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Case Report

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Shoulder MR Arthrography Complication - Direct Injection of the Biceps Tendon: A Case Report

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Abstract

We present a case of direct iatrogenic injection of the intra-articular and extra-articular biceps tendon during an arthrogram contrast injection. To our knowledge, this is only the second report of direct biceps tendon injection following arthrography and the first report presented in three planes with a corresponding fluoroscopy spot image and clinical history.

Keywords

Shoulder arthrogram, Biceps tendon injection, Biceps tendon, Arthrographic injection, Arthrogram complication, Arthrogram technique

Abbreviations

MR: Magnetic Resonance; FS: Fat Suppressed; PDFS: Proton Density Fat Saturated; SLAP: Superior Labral Tear from Anterior to Posterior

Case Report

A 47-year-old male presents for a shoulder arthrography after a one-month history of shoulder pain following a lifting injury with heavy sandbags. During the lifting injury he felt the shoulder 'pop out'. The humeral head reportedly reduced soon after, however, he continued to experience residual symptoms. Upon physical exam, there was audible clicking with shoulder abduction and a positive O'Brien's test. Otherwise, motor strength and tone of the patient was intact with full range of motion. Clinical concern of our patient was for labral tear, and Magnetic Resonance (MR) arthrogram was ordered at the request of the referring orthopedic surgeon because the previous non-contrast outside MRI did not definitively diagnose a labral tear, and the patient's symptoms persisted.

Arthrographic contrast injection was performed utilizing anterior approach technique; however, there was suboptimal superior placement of the needle. Additionally, the patient's shoulder was not in optimal external rotation. Following the localizing injection (1 cc of Omnipaque 300), iodinated contrast was present in either the biceps tendon or biceps sheath on the arthrography spot fluoroscopic image (Figure 1), however, this was not noted by the performing radiologist, and the MR contrast (0.1 cc OptiMARK 0.5 mmol/ml in 10 cc of normal saline) was injected without adjustment of the needle. It was noted the pressure needed to inject was greater than usual, but the patient did not complain any of discomfort.

Following MR contrast injection, standard MR arthrography sequence was performed on a 3.0 Tesla 16x (GE Healthcare (Milwaukee)), including T1 axial, T1 sagittal, proton density fat saturation (PDFS) axial, PDFS coronal and T2 fat suppressed (FS) coronal sequences at 3.0 mm slice thickness.

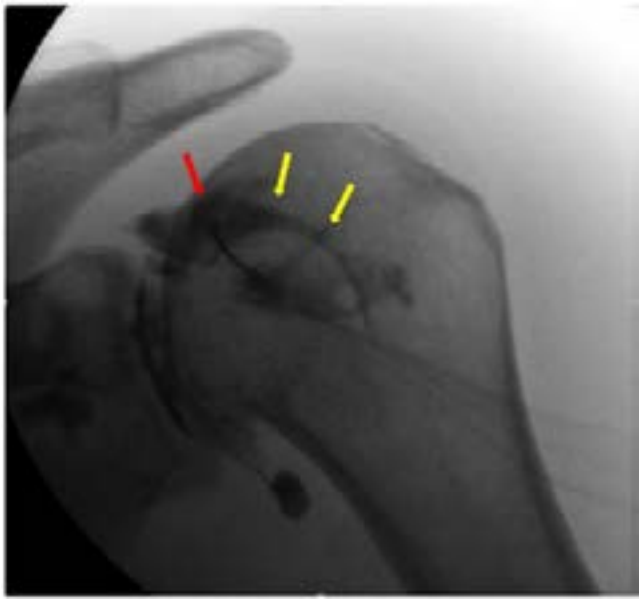

Figure 1: Anterior approach technique, suboptimal superior placement of the needle (red arrow) with medium diffuses throughout the bicep tendon or bicipital sheath (yellow arrows).

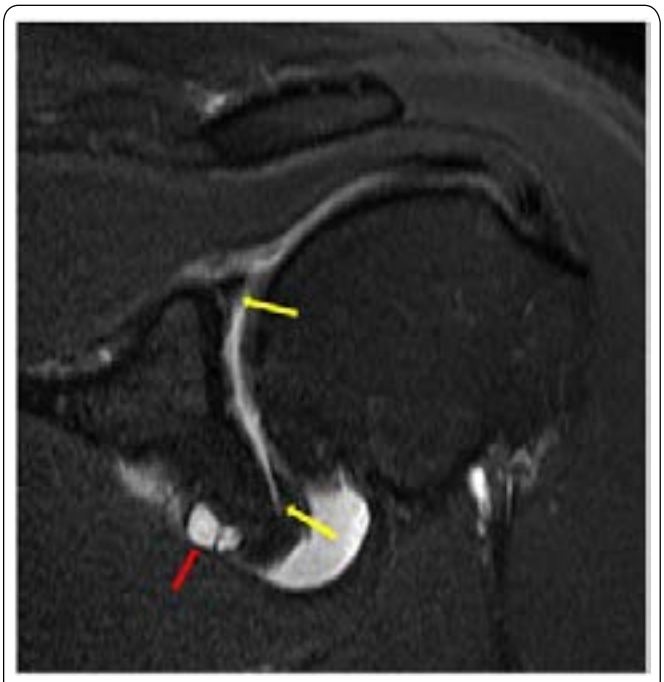

Figure 2: Coronal T2FS sequence demonstrates an anterior inferior paralabral cyst (red arrow) and labral tear (yellow arrows).

MR Arthrogram images demonstrate a SLAP tear which extended to the anterior inferior labrum with an associated 8 x 9 x 8 mm paralabral cyst, which likely accounted for the patient's symptoms (Figure 2). Other MR findings were mild rotator cuff tendinosis, moderate glenohumeral cartilage loss with medial humeral head osteophyte formation. On the arthrographic MR imaging, the biceps tendon was diffusely enlarged and prominent with homogeneously increased T1 weighted signal presents throughout the intra-articular biceps tendon and the proximal extra-articular biceps tendon to the level of the humeral neck. Upon further inspection, the SLAP tear did not extend to or involve the biceps tendon insertion and there is no evidence of tearing within the biceps tendon. These findings indicate contrast had been injected directly into the biceps tendon, and in retrospect correlates with the fluoroscopic spot image (Figures 3-5).

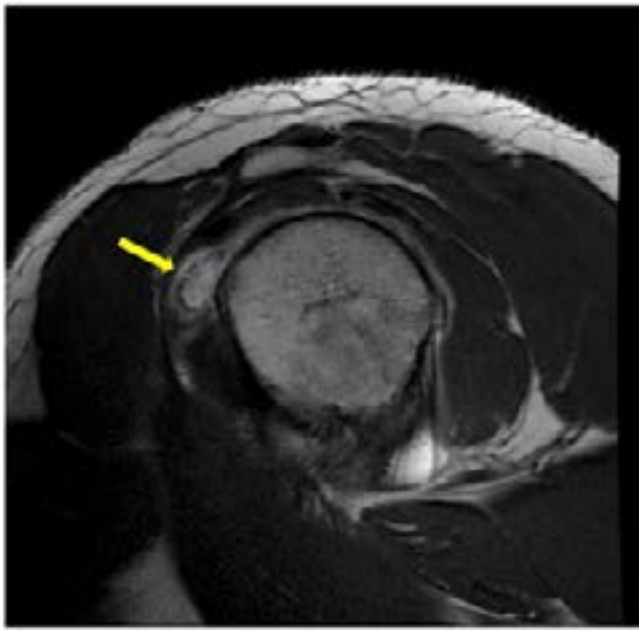

Figure 3: Sagittal T1 MR sequence demonstrates contrast medium diffusely throughout the biceps tendon (arrow) just lateral to the rotator cuff interval secondary to iatrogenic injection. No tear of the biceps tendon or extension of SLAP tear to the biceps tendon.

Discussion

Clinical & Imaging Finding

A shoulder arthrogram joint injection is usually performed under fluoroscopy by a radiologist and contrast is injected into the joint, and thereafter the patient receives MR imaging [1]. If the patient cannot receive an MRI, CT arthrography can also be performed but with more limited visualization of the soft tissue structures. The most common technique for injecting contrast medium into the glenohumeral joint is through an anterior approach, although a posterior approach may also be performed [2]. Optimal needle placement is shown in figure 6 with the tip of the needle terminating at the glenoid aspect of the mid aspect of the glenohumeral joint. Using this approach, the needle is advanced under fluoroscopic guidance through the subscapularis muscle until contact is felt with the medial glenoid. It is important for the patients arm to be placed at their side, palm up, in order to externally rotate the shoulder, opening the joint and also optimally removing the biceps tendon from the needle path.

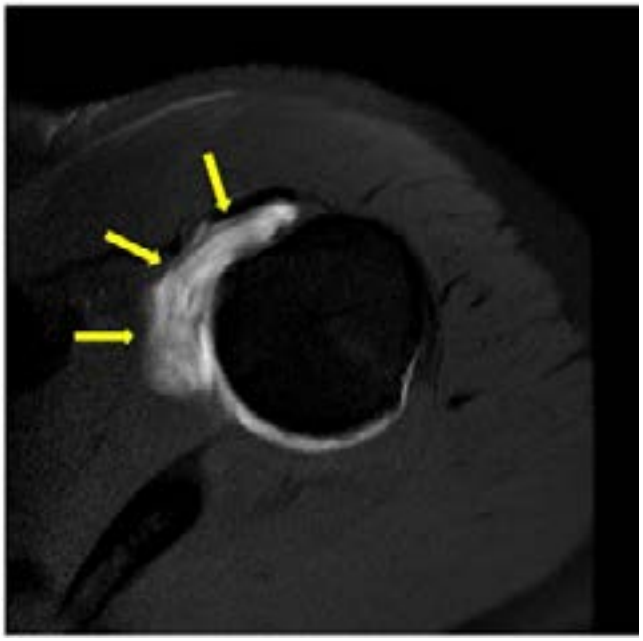

Figure 4: Axial fat saturation T1 sequence demonstrates contrast medium diffusely throughout the intra-articular and proximal extra-articular biceps tendon (arrows) secondary to iatrogenic injection. No tear of the biceps tendon or extension of SLAP tear to the biceps tendon.

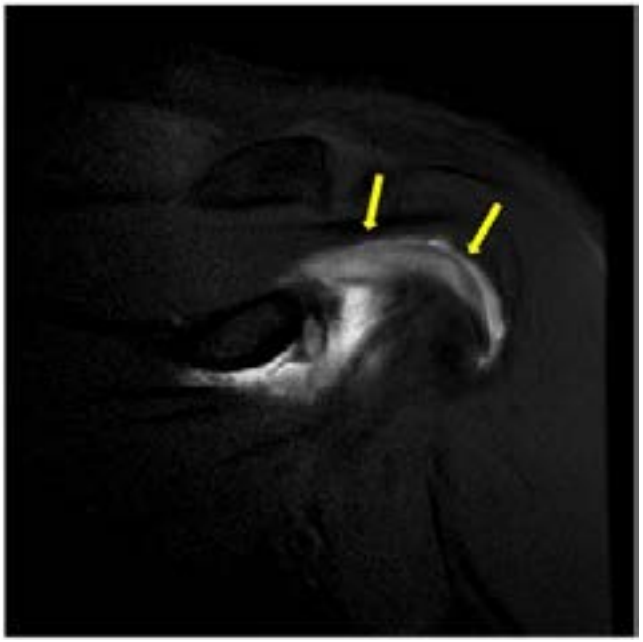

Figure 5: Coronal fat saturation T1 sequence demonstrates contrast medium diffusely throughout the intra-articular and proximal extra-articular biceps tendon (arrows) secondary to iatrogenic injection. No tear of the biceps tendon or extension of SLAP tear to the biceps tendon.

The noniodinated injected MR contrast is bright on T1 weighted sequences and atypical location of this injected contrast on MR imaging can be diagnostic of pathology. MR shoulder arthrography is performed for a variety of conditions, most commonly for labral tears in younger patients on lower strength (Tesla) magnet MRI systems. On 1.5 Tesla or less MRI systems, arthrogram increases sensitivity for labral tears, although it may also increase rate of false positives [3, 4]. On higher field 3.0 Tesla MRI systems, non-contrasted MRI is

Figure 6: Anterior approach technique, with optimal placement of the needle (yellow arrow), without medium diffuses throughout the bicep tendon or bicipital sheath.

generally performed as the initial evaluating imaging modality for SLAP tears, even in these younger patients. However, if the initial 3.0 Tesla MRI is negative or equivocal, as in our patient, arthrogram may increase sensitivity for SLAP diagnosis [5]. In selected clinical scenarios, arthrogram may also be useful for assessing full-thickness rotator cuff pathology, undersurface rotator cuff tearing, loose bodies and synovitis or to assess a post-surgical shoulder [6].

Incorrect concentration and volume of the contrast medium may also affect image quality and cause patient discomfort [7]. Common complication of arthrography includes, pooling of contrast medium in extra-articular locations or leakage from the joint space, causing difficulty in interpreting the images. Intraosseous and epiphyseal injection has also been reported as a complication [8]. Contrast can be seen in the superior subscapular recess as these as communicate with the joint in 47.5% of cases [9]. Contrast is most commonly seen in the subacromial/subdeltoid space following a full thickness rotator cuff tear [10]. The subacromial/subdeltoid space communicates with the subcoracoid bursa in 11-55% of cases [11]. Following a rotator cuff tear and inferior acromioclavicular ligament tear, contrast may extend superior to the acromioclavicular joint giving the characteristic 'geyser sign' [10]. Subscapularis muscle and tendon injection is not uncommon [7].

The extra-articular tendon of the long head biceps brachii travels within the bicipital/intertubercular groove, then transverses the rotator interval as the intra-articular biceps tendon before attaching to the glenoid. Occasionally in clinical practice, the biceps tendon sheath is injected iatrogenically/directly, or contrast is noted within the sheath as the sheath communicates with the joint [11]. A case series discussing iatrogenic air injection into the bicipital sheath giving a 'rope

ladder appearance' has been described without mention of contrast injection into the tendon [12]. To our knowledge, only a single case of direct biceps tendon injection following arthrographic contrast injection has been reported in the literature, which case did not include multiplanar imaging, a clinical history or arthrographic fluoroscopic image correlation [7]. The largest review article on 500 shoulder arthrograms with special attention to the biceps did not demonstrate any case of direct tendon injection [13].

A bicep tear or rupture could demonstrate a similar imaging appearance, however, the tendon in this case appeared completely continuous without disruption or surface irregularity. Tendinopathy or tenosynovitis would not demonstrate contrast within the tendon proper [13].

Treatment & Prognosis

Tendon injection is generally considered a benign iatrogenic event which will quickly resolve without additional intervention. This patient only underwent conservative treatment for the SLAP tear with improving symptoms and without mention of biceps symptomology [14]. Treatment of labral and SLAP tears may be conservative including pain management with nonsteroidal anti-inflammatory medications and avoiding aggravating activities [15]. Rehabilitation, physical therapy and surgery are also common options for treatment [15, 16].

Conclusion

MR arthrography is a technique-sensitive procedure and the performing radiologist needs to be aware of possible complications and optimize patient positioning and needle placement.

Disclosure Statement

None of the authors have any conflict of interest pertaining to this case report.

References

1. Ng AW, Hung EH, Griffith JF, Tong CS, Cho CC. 2013. Comparison of ultrasound versus fluoroscopic guided rotator cuff interval approach for MR arthrography. *Clin Imaging* 37(3): 548-553. https://doi.org/10.1016/j.clinimag.2012.08.002
2. Ogul H, Bayraktutan U, Ozgokce M, Tuncer K, Yuce I, et al. 2014. Ultrasound-guided shoulder MR arthrography: comparison of rotator interval and posterior approach. *Clin Imaging* 38(1): 11-17. https://doi.org/10.1016/j.clinimag.2013.07.006
3. Berth A, Pozniak A, Stendel L, Fischbach F, Lohmann C, et al. 2019. Magnetic resonance-guided direct shoulder arthrography for the detection of superior labrum anterior-posterior lesions using an open 1.0-T MRI scanner. *Pol J Radiol* 84: e251-e257. https://doi.org/10.5114/pjr.2019.86894
4. Sheridan K, Kreulen C, Kim S, Mak W, Lewis K, et al. 2015. Accuracy of magnetic resonance imaging to diagnose superior labrum anterior-posterior tears. *Knee Surg Sports Traumatol Arthrosc* 23(9): 2645-2650. https://doi.org/10.1007/s00167-014-3109-z
5. Magee T. 2016. Utility of pre- and post-MR arthrogram imaging of the shoulder: effect on patient care. *Br J Radiol* 89(1062): 20160028. https://doi.org/10.1259/bjr.20160028
6. Goh CK, Peh WC. 2012. Pictorial essay: pitfalls in magnetic resonance imaging of the shoulder. *Can Assoc Radiol J* 63(4): 247-259. https://doi.org/10.1016/j.carj.2011.02.005
7. Hodler J. 2008. Technical errors in MR arthrography. *Skeletal Radiol* 37(1): 9-18. https://doi.org/10.1007/s00256-007-0329-z
8. Pack JR, Jordanov MI, Block JJ. 2008. Inadvertent intraosseous gadolinium injection during pediatric shoulder MR arthrography. *Pediatr Radiol* 38(7): 772-775. https://doi.org/10.1007/s00247-008-0828-7
9. Ogul H, Kantarci M, Topal M, Karaca L, Tuncer K, et al. 2014. Extra-articular contrast material leaks into locations unrelated to the injection path in shoulder MR arthrography. *Eur Radiol* 24(10): 2606-2613. https://doi.org/10.1007/s00330-014-3270-2
10. Motamedi D, Everist BM, Mahanty SR, Steinbach LS. 2014. Pitfalls in shoulder MRI: part 2--biceps tendon, bursae and cysts, incidental and postsurgical findings, and artifacts. *AJR Am J Roentgenol* 203(3): 508-515. https://doi.org/10.2214/AJR.14.12849
11. Grainger AJ, Tirman PF, Elliott JM, Kingzett-Taylor A, Steinbach LS, et al. 2000. MR anatomy of the subcoracoid bursa and the association of subcoracoid effusion with tears of the anterior rotator cuff and the rotator interval. *AJR Am J Roentgenol* 174(5): 1377-1380. https://doi.org/10.2214/ajr.174.5.1741377
12. Gückel C, Nidecker A. 1997. The rope ladder: an uncommon artifact and potential pitfall in MR arthrography of the shoulder. *AJR Am J Roentgenol* 168(4): 947-950. https://doi.org/10.2214/ajr.168.4.9124146
13. Gückel C, Nidecker A. 1998. MR arthrographic findings in tenosynovitis of the long bicipital tendon of the shoulder. *Skeletal Radiol* 27(1): 7-12. https://doi.org/10.1007/s002560050326
14. Kim TK, Queale WS, Cosgarea AJ, McFarland EG. 2003. Clinical features of the different types of SLAP lesions: an analysis of one hundred and thirty-nine cases. *J Bone Joint Surg Am* 85(1): 66-71.
15. Knesek M, Skendzel JG, Dines JS, Altchek DW, Allen AA, et al. 2013. Diagnosis and management of superior labral anterior posterior tears in throwing athletes. *Am J Sports Med* 41(2): 444-460. https://doi.org/10.1177/0363546512466067
16. Mohana-Borges AV, Chung CB, Resnick D. 2003. Superior labral anteroposterior tear: classification and diagnosis on MRI and MR arthrography. *AJR Am J Roentgenol* 181(6): 1449-1462. https://doi.org/10.2214/ajr.181.6.1811449