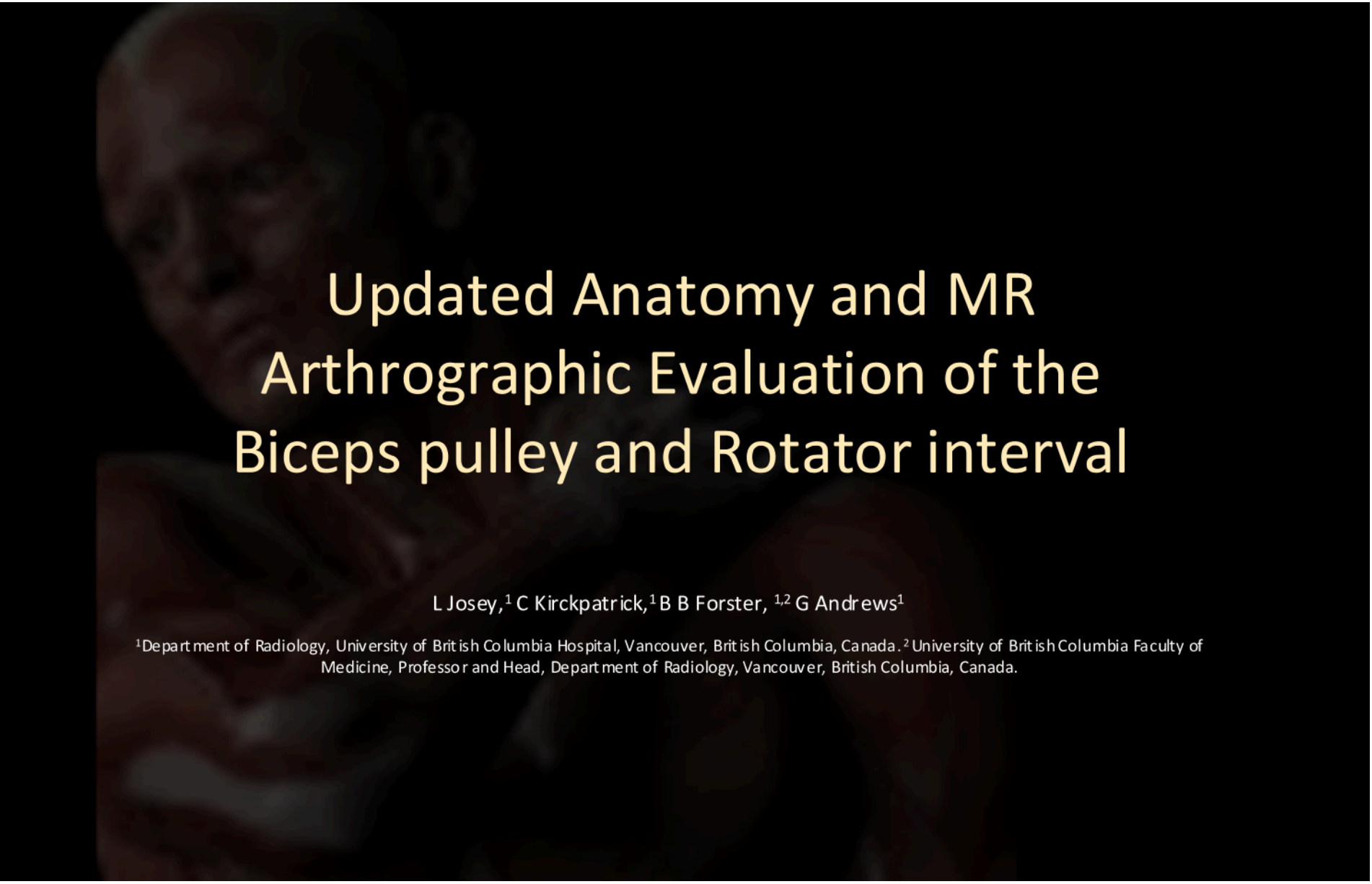
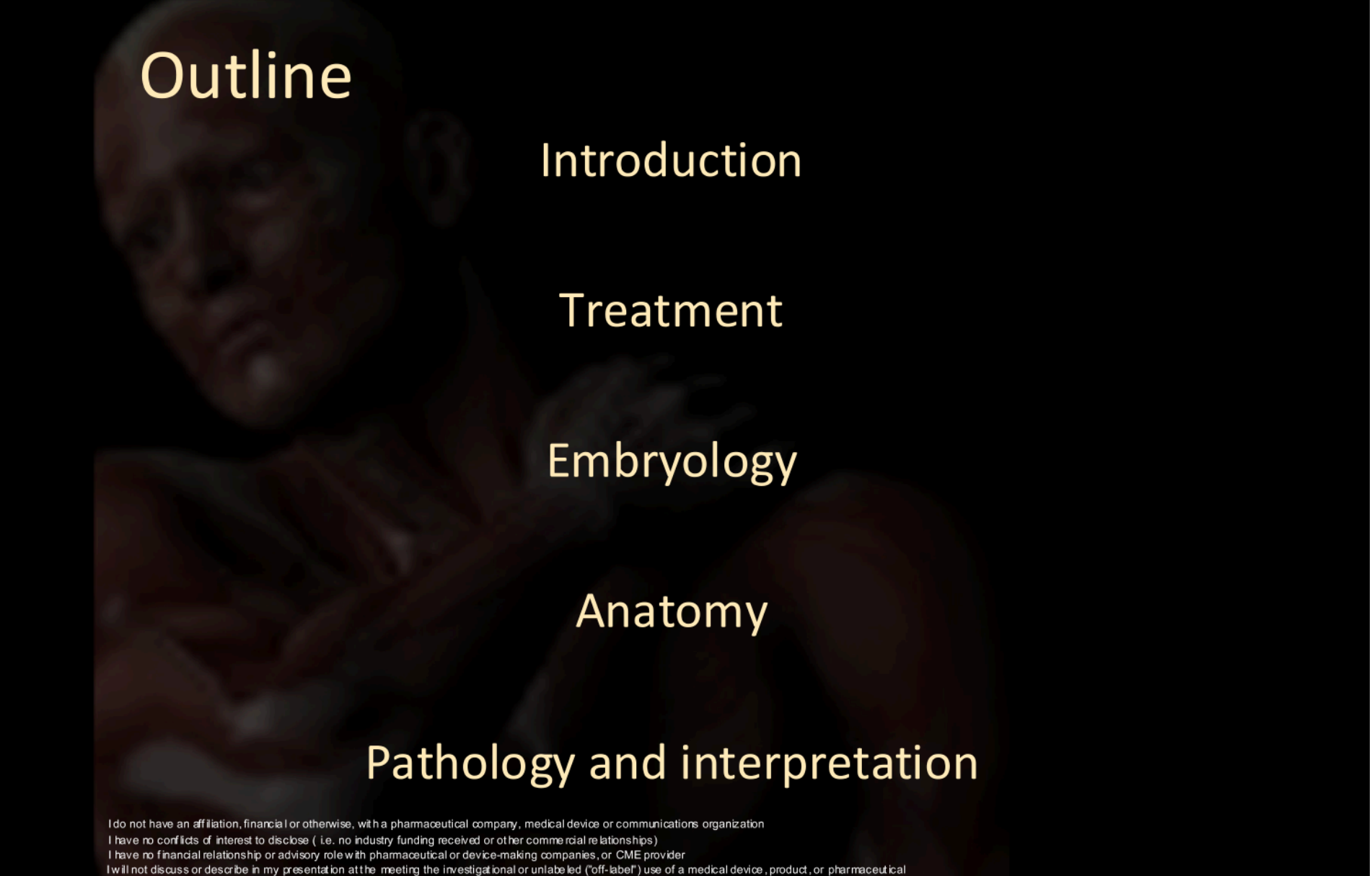




Updated Anatomy and MR Arthrographic Evaluation of the Biceps pulley and Rotator interval

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Outline

Introduction

Treatment

Embryology

Anatomy

Pathology and interpretation

I do not have an affiliation, financial or otherwise, with a pharmaceutical company, medical device or communications organization

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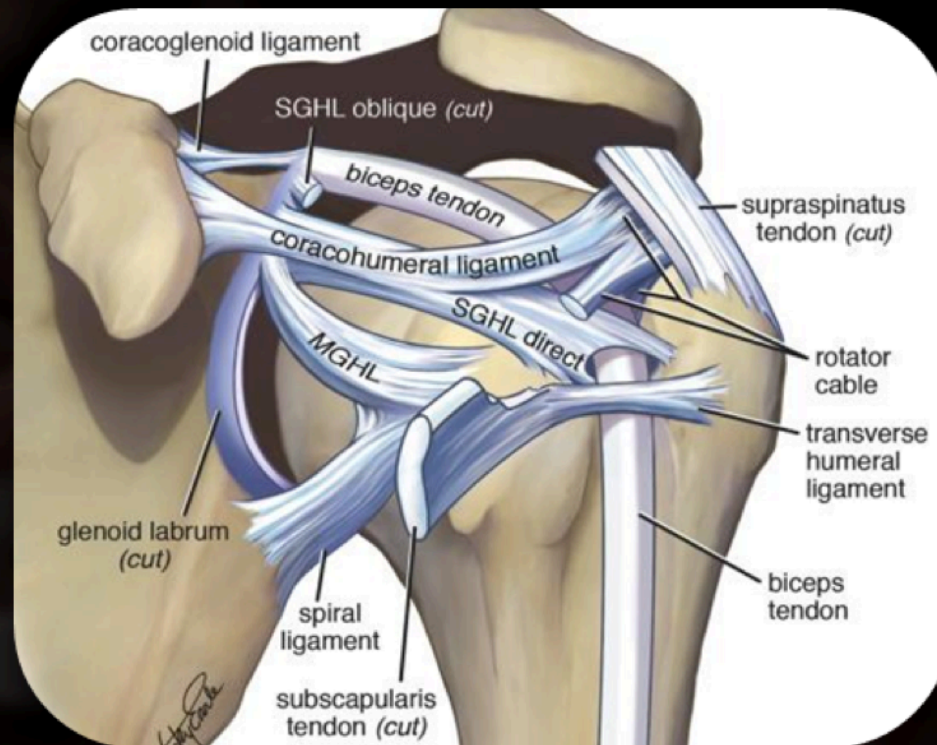
Introduction

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

**JOURNAL OF
SHOULDER AND
ELBOW
SURGERY**

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%

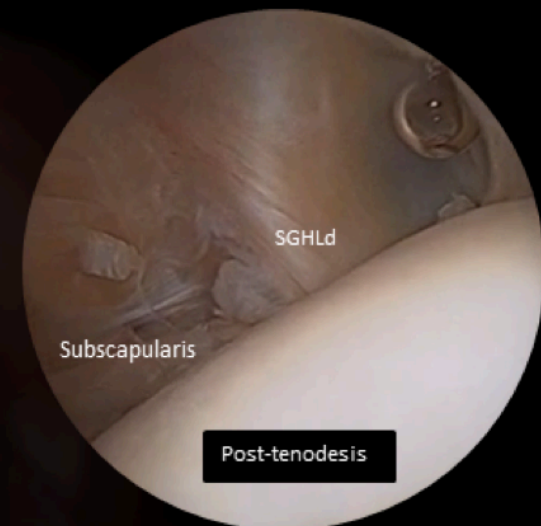
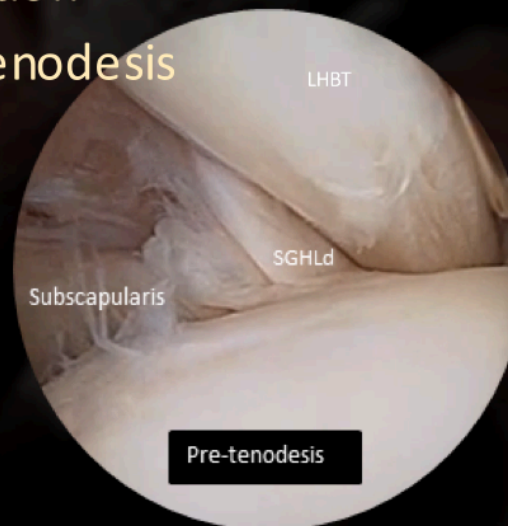
Pulley lesions are progressive

Early surgical treatment available

Electrothermal treatment

Primary reconstruction

Long head biceps tenodesis



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

Embryology

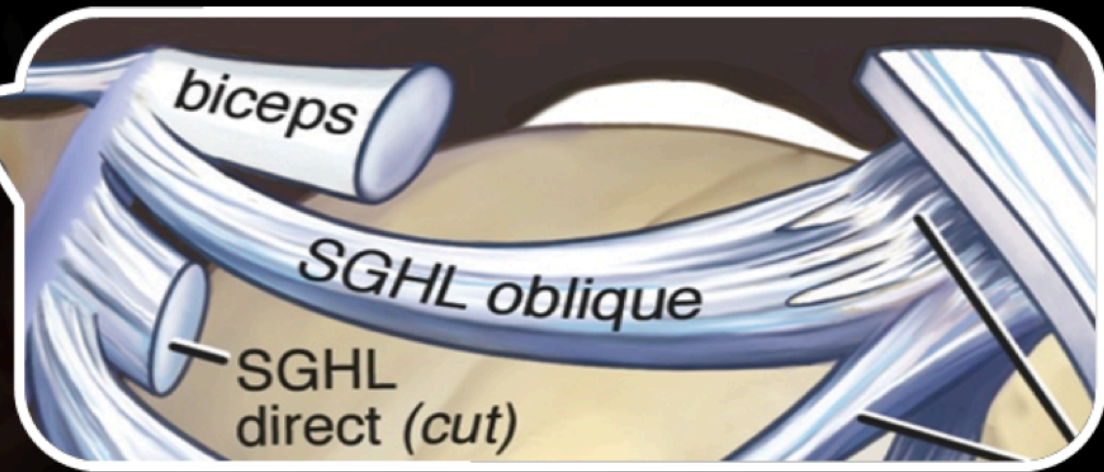
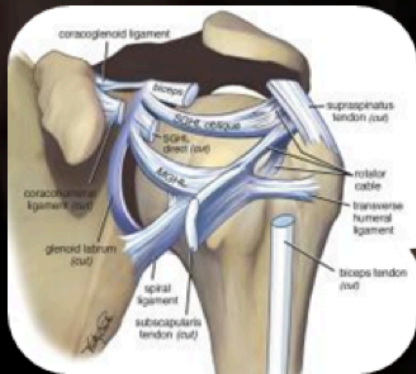
Mesenchyme surrounds the humeral head

Rotator cuff tendons propagate through the mesenchyme to reach humerus

Mesenchyme matures to become the capsular ligaments

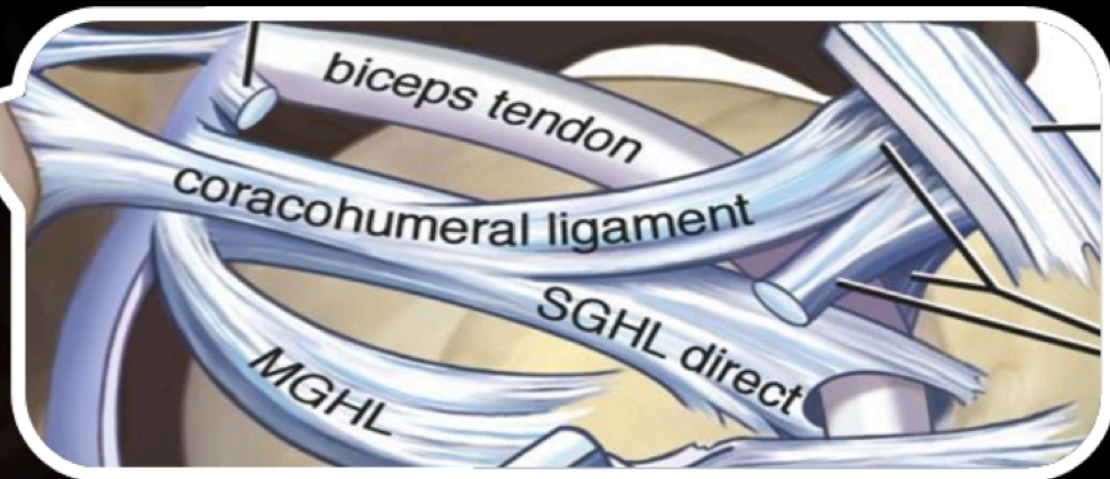


Biceps pulley - anatomy



Superior Glenohumeral Ligament, oblique
Supraglenoid tubercle >> rotator cable

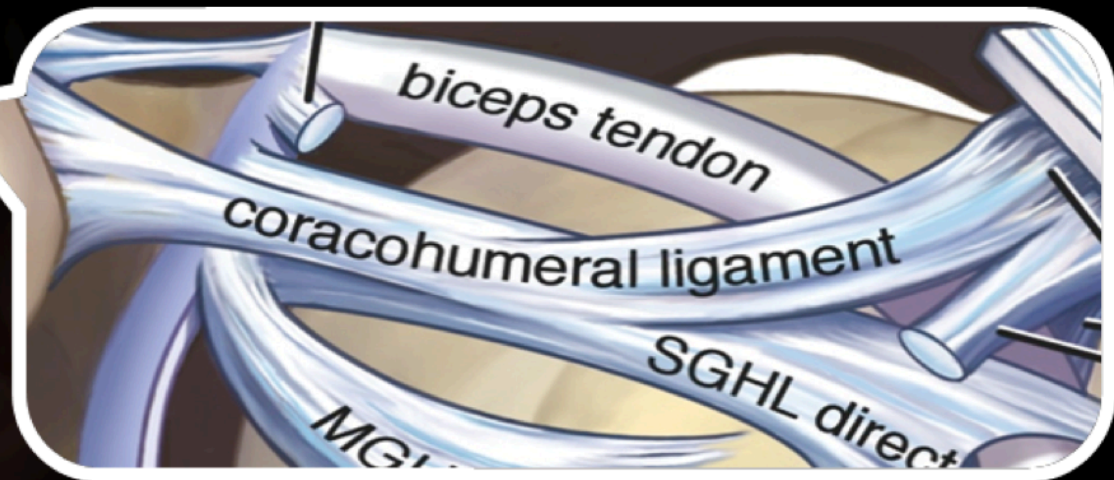
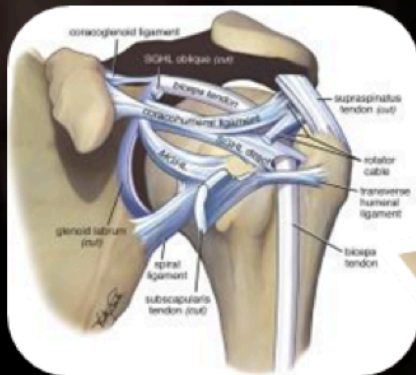
Biceps pulley - anatomy



Superior Glenohumeral Ligament, direct
Anterosuperior labrum >> humerus



Biceps pulley - anatomy

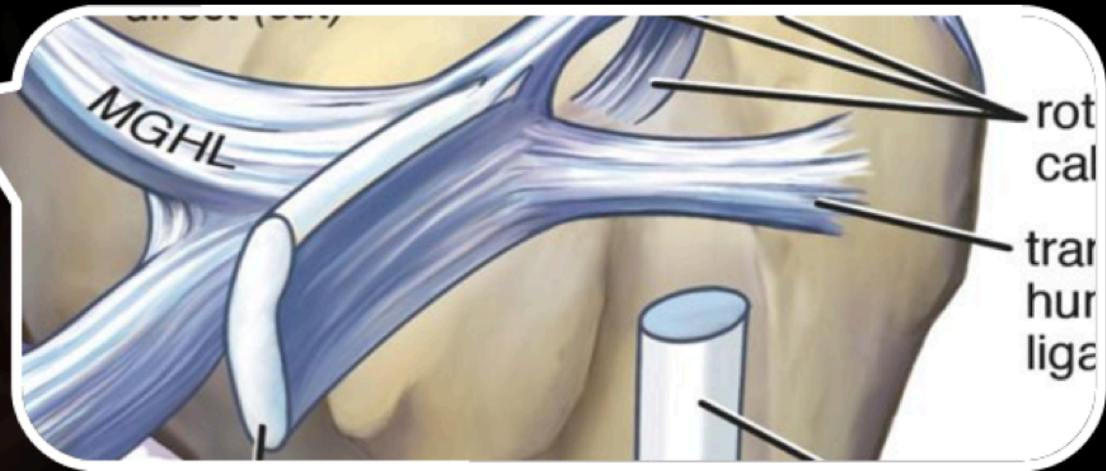
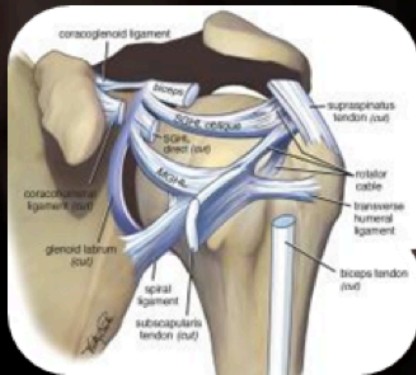


Coracohumeral ligament

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

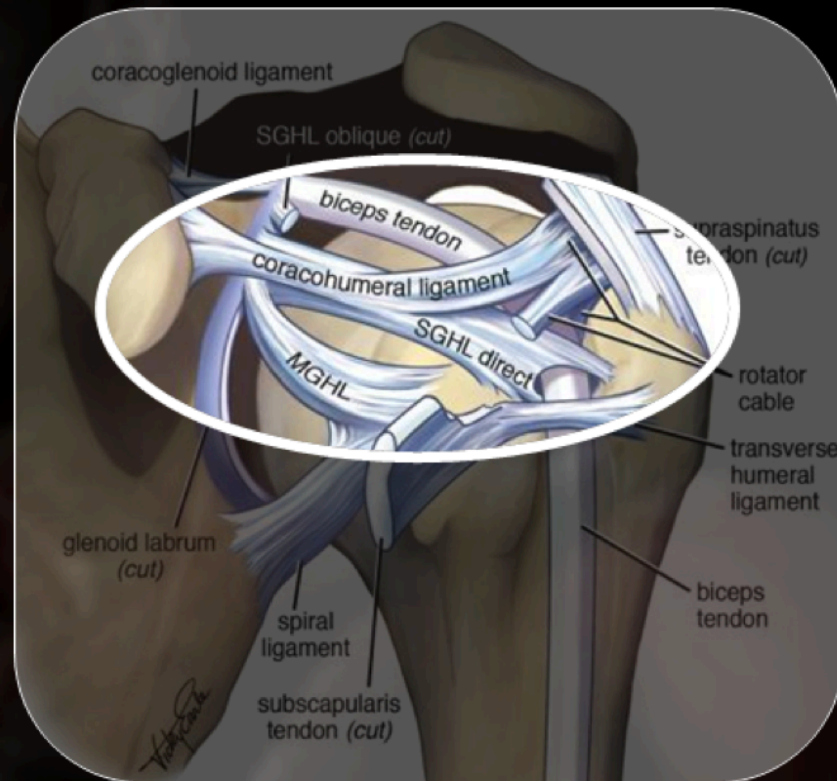


Subscapularis

Supports the Superior glenohumeral ligament and forms the transverse humeral ligament

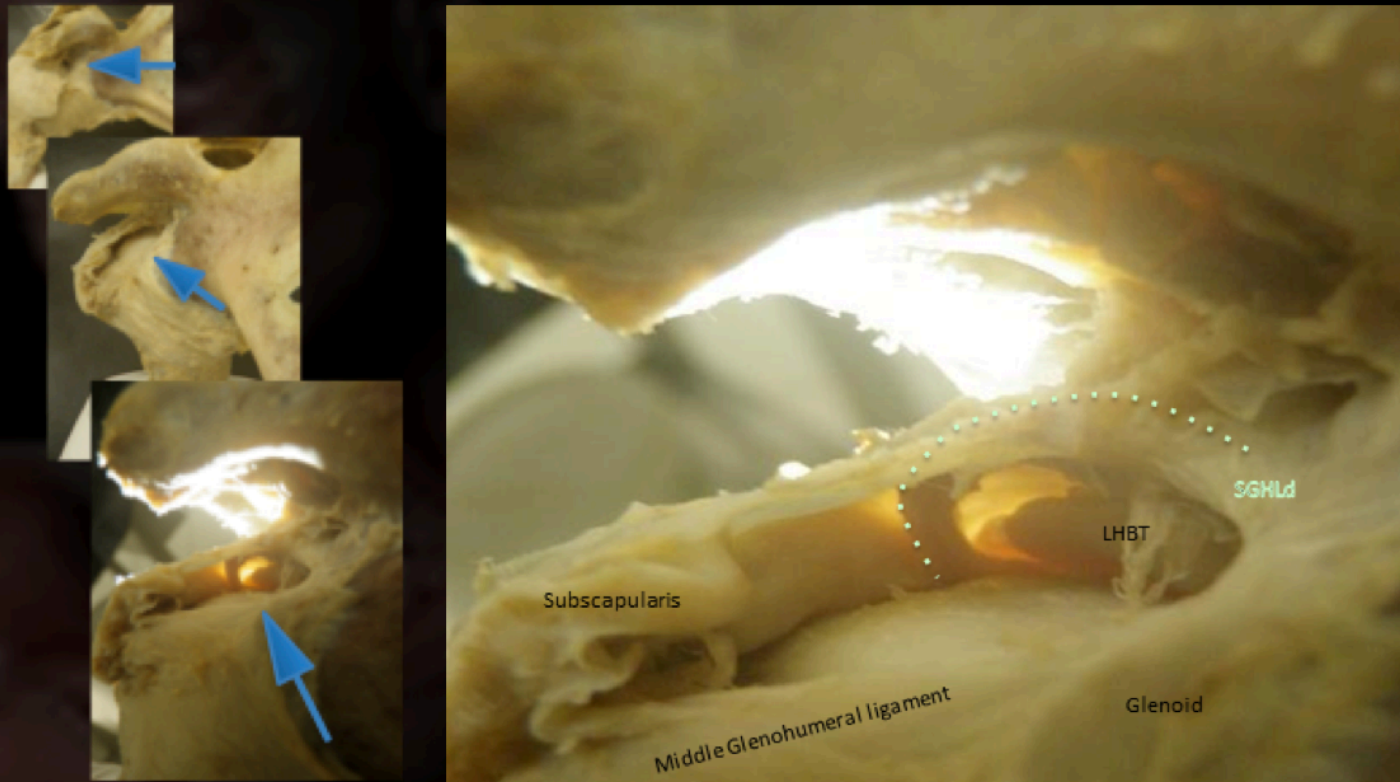
Arai R, Mochizuki T, Yamaguchi K, Sugaya H, Kobayashi M, Nakamura T, et al. Functional anatomy of the superior glenohumeral and coracohumeral ligaments and the subscapularis tendon in view of stabilization of the long head of the biceps tendon. *Journal of Shoulder and Elbow Surgery*. 2010 Jan; 19(1):58–64.

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

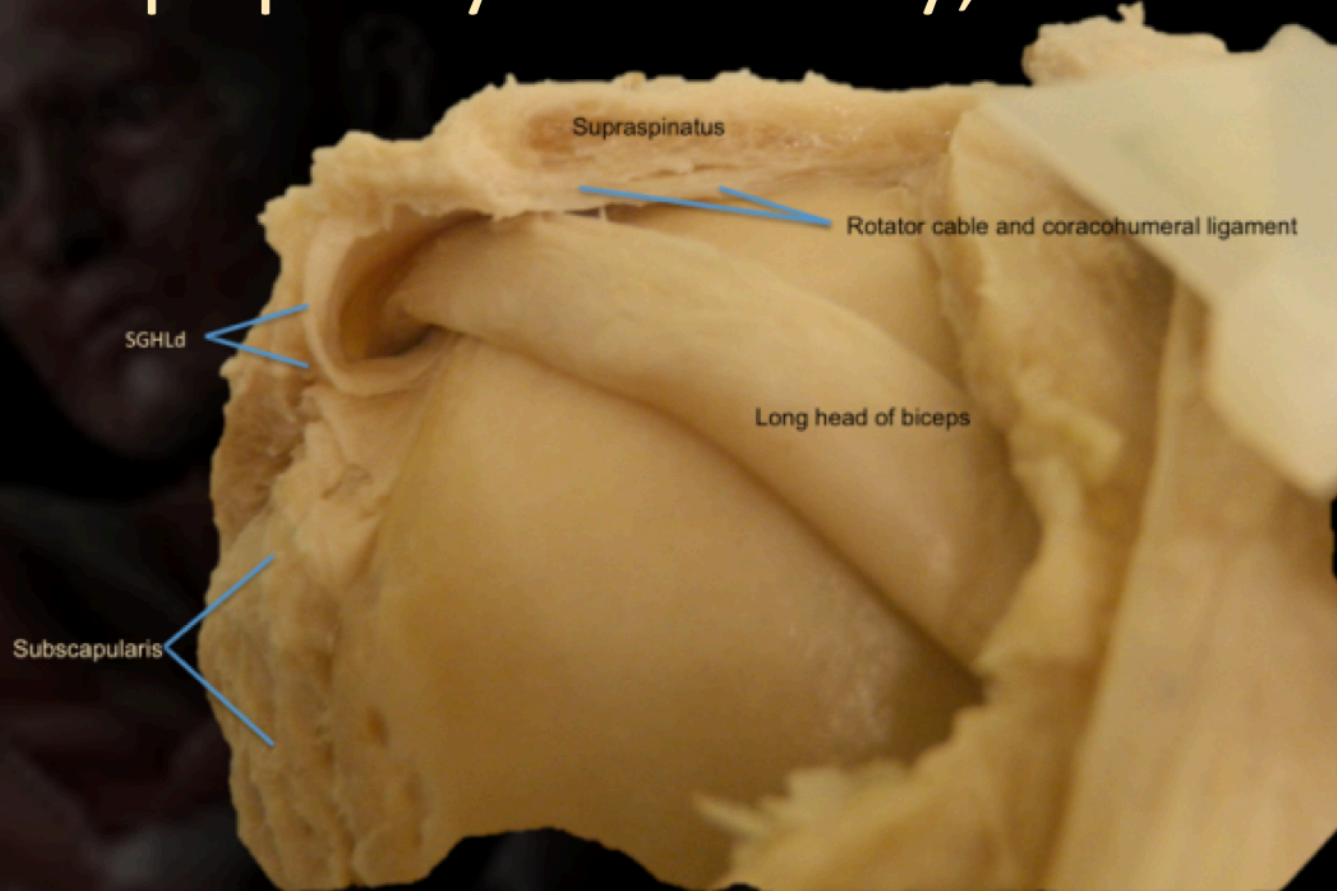


SGHLd = Superior Glenohumeral ligament, direct. LHBT = Long Head Biceps Tendon

Superior glenohumeral ligament is discrete

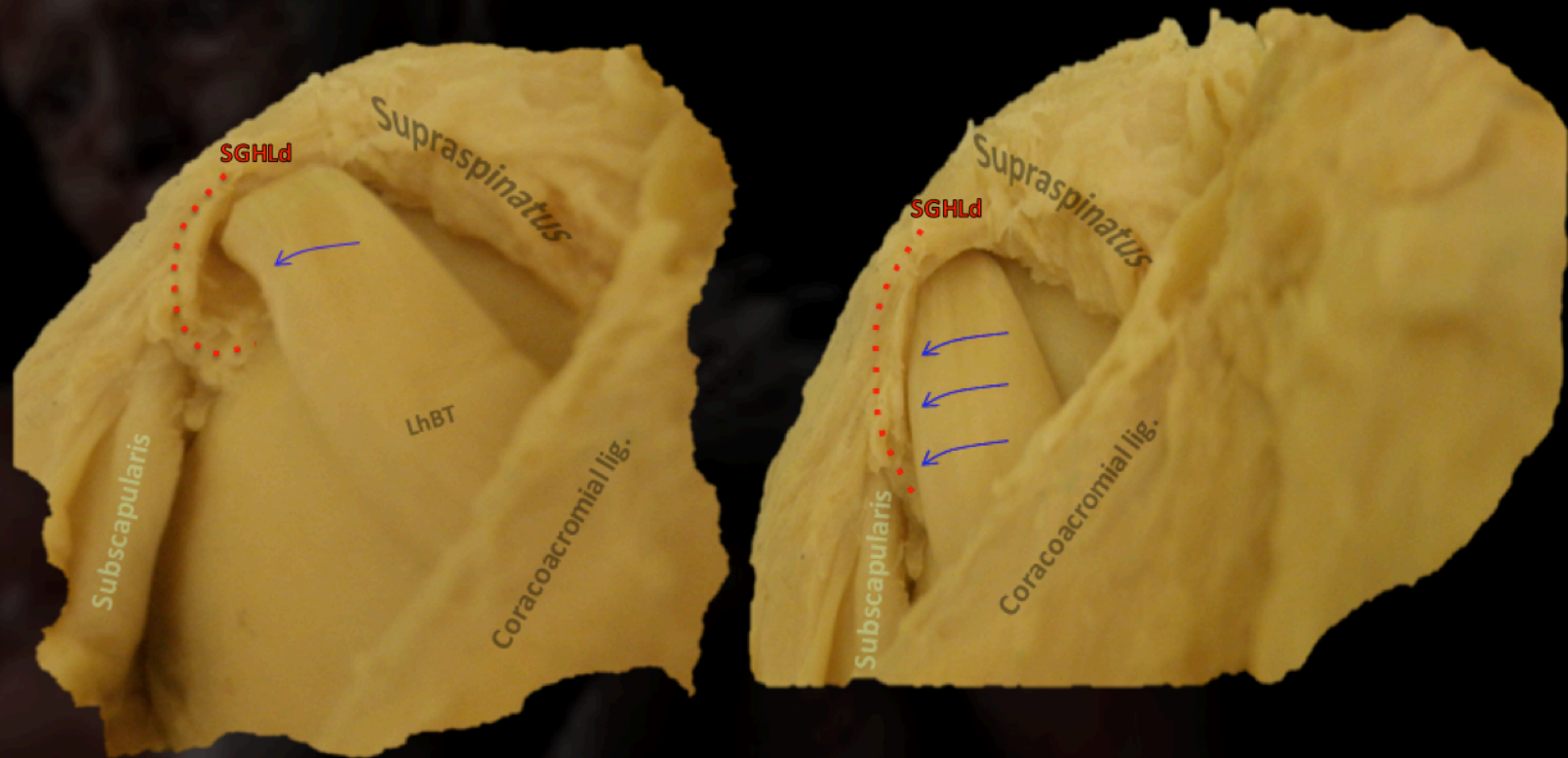
Arises from the anterosuperior labrum and spirals under the biceps

Biceps pulley – anatomy; lateral



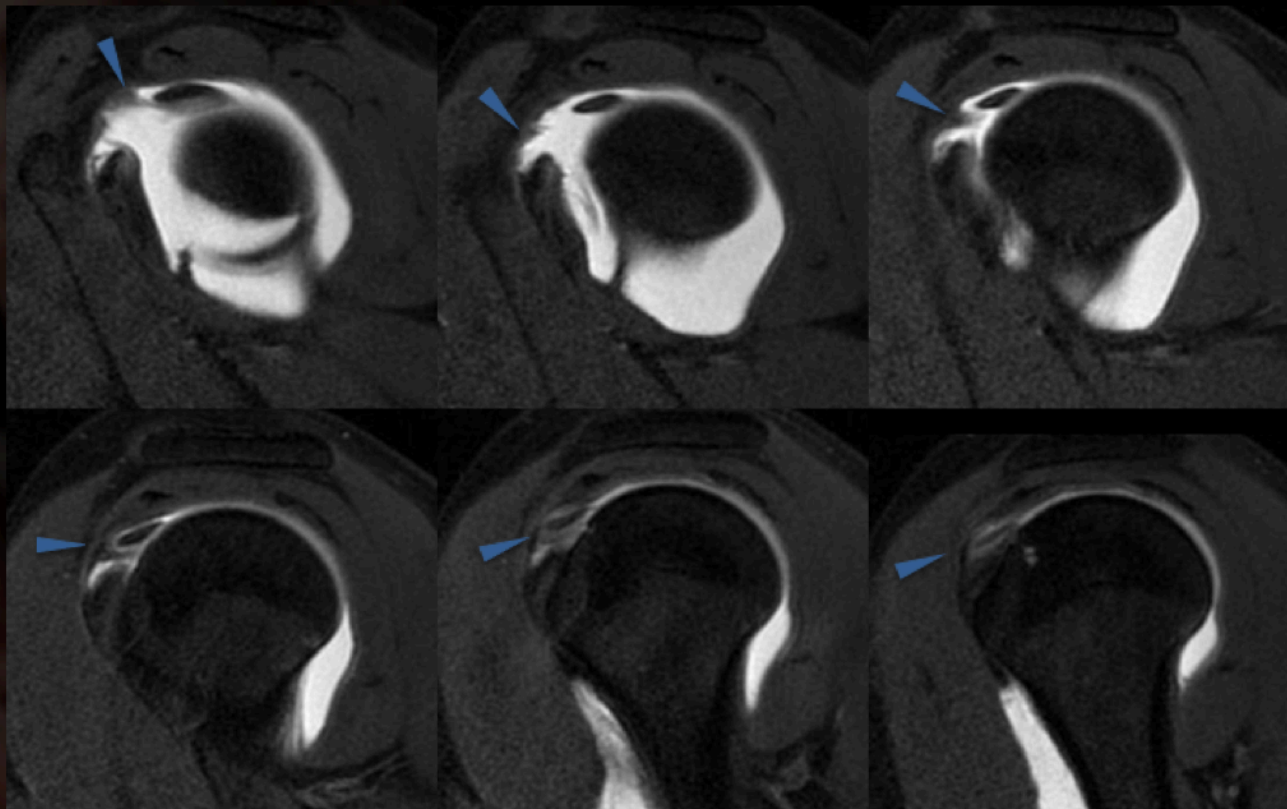
Superior glenohumeral ligament spirals under the longhead of biceps tendon
Coracohumeral ligament inserts into the rotator cable, not the humerus

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

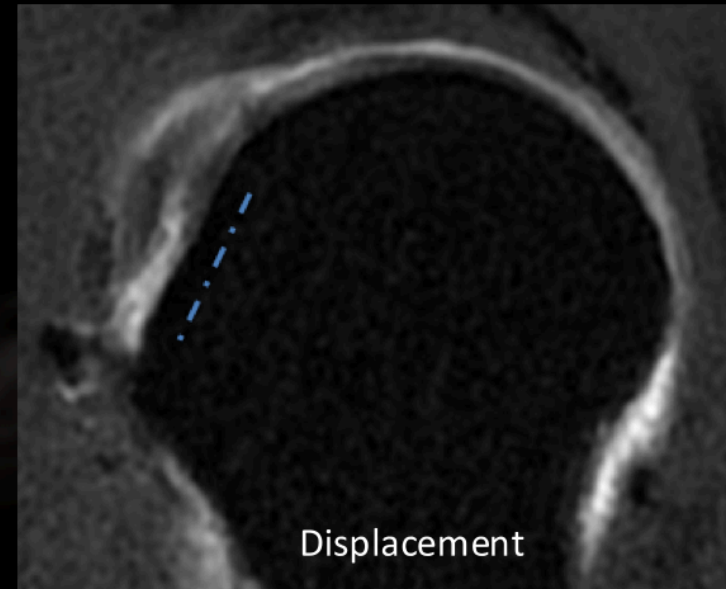
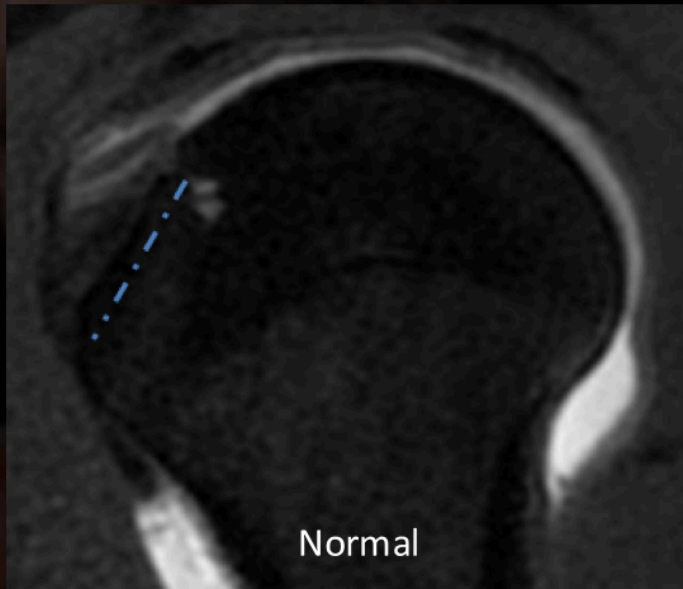
Lesions of the Biceps Pulley:

Diagnostic Accuracy of MR

Arthrography of the Shoulder and
Evaluation of Previously Described
and New Diagnostic Signs¹

Radiology

Biceps pulley – injury and diagnosis



Displacement sign;

Mid-point of lesser tubercle in sagittal plane

Biceps tendon displaces inferiorly

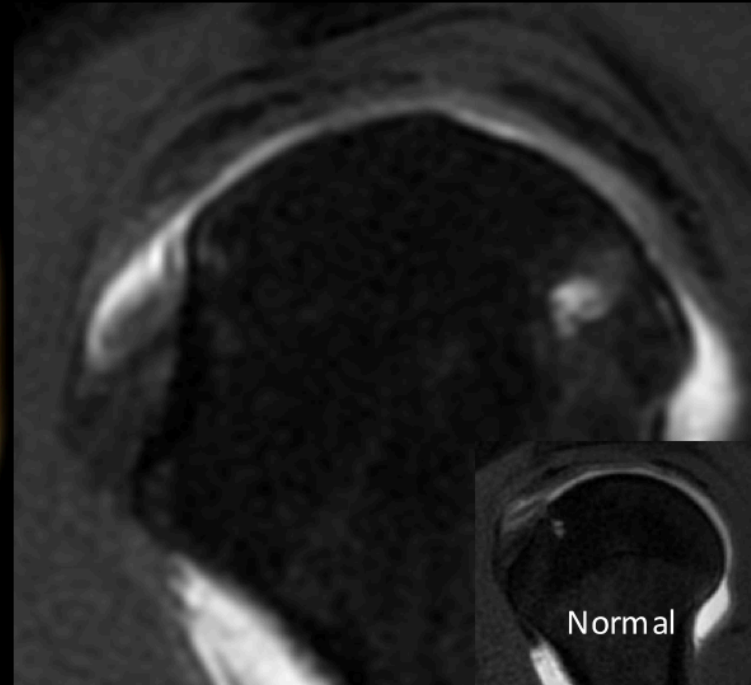
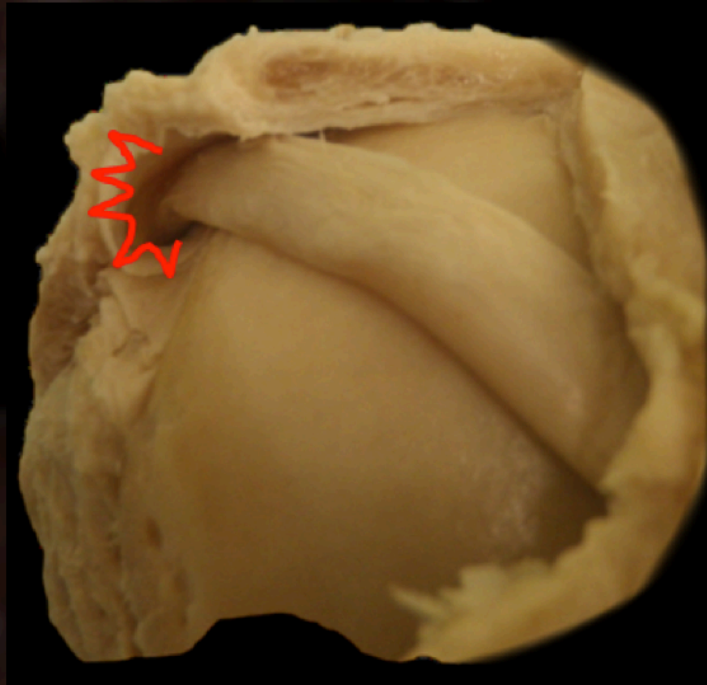
Three readers; Sensitivity = 86%, 82%, 75%. Specificity = 96%, 98%, 90%.

Subluxation of biceps tendon on axial images;

Three readers; Sensitivity = 36%, 50%, 64%. Specificity = 100%, 98%, 96%.



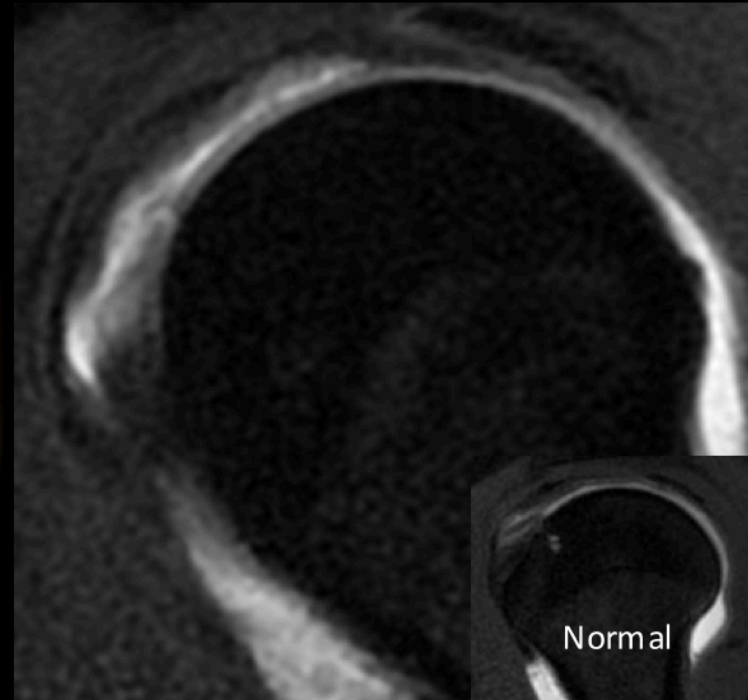
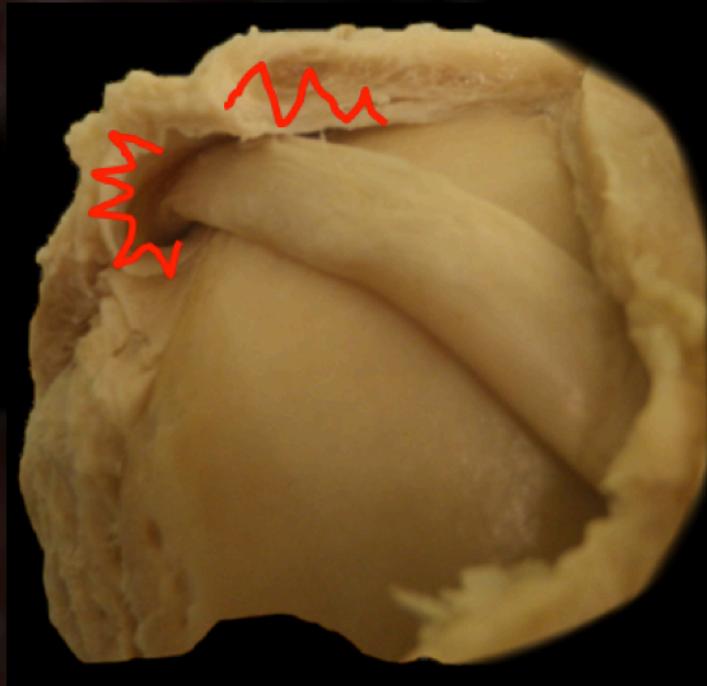
Pulley injuries – Habermeyer type I



Superior glenohumeral ligament

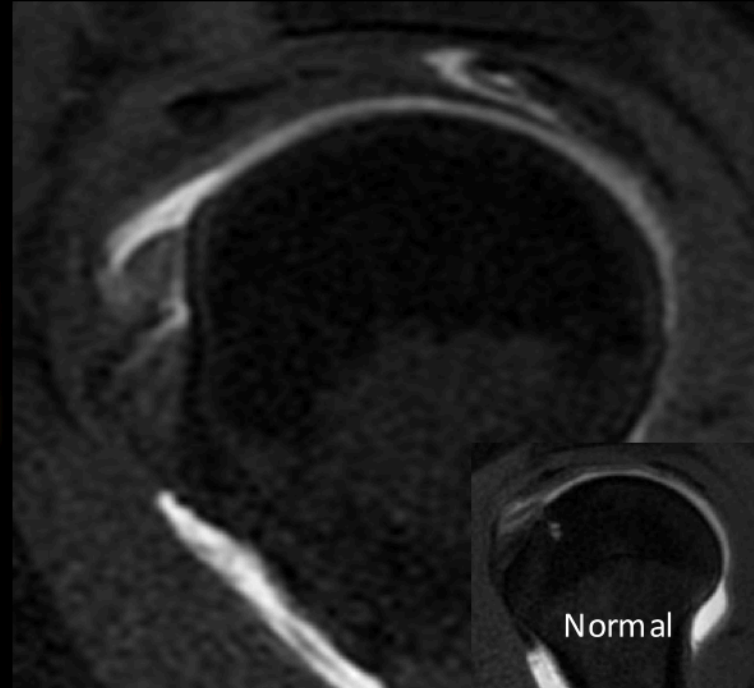
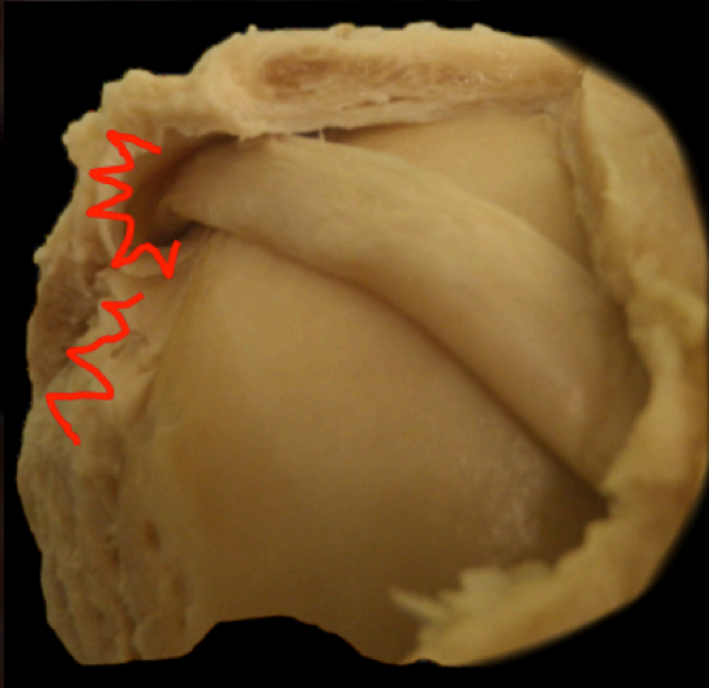
Habermeyer P, Magosch P, Pritsch M, Scheibel MT, Lichtenberg S. Anterosuperior impingement of the shoulder as a result of pulley lesions: a prospective arthroscopic study. J Shoulder Elbow Surg. 2004 Jan;13(1):5-12.

Pulley injuries – Habermeyer type II



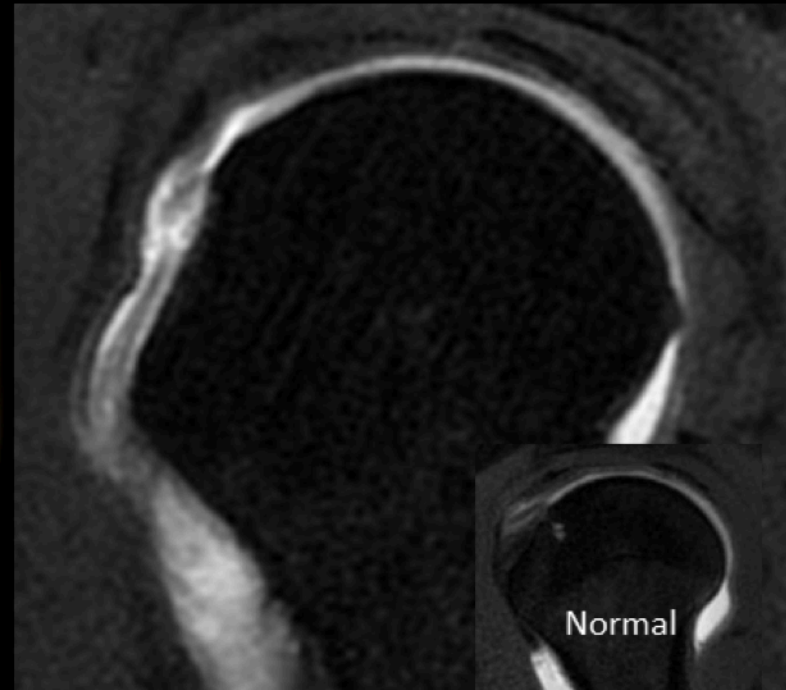
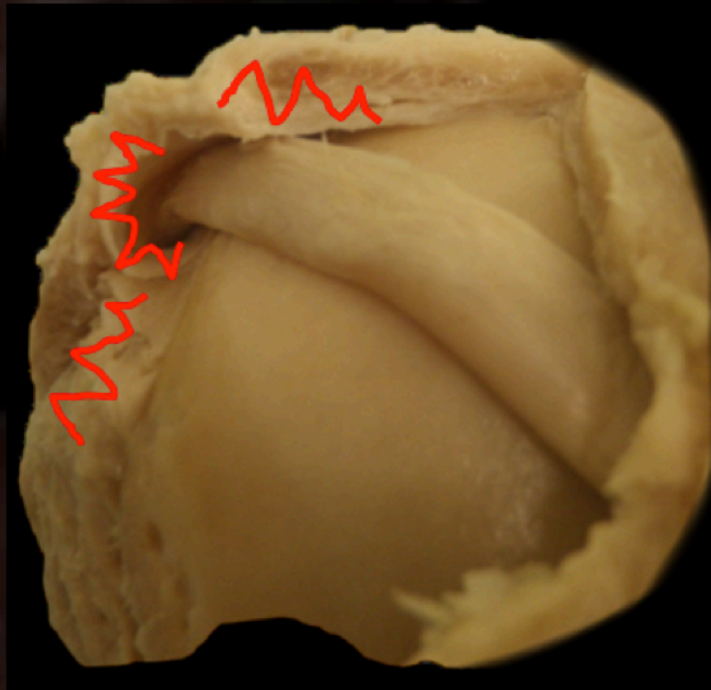
Superior glenohumeral ligament + Supraspinatus

Pulley injuries – Habermeyer type III



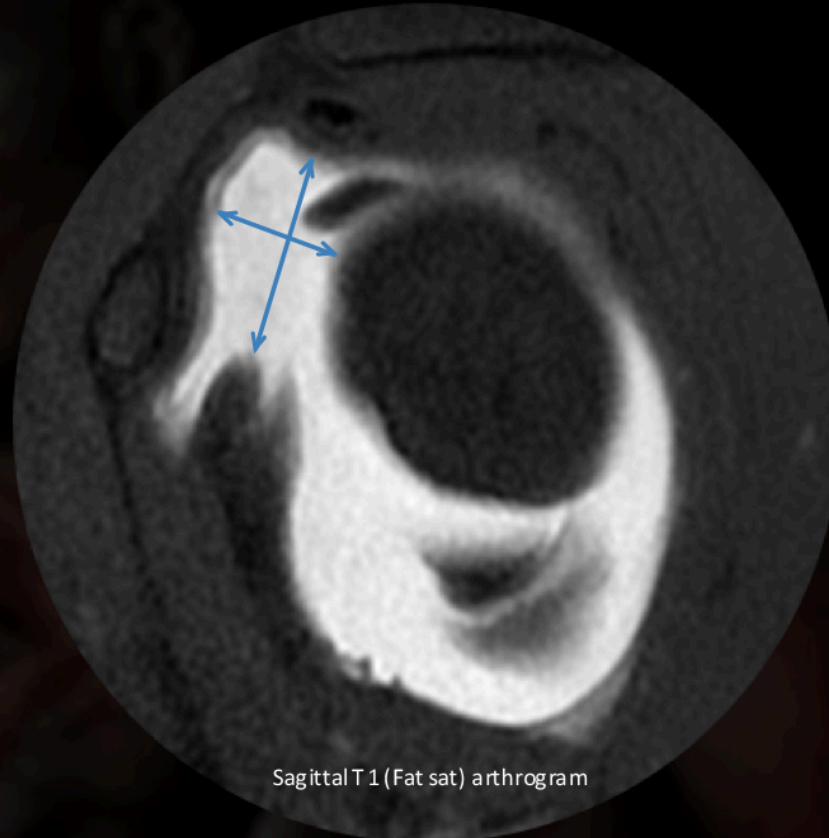
Superior glenohumeral ligament + Subscapularis

Pulley injuries – Habermeyer type IV

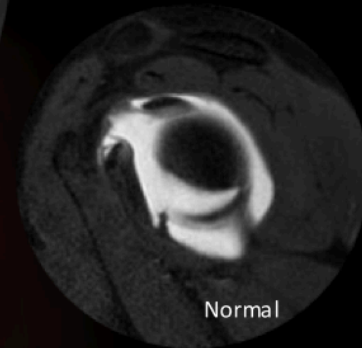


Superior glenohumeral ligament + supraspinatus + subscapularis

Rotator interval – capsular laxity



Sagittal T1 (Fat sat) arthrogram



Normal

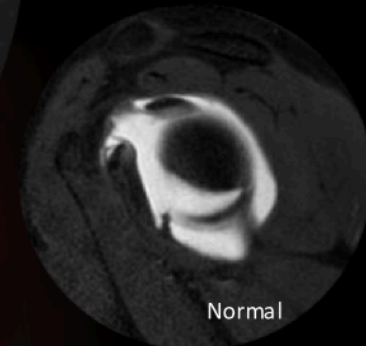
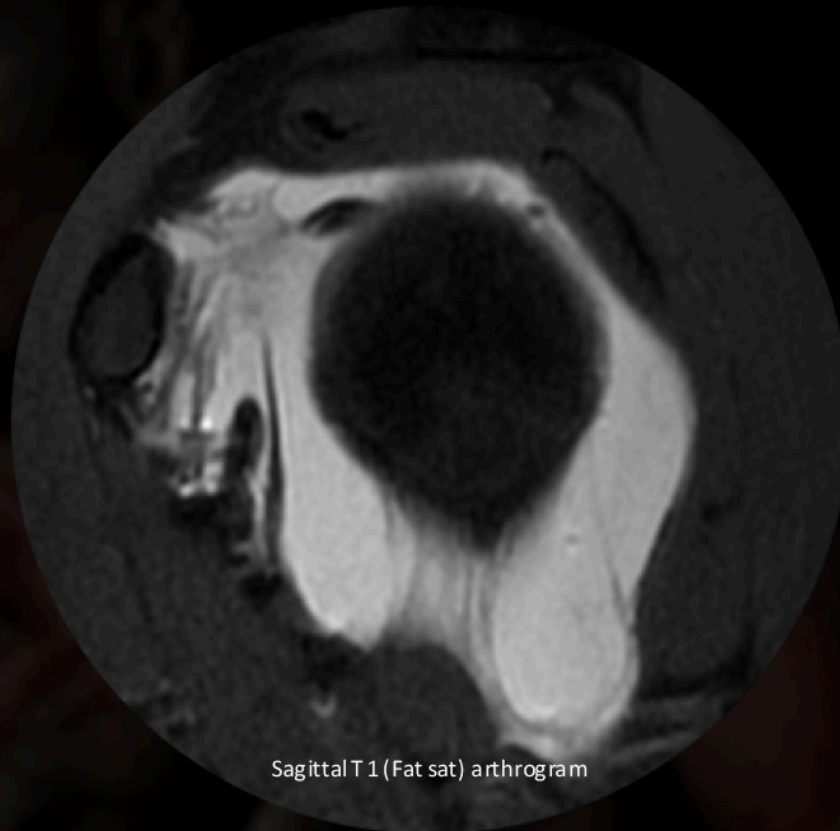
Capsular laxity and Multidirectional instability

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%.

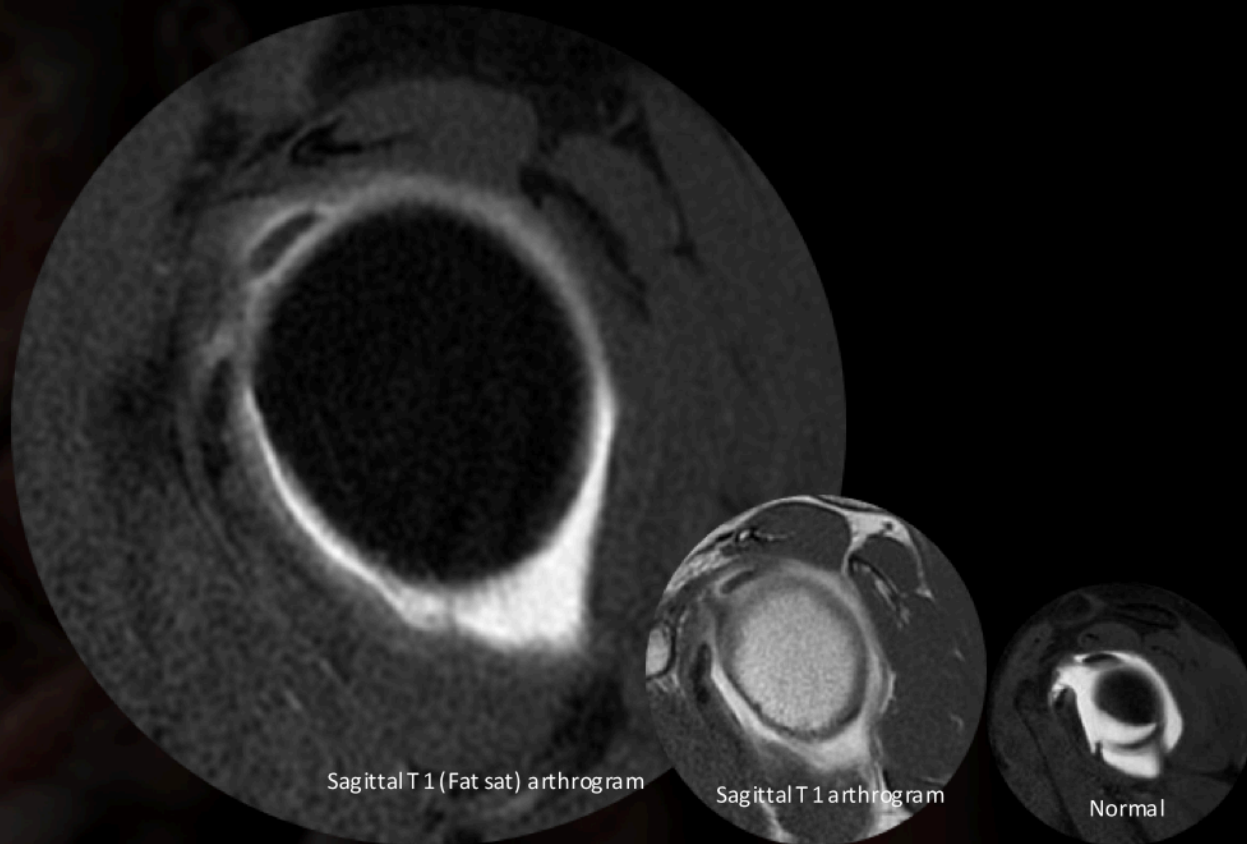
Rotator interval – interval tear



Widened interval

Contrast contacting the posterior coracoid cortex

Rotator interval - adhesive capsulitis



Sagittal T1 (Fat sat) arthrogram

Sagittal T1 arthrogram

Normal

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