

CASE REPORT

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Xanthomatous Infiltration of the Rotator Cuff and Long Head of Biceps with Rotator Cuff Tear in a Patient with Mixed Hyperlipidemia: A Case Report with MRI Imaging

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Abstract: Xanthomatous infiltration may rarely affect the rotator cuff muscles and long head of the biceps tendon. It is the deposition of cholesterol within the rotator cuff muscles and long head of the biceps tendon resulting from hyperlipidemia, specifically high triglyceride and total cholesterol levels. As more commonly seen with xanthomatous infiltration and tear of the Achilles tendon, there may also be an association with rotator cuff tendon deposition and tear. MRI images of xanthomatous infiltration with rotator cuff tear in a 77 year old man with hyperlipidemia are detailed in the following case report.

Keywords: xanthoma, rotator cuff, achilles, hyperlipidemia, magnetic resonance imaging

Clinical Medicine Insights: Arthritis and Musculoskeletal Disorders 2010:3 77–80

doi: [10.4137/CMAMD.S3172](https://doi.org/10.4137/CMAMD.S3172)

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Introduction

Xanthomatous infiltration may be a risk to the rotator cuff muscles and long head of the biceps. We believe it is a rare entity where there is fatty infiltration of the shoulder tendons, predisposing the shoulder to rotator cuff tear. It may be diagnosed on MRI, in patients with hyperlipidemia. We describe the MRI features of what we suspect is likely the first reported case of rotator cuff tear associated with xanthomatous infiltration, in a patient with hyperlipidemia.

Case Report

A 77 year old with past medical history of mixed (Type IIa) hyperlipidemia and chronic pain in both shoulders presented with increased left shoulder pain. On physical examination, there was reduced range of motion up to thirty degree's and elicited crepitus with movement. The patient had also recently experienced difficulty sleeping at night due to the intense nature of the pain. The more acute symptoms had started after he had attempted to lift a heavy object.

An MRI examination of the shoulder was obtained. This demonstrated extensive infiltration of the rotator cuff muscles, including the supraspinatus, infraspinatus, and subscapularis. There was also extensive infiltration of the long head of the biceps, as well. The rotator cuff tendons were all thickened. This was imaged as parallel vertical striations with heterogeneously increased T1 and T2 signal. (Figs. 1 and 2) The long head of the biceps displayed a more stippled appearance, which is characteristic for xanthoma. (Fig. 3) Ultrasound is not routinely performed at our institution, and we do not

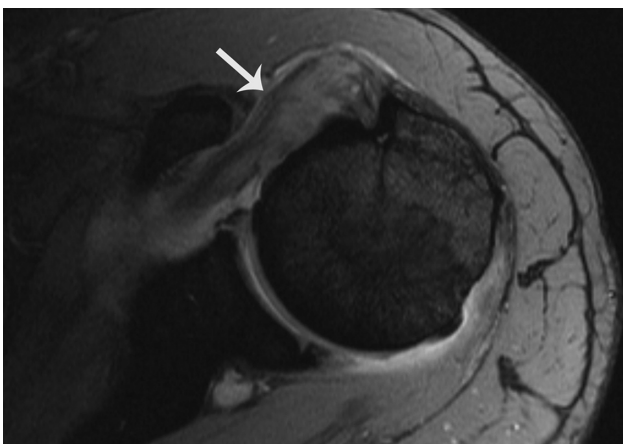


Figure 1. (T2WI) in the axial plane shows a thickened subscapularis with abnormal increased signal. (white arrow)

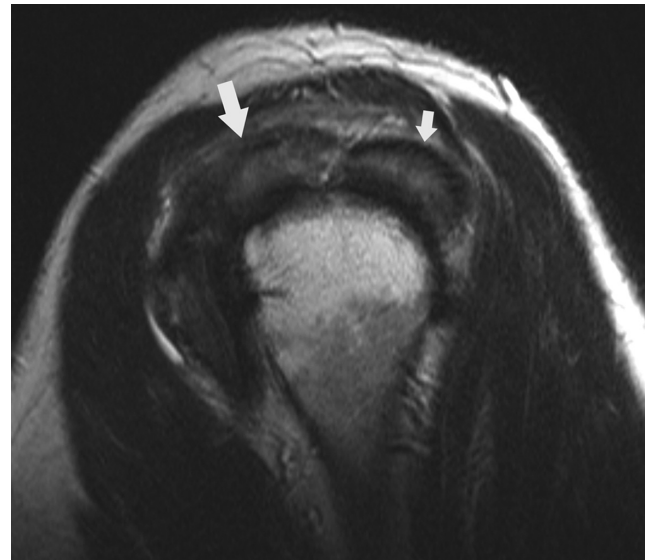


Figure 2. (T2WI) in the sagittal plane demonstrates diffuse thickening with increased signal within the supraspinatus (large arrow) and infraspinatus (small arrow).

believe it adds in retrospective diagnosis, once MRI has been obtained. Furthermore, there were also complete tears with myotendonous retraction of the supraspinatus and infraspinatus (Figs. 4A and B). Conservative management was indicated due to the extent of retracted tendons. Additionally, a full thickness tear of the subscapularis was present, with the long head of the biceps still remaining in the bicipital groove (Fig. 3).

The patient had initially presented to our institution nearly five years earlier with fasting total cholesterol levels of 270 mg/dL, HDL 40, triglyceride 294, and LDL of 171.

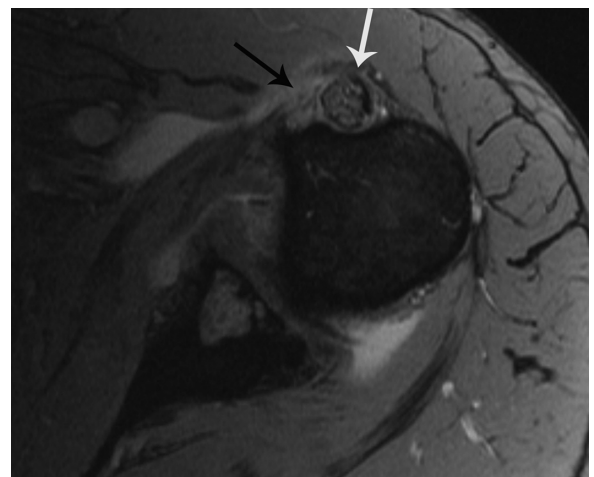


Figure 3. (T2WI) in the axial plane displays a stippled pattern of increased signal, interspersed with dots of low signal within a grossly thickened long head of biceps tendon (white arrow). Notice the tear within the distal subscapularis (black arrow). The long head of the biceps remains within the bicipital groove.

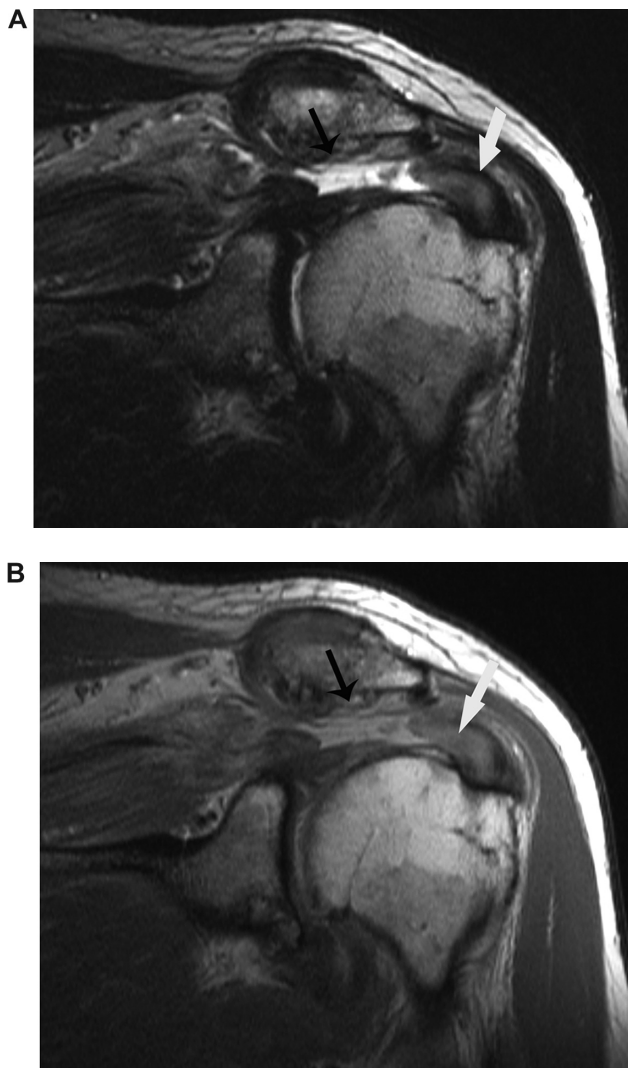


Figure 4. **A)** (T2WI) and **B)** (T1WI) in the coronal planes demonstrate a thickened supraspinatus tendon measuring 1.0 cm, with wavy increased T1 and T2 signal (white arrow). There is also complete tear of supraspinatus (black arrow) with myotendinous retraction to the glenoid.

His highest LDL level reached 210 and total cholesterol level up to 275. The HDL level would also decrease to a low of 32. The patient's chart did not document if the patient was on any prior cholesterol medication. The normal cholesterol reference range is <200 for total cholesterol, >40 for HDL, <150 for triglyceride, and <100 for LDL levels. The patient's other presenting features of hyperlipidemia included pterygium formation over the conjunctiva of his left eye which had extended to the cornea. This resulted in subsequent laser iridotomy for removal. He also had a history of coronary artery disease and an abdominal aortic aneurysm measuring 5.1 cm, findings which also are commonly seen with hyperlipidemia.

Discussion

Dyslipidemias were traditionally classified by patterns of elevation in lipids and lipoproteins (Fredrickson phenotype). A more practical system categorizes dyslipidemias as primary or secondary and characterizes them by increases in cholesterol only (pure or isolated hypercholesterolemia), increases in TGs only (pure or isolated hypertriglyceridemia), or increases in both cholesterol and TGs (mixed or combined hyperlipidemias).¹

Tendon xanthoma is a nonneoplastic tumor involving tendon and constitutes a significant physical manifestation of hyperlipidemia. These deposits may accompany rapidly progressive atherosclerosis and may signal the presence of life threatening hyperlipidemia.²

Pathogenesis remains unclear, however it is likely that mechanical stress and extensive vascularization are essential factors for xanthoma formation. Moreover, endothelial cells and macrophages cells are principal contributors to the pathogenesis of tendinous xanthomas and to atherogenesis.³

Xanthoma can occur in all five types of hypercholesterolemia. In particular, type IIa hyperlipidemia and type III hyperlipidemia have shown a strong association with tendinous xanthomas, which have a predilection to involve the extensors, most notably the Achilles and the metacarpal phalangeal extensor tendons of the hands.^{4,5}

The main value of diagnosing tendon xanthomas is establishing the diagnosis of familial hyperlipidemia in patients with hypercholesterolemia. The disease can then be treated appropriately, preventing or retarding atherosclerotic disease.⁶ Once diagnosis is established, lipid level control and excision of lipid deposits shall be a priority.

The clinical manifestations of xanthomatosis are broad, and include cataracts, neurological dysfunction, atherosclerosis, as well as tendon xanthoma.⁷

Involved tendons may have a diffuse stippled pattern formed by many low signal round structures of equal size surrounded by high signal material. The uniformly sized, round, low signal structures seen on MR images probably represent collagen fibers, whereas the high signal intensity between the collagen fibers represents infiltrating cholesterol foam cells and an inflammatory response.⁶⁻⁹ Patients with tendinous xanthomas demonstrate focal regions of high signal T1 intensity suggesting high percentage of triglycerides.^{7,10,11} The diffuse reticulated pattern has been described as a characteristic MR finding of tendinous xanthoma.^{7,11,12} This



reticulated or stippled pattern is clearly depicted within the axial images of the long head of the biceps (Fig. 3).

A diffusely thickened tendon or one with discreet irregularities is suggestive of a xanthoma.⁴ This is seen as thickened wavy high T1 and T2 signal within the supraspinatus, infraspinatus, and subscapularis (Figs. 1 and 2).

Prior to the case presented, tendinous xanthoma has been commonly described in the tendons of the hand, the patellar tendon, the Achilles tendon, the plantar aponeurosis, the peroneal tendon, and around the elbow and lower tibia.^{11,13} The rotator cuff tendons and the long head of the biceps may also now be included on this list and should be reported to aid in the diagnosis of hyperlipidemia. Thus, it is imperative to recognize the imaging features of xanthoma in the shoulder, as well as the more commonly involved tendons. It seems that the principal problem is the conflict of volume of the xanthoma, which in turn may eventually lead to tear. Similarly, cases of tendinous tears have been described with tophaceous gouty infiltration.¹⁴

Tendon biopsies for demonstration of cholesterol are avoided because it is known that both major and minor direct injuries to any tendon complex can lead to chronic posttraumatic pain syndromes.¹⁵

In conclusion, MRI may play a more prominent role in diagnosing xanthoma and thus helping to more accurately characterize a patient with familial hyperlipidemia. Perhaps, we may see more shoulder xanthoma or other tendinous xanthoma in lesser known target tendons associated with pathological tears, if patients with high triglyceride levels and family history who have focal pain are more routinely imaged.

Disclosure

This manuscript has been read and approved by all authors. This paper is unique and is not under consideration by any other publication and has not been published elsewhere. The authors and peer reviewers of this paper report no conflicts of interest. The authors confirm that they have permission to reproduce any copyrighted material. There is no monetary or alternative gain for this article. The authors have presented this case for educational purposes only. Written consent was obtained from the patient or relative for publication of this study.

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