Normal variants of the middle glenohumeral ligament in MR imaging of the shoulder
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Citation

Abstract
The middle glenohumeral ligament [MGHL] demonstrates the greatest variation in size and thickness, of all the three glenohumeral ligaments seen on MR imaging of the shoulder. We report a series of patients who underwent routine MR imaging of the shoulder for unrelated pathologies in whom a significant number of MGHL variants were identified. The importance of recognizing this lies in avoiding overdiagnosing or mistaking these for labral or ligamentous pathology. We conclude with a brief review of the importance and functions of the MGHL.

CASE REPORT
We report a series of patients who presented with varying symptomatologies in relation to the shoulder joint and underwent MR imaging for the same. Incidental normal variants of the middle glenohumeral ligament were identified and are presented.

DISCUSSION
The MGHL attaches to the ventral scapula, medial to the articular surface. It then lies obliquely, posterior to the superior margin of the subscapularis muscle and blends with the anterior capsule. Distally it is attached to the anterior portion of the proximal humerus, below the insertion of the superior glenohumeral ligament [SGHL] [1,2]. There are two named forminae between the glenohumeral ligaments, i.e foramen of Weitbrecht which is located between the superior and middle glenohumeral ligaments, and the foramen of Rouviere, which is located between the middle and inferior glenohumeral ligaments.[3] The scapular insertion of the MGHL is seen at the level of the superior anterior labrum on MR imaging and MR arthrography. At this level, the MGHL can be seen on axial MR images as a linear hypointense structure separated from the anterior superior labrum by a small cleft. Further distally, the MGHL is demonstrated as a flat or round structure partially attached or completely separated from the joint capsule. Oblique sagittal images demonstrate the MGHL as a hypointense band crossing the anterior capsular space from its labral attachment to its capsular attachment.

The MGHL presents the largest multiplicity of normal variants. Wall and OBrien [4] found that it was absent in up to 27% of specimens, a finding consistent with the work of De Palma,[5] who originally described a poorly defined or absent MGHL in 30% of shoulders studied. In another separate anatomical study, the ligament was absent again in 30% of the specimens [6]. In Chandnani et al.'s series [7] the normal MGHL [Figure 1] was identified with MR arthrography in 85% of their cases. In a series of 108 MR arthograms obtained in 95 asymptomatic volunteers, Park et al. [8] found that the SGHL and the IGHL were present in 99% of the cases, but the MGHL was present in only 79% of the cases. Absence of the MGHL is often associated with a prominent anterior capsular recess. The MGHL, may also present as thin ligamentous tissue [Figure 2] or appear cord-like and as thick as the biceps tendon. The origin of the MGHL is a frequent location of normal variants, the most common being a joint origin of the MGHL with the SGHL, less frequently, joint origin with the SGHL and long biceps tendon or joint origin with the long biceps tendon, with absent SGHL. A well-recognized variant is the Buford complex, which represents a cord-like thickening of the MGHL, with absence of the anterior superior portion of the labrum. [Figure 3, 4] This variant may easily be mistaken for an anterior labral tear [9]. The more frequently encountered appearance however is that of a cord like thickening of the MGHL with a normal labrum.[Figure 5] The Buford variant is defined as a Buford complex, associated with a thickened cord like IGHL.[Figure 6,7] A few cases of longitudinal split or duplicate ligament have been reported [10]. This may
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represent a true normal variant or an old longitudinal tear of the MGHL.

The MGHL has a role in the stability of the shoulder joint from 0° to 45° of abduction. Along with the subscapularis tendon and the superior part of the IGHL, the MGHL contributes to anterior stability at 45° of abduction. In the lower and middle ranges of abduction, the MGHL limits external rotation. Inferior translation of the abducted and externally rotated shoulder is limited as a secondary restraint function of the MGHL. With internal rotation the MGHL demonstrates a more vertical orientation, and with external rotation it assumes a more horizontal orientation (elongation of the MGHL).

In summary having recognised the importance of this ligament and its varying normal appearances, musculoskeletal radiologists should be able to differentiate normal from pathological appearances of this vital labroligamentous complex.

**Figure 1**
Figure 1: Axial T2 SPAIR fat suppressed sequence showing normal MGHL.

**Figure 2**
Figure 2: Axial T2 SPAIR fat suppressed sequence showing a thin MGHL variant.

**Figure 3,4**
Figure 3,4: Axial and oblique sagittal T2 SPAIR fat suppressed sequence showing Buford complex, which represents a cord-like thickening of the MGHL with absence of the anterior superior portion of the labrum.
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Figure 4

Figure 4

Figure 5: Axial T2 SPAIR fat suppressed sequence showing cord like thickening of the MGHL with a normal labrum

Figure 6,7: Axial and oblique sagittal T2 SPAIR fat suppressed sequence showing Buford complex, which represents a cord-like thickening of the MGHL,[thick arrow] with absence of the anterior superior portion of the labrum.[thin arrow]. The Buford variant is defined as a Buford complex, associated with a thickened cord like IGHL.[blue arrow in Figure 7]

Figure 5

Figure 6

Figure 7

References
4. Stoller, David W. Magnetic Resonance Imaging in Orthopaedics and Sports Medicine, 3rd Edition:: Lippincott Williams & Wilkins
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