Acta Radiologica Open
4(12) 1–7

DOI: 10.1177/2058460115606156
arr.sagepub.com
SAGE

Self-resolving focal non-ossifying myositis: a poorly known clinical and imaging entity diagnosed with MRI

Vasiliki Perlepe, Benjamin Dallaudière, Patrick Omoumi, Lora Hristova, Afshin Rezzazadeh, Bruno Vande Berg, Jacques Malghem and Frederic Lecouvet

Abstract

Background: Focal myositis is a rare benign inflammatory pseudotumor, presenting as a painful nodular mass within a muscle, and characterized by spontaneous resolution within weeks.

Purpose: To assess the clinical and imaging findings of focal nodular myositis simulating a neoplasm at clinical examination, with no history of trauma.

Material and Methods: This study describes the locations and appearance at ultrasonography (US), computed tomography (CT), and magnetic resonance imaging (MRI) of this condition in a series of five patients.

Results: MRI and US displayed a solid intramuscular "tumor" and suggested a continuum between the proximal and distal muscle fibers that appeared thickened within the nodular lesion, a sign that has been reported in myositis ossificans. MRI showed edema in adjacent muscles and soft tissues, as well as intense enhancement of the mass. Intense vascular flows were seen at Doppler analysis. CT did not reveal the appearance of peripheral ossifications, ruling out the diagnosis of myositis ossificans. In some patients, the diagnosis of sarcoma had been suggested as possible by the radiologist. Imaging follow-up with MRI showed complete resolution of the masses over several weeks, thus avoiding a biopsy; no recurrence was observed at long-term follow-up (more than 24 months).

Conclusion: This paper highlights MRI and US findings in focal non-ossifying myositis, and emphasizes the role of MRI in suggesting this diagnosis, leading to the careful follow-up of the lesion until its resolution, and ruling out more aggressive lesions.

Keywords
Muscle, inflammation, soft tissue, tumor, magnetic resonance imaging (MRI), ultrasound

Date received: 1 October 2014; revised: 27th July 2015; accepted: 13 August 2015

Introduction

Focal myositis is an inflammatory pseudotumor of the skeletal muscle, first recognized as a distinct clinicopathological entity in 1977 by Heffner et al. (1). It is one of a variety of inflammatory conditions that may affect muscles, including myositis ossificans, proliferative myositis, nodular myositis, and diabetic myonecrosis. These conditions can be differentiated histologically, but have similar clinical and imaging patterns (2).

The usual clinical presentation of focal myositis is a recent, rapidly enlarging, painful mass within a muscle, often suggestive of a neoplasm at clinical examination (1,3,4). The clinical course of focal myositis is spontaneous regression within 2–8 weeks, without sequelae or recurrence (1,5). The correct diagnosis is sometimes suggested on the basis of imaging findings, but often requires biopsy, although careful follow-up may be suggested (3,6). The lesion mainly affects the lower limbs,

Cliniques Universitaires Saint-Luc, Avenue Hippocrate 10, 1200 Brussels, Belgium

Corresponding author:
Vasiliki Perlepe, Cliniques Universitaires Saint-Luc, Avenue Hippocrate 10, 1200 Brussels, Belgium.
Email: vasilikiperlepe@gmail.com

especially the thighs, without age or sex distinction (1,4). Its etiology remains unclear. There is usually no association with trauma, systemic disorders, or family history.

We report imaging findings in a series of five patients with focal myositis simulating a sarcoma at clinical examination. The lesions were first considered as potentially aggressive tumors at ultrasonography (US) and magnetic resonance imaging (MRI), but finally completely resolved at imaging follow-up. The purpose of this paper is to highlight the imaging characteristics of focal non-ossifying myositis, which will suggest the diagnosis, and the role of MRI as a non-invasive tool for the careful follow-up of the lesion until its complete resolution, ruling out more aggressive tumors.

Material and Methods

Over a 5-year period, we collected five cases of patients with a clinical history of recent painful swelling of the thigh, the shoulder or the forearm. Clinical and first-line imaging observations indicated potential soft tissue malignancies. The subsequent MRI work-up and follow-up were performed in the same institution.

Patient characteristics, US, computed tomography (CT), and MRI examinations at baseline and MRI during follow-up were carefully recorded for all patients. X-ray was performed in one patient before CT and bone scan was performed in two patients at baseline. A second CT during follow-up was performed in one patient.

Results

The clinical history, the characteristic imaging findings, and the evolution of this entity are summarized in Table 1. Patient 1 had a history of Hodgkin disease in remission for 30 years. The other four patients had no medical or traumatic history.

All patients underwent ultrasound as an initial examination. US revealed a nodular heterogeneous lesion frequently showing thickened muscle fibers separated by thin hypoechoic bands and intense vascular flows at Doppler analysis.

MRI showed an intramuscular mass with the same signal intensity as the muscle on T1-weighted (T1W) images, and intermediate to high signal intensity on T2-weighted (T2W) images. Surrounding edema was present within the adjacent muscle in four cases. Intravenous administration of contrast material revealed almost homogeneous enhancement of the mass.

Interestingly, US and MR images demonstrated continuous thickened muscle fibers running through the lesion without interruption.

These imaging features suggested the possible diagnosis of myositis ossificans, but plain films and CT only showed a soft tissue mass, without any calcification or ossification in patients 2 to 5. CT scan in patient 1 revealed very subtle calcifications at the surface of the lesion, but with complete resolution at 6-week follow-up. A bone scan was performed in two patients and revealed no tracer uptake in the soft tissues, which is atypical for myositis ossificans.

At last and above all, the lesions completely disappeared at MRI after several weeks, ruling out an aggressive lesion. No recurrence was detected in any patient.

Figs 1–5 illustrate the most characteristic imaging findings.

Discussion

Focal myositis was first described in 1977 by Heffner who reported the clinical and pathological findings in a series of 16 cases, years before the availability of US and MRI for the investigation of soft tissue masses (1). Subsequently, several reports of the clinical, imaging and pathological appearances of focal myositis have been published, but little information is available in the literature on the typical US and MRI features and natural history of this entity (2–4,7–9).

Focal myositis has been reported in patients aged in the range of 10–67 years (1,5,10). Our population was in the age range of 40–58 years (mean age, 48 years).

Table 1. Clinical and imaging features in five patients with focal myositis.

Patient no.	Age (years) (mean age, 48)	Gender	Symptoms	Location	Maximal diameter (cm)	Intense flows at US Doppler	T2 adjacent edema	Post-contrast T1 enhancement	Calcifications at CT	Time to resolution (weeks)
1	58	M	Mass	Thigh	3	Present	Absent	Present	Subtle	6
2	47	F	Mass, pain	Forearm	6	Present	Present	Present	No	6
3	40	M	Mass, pain	Thigh	4	Present	Present	Present	No	8
4	55	F	Mass, pain	Thigh	3	Present	Present	Present	No	8
5	40	M	Pain	Deltoid	1	Present	Present	Present	No	6

It affects men and women equally, as almost found in our series (3 men, 2 women). All patients presented a recent history of localized painful intramuscular swelling, except for patient 1 who had no pain. At clinical examination, a focal induration and tenderness at palpation were consistent, without overlying skin changes. The predominant involvement of the lower extremity in our study (60% in the thigh) is in agreement with previous series (1,2,4). Other locations found in the literature include the upper extremity, the neck (7,11), pectoral region (12), abdomen (13), hand (14), eyelids (15), and paraspinal muscles (16,17). No etiological factor, such as trauma or systemic disease (e.g. inflammatory disease or lymphoma) was recognized in our patients, except for one patient who had history of Hodgkin's lymphoma. The clinical evolution reported in the literature is spontaneous resolution within 2–8 weeks without recurrence (1,5). In our patients, the delay before complete resolution at MRI follow-up was within the same range (7 weeks on average).

The differential diagnosis of a mass involving a skeletal muscle should include sarcoma, myositis ossificans, muscle strains, and inflammatory or infectious conditions (18). Our patients had no history of trauma and their lesions were not located in the musculotendinous junction. There were no signs of scar tissue in the follow-up. Muscle strains could present a mass-like pattern usually when there is a hematoma in case of severe injuries, which was not the case with our patients. Proliferative myositis and lymphoma were less suggestive as these entities usually involve the muscle in a diffuse pattern and not a nodular one. Diabetic myonecrosis was excluded, as none of the patients had diabetes or muscle necrosis by MRI. Deep venous thrombosis was also excluded, as the lesions were not located near a neurovascular bundle and did not have a tubular structure.

Focal non-ossifying myositis and myositis ossificans show an intra-muscular location. Abscesses could occur in a cutaneous, subcutaneous or intra-muscular location.

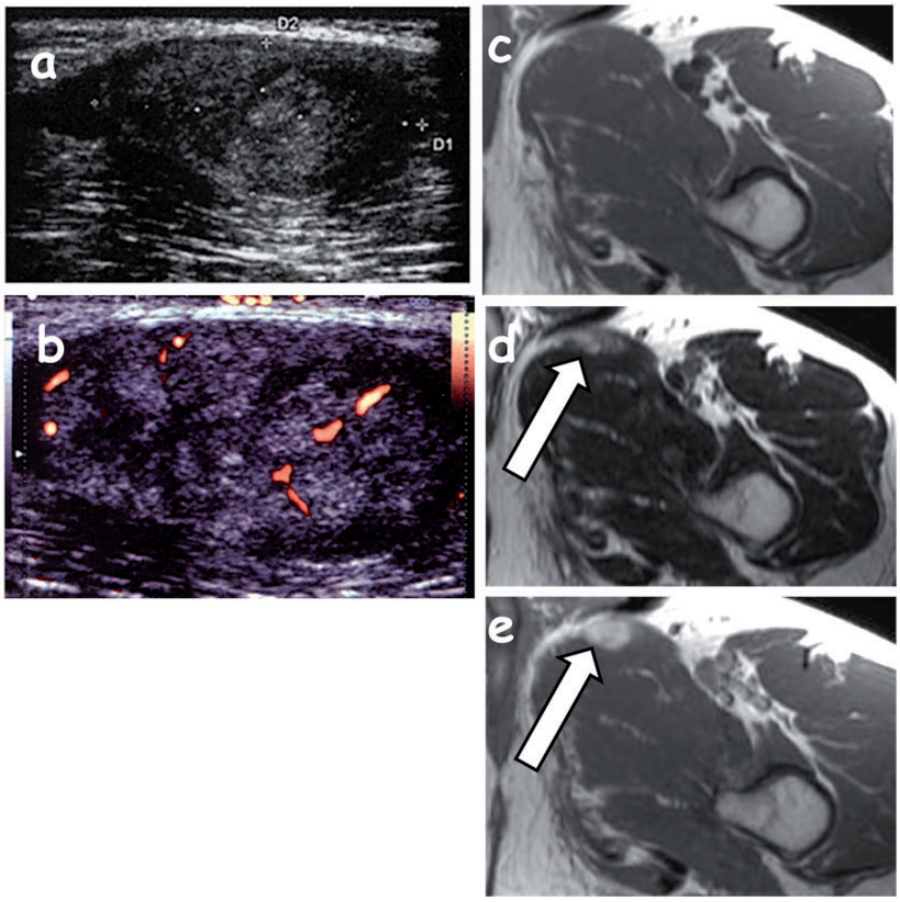

Fig. 1. A 58-year-old man with a history of a Hodgkin disease in remission presenting with a left groin mass. Ultrasound (a) shows an inhomogeneous solid lesion within the long adductor muscle. Doppler analysis (b) shows intralesional vascular flows. Transverse T1W (c), T2W (d), and post-contrast T1W (e) MR images show a well-defined small mass on the medial aspect of the long adductor, invisible on T1W images (c), with intermediate signal intensity on T2W images (arrow in d), and evident enhancement on post-contrast T1W images (arrow in e).

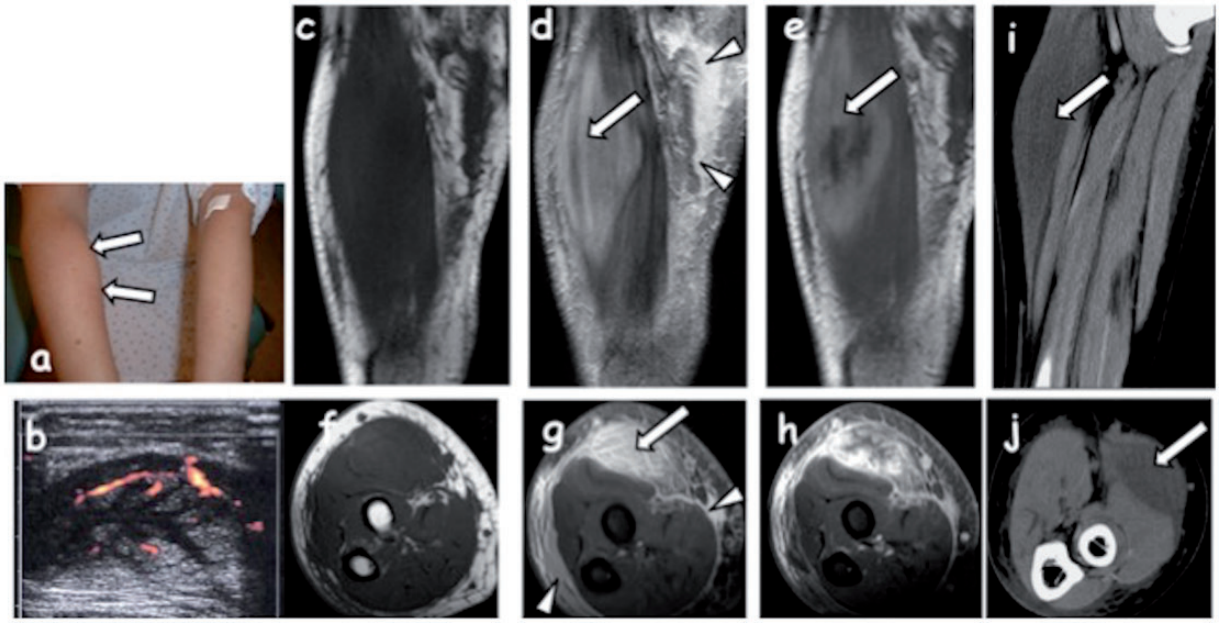

Fig. 2. A 47-year-old woman with a 2-day history of painful mass of the right forearm. (a) Clinical picture shows frank swelling of the right forearm (arrows). (b) Sonography reveals heterogeneous intramuscular mass with hypoechoic "septations" and intense vascular flows at power Doppler analysis. (c–e) Coronal and (f–h) transverse MR images of the forearm show an intramuscular fusiform mass within the brachioradialis muscle with same signal intensity as the skeletal muscle on T1W images (c, f), high signal intensity on T2W images (arrows in d, g), which also show extensive edema in the involved muscle and adjacent soft tissues (arrowheads in d, g). After intravenous administration of gadolinium (e, h) marked enhancement is seen within the lesion and surrounding edematous tissues. T2W and post-contrast fat-saturated T1W images demonstrate continuous thickened muscle fibers without interruption running through the lesion (arrows in d and e). Coronal (i) and transverse (j) reformatted CT images show an intramuscular, low density mass (arrows), without any calcification, ossification, or skeletal abnormality.

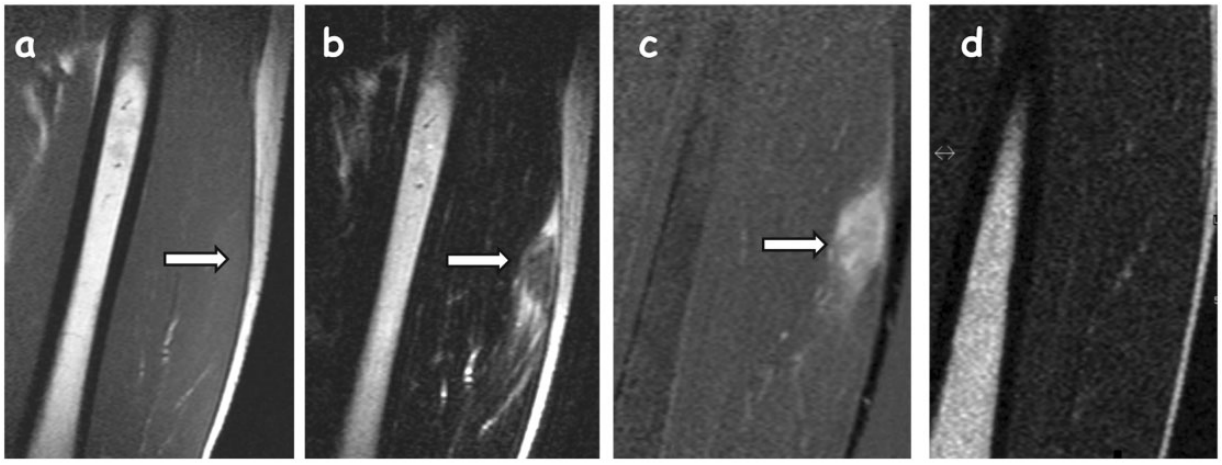

Fig. 3. A 40-year-old man with painful swelling of the left thigh. Coronal T1W (a), T2W (b), and post-contrast T1W (c) MR images reveal small mass within the vastus lateralis muscle barely seen on T1W images (arrow in a), with intermediate to high signal intensity on T2W images (arrow in b), intense enhancement on post-contrast T1W image (arrow in c) as well as discrete surrounding edema. Two-month follow-up MRI shows complete resolution of the lesion on the coronal T2W images (d).

Nodular fasciitis has a similar clinical presentation but its location is mainly subcutaneous and fascial, whereas intramuscular locations are more exceptional (19). Beside these topographic considerations, our paper highlights some imaging features that may be suggestive of the diagnosis of focal non-ossifying myositis. As main imaging feature, focal myositis appears as a small nodular lesion located within a muscle. Of major interest, we

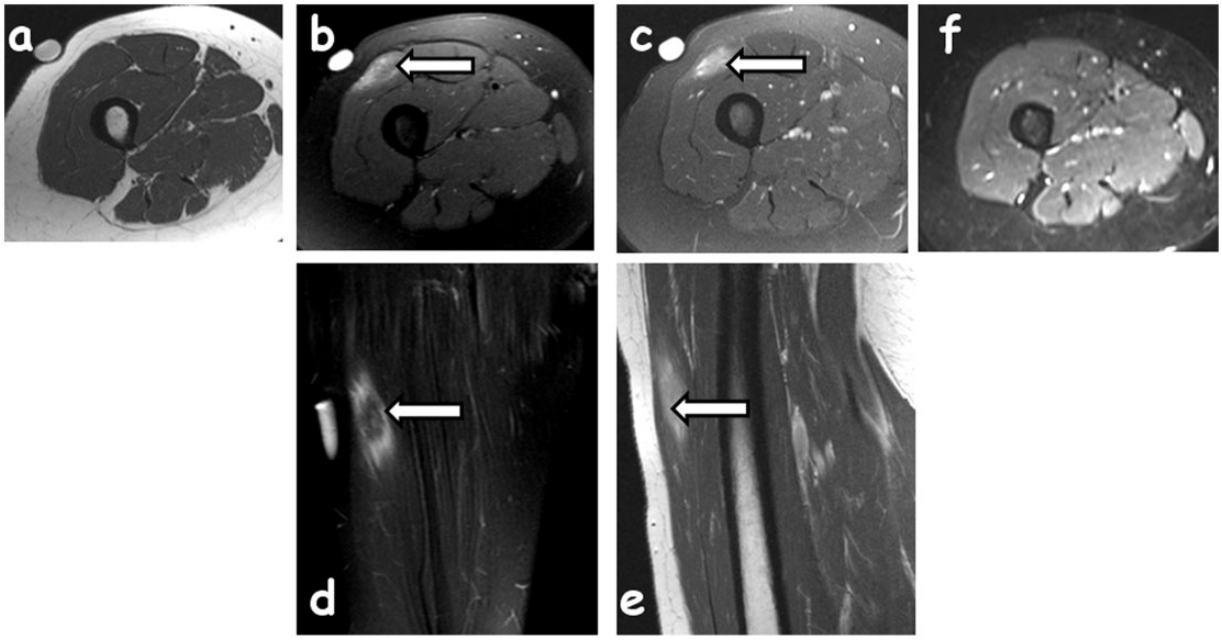

Fig. 4. A 55-year-old woman with painful swelling of the right thigh. (a–c) Transverse MR images show a well-defined 2 × 3 cm mass in the belly of the vastus lateralis muscle, showing same signal intensity as the muscle on T1W image (a), intermediate signal intensity with surrounding edema on STIR-weighted image (arrow in b), peripheral enhancement with central thickened muscle fibers "crossing" the tumor on post-contrast T1W fat-saturated image (arrow in c). Coronal STIR (d) and post-contrast T1W images (e) show the same observations. (f) Eight weeks later, follow-up transverse STIR MR images show complete resolution of the mass.

observed that muscle fibers located at the proximal and distal aspects of the mass seemed to be continuous through the lesion. These thickened, fasciculated fibers provided a "bundle" appearance when imaged in their longitudinal axis, and a "mosaic" pattern in the transverse plane. Thus, the architecture of the muscle was preserved, and the fascias were respected. This continuum of fibers through the lesion without significant alteration of the muscle architecture has been noted in myositis ossificans (2,20). This feature of focal myositis most likely reflects underlying pathological changes consisting in muscle fibers hypertrophy, inflammatory cells infiltration, sometimes surrounded by necrosis and fiber regeneration (1,21).

At US, the lesion may present a heterogeneous and aggressive appearance, especially at Doppler analysis, with rapid vascular flows suggestive of malignancy (2,22). Again, the recognition of some "thickened" muscle fibers running through the lesion, presenting as tubular structures in the longitudinal axis, rounded sections in the transverse plane, and separated by hypoechoic septations should be regarded as suggestive of this diagnosis.

MRI studies also revealed consistent enhancement of the mass and extensive edema in the surrounding muscle fibers, sometimes involving the adjacent subcutaneous soft tissues. Surrounding edema can occur in sarcomas but from our experience, extensive perilesional edema is more suggestive of other conditions such as infection or myositis. Another interesting feature was the homogeneous internal enhancement of the lesions after intravenous administration of contrast material, instead of peripheral rim-like enhancement (pseudo-capsule). A pseudo-capsule is a sign frequently observed in soft tissue sarcomas, likely related to the centrifugal growth of the tumor and compression of adjacent structures (23).

Radiographs and CT ruled out the appearance of heterotopic calcifications or ossifications, and the bone scan revealed no tracer uptake. These features distinguish focal non-ossifying myositis from myositis ossificans, which is characterized by the appearance of peripheral faint irregular calcification 2–6 weeks after onset of symptoms. A sharply circumscribed mass is usually apparent by 6–8 weeks, becoming smaller and mature by 5–6 months (2,23). Myositis ossificans was ruled out in our cases without biopsy, because of spontaneous complete resolution in 6–8 weeks (earlier than the typical history and resolution of myositis ossificans) and absence of calcification/ossification, a constant typical finding in this entity. The transient observation of subtle calcification at the surface of the lesion in one of our patients remains difficult to explain. Indeed, the multi-modality imaging follow-up showed that no ossification appeared in this lesion. Absence of calcifications could partially rule out some rare calcifying soft

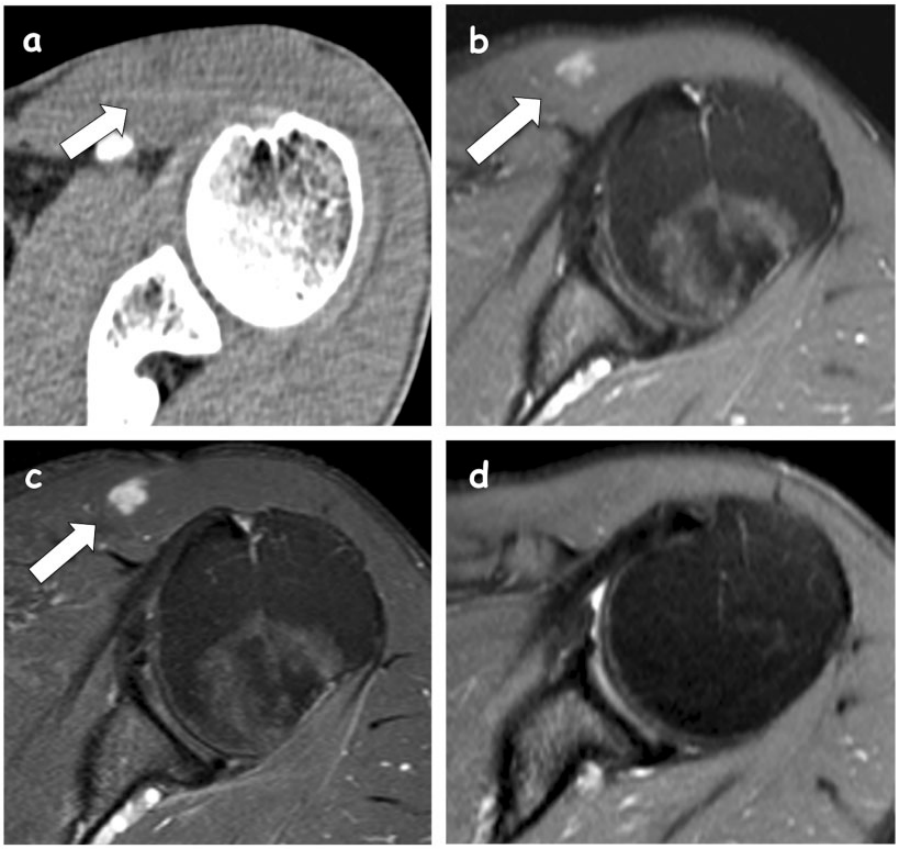

Fig. 5. A 40-year-old man with painful swelling of the left shoulder. Transverse reformatted CT image (a) shows an intramuscular, low density lesion (arrow), without calcification. Transverse fat-saturated proton density (PDFS)-weighted MR image (b) and post-contrast fat-saturated T1W image (c) reveal a small ovoid mass with irregular margins within the anterior part of the deltoid muscle lesion, showing high signal intensity on PDFS-weighted images and intense enhancement on post-contrast T1W image (arrows in b and c). Six-week follow-up MRI shows complete resolution of the lesion on the transverse PDFS-weighted image (d).

tissue sarcomas, such as synovial sarcomas, which are however rare disorders and present with calcifications in only 30% (24).

In this series, because the primary suggested diagnosis of myositis ossificans raised the need for additional imaging, i.e. CT or bone scan, and/or because the patients were referred for second-line opinion or biopsy, we had the opportunity to perform follow-up MRI studies and to observe the spontaneous resolution of the lesions, obviating the need for biopsies.

In conclusion, the strict intra-muscular location, the ''continuum'' of muscle fibers within the mass, and presence of surrounding edema were consistent MRI features in our patients with spontaneously resolutive focal non-ossifying myositis. Facing an intramuscular lesion suggestive of this diagnosis, short-term clinical and MRI follow-up is mandatory to re-evaluate the lesion after several weeks. In case of focal non-ossifying myositis, the mass should have significantly decreased or disappeared. Stability or increase in size should be regarded as suggestive of malignancies and should prompt biopsies.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

References

1. Heffner RR Jr, Armbrustmacher VW, Earle KM. Focal myositis. Cancer 1977;40:301–306.
2. Malghem J, Lecouvet F, Galant CH, et al. Myosite ossifiante circoncsrite. Monteppelier: Sauramps Medical, 2004:327–346.
3. Moskovic E, Fisher C, Westbury G, et al. Focal myositis, a benign inflammatory pseudotumour: CT appearances. Br J Radiol 1991;64:489–493.
4. Liefeld PA, Ferguson AB Jr, Fu FH. Focal myositis: a benign lesion that mimics malignant disease. A case report. J Bone Joint Surg Am 1982;64:1371–1373.

5. Lebon CJ, Lecouvet F, Vande Berg B, et al. Pseudotumors of the soft tisssues. In: Encyclopédie Médico-chirurgicale. Paris: Elsevier, 2003:752–787.
6. Hoffmann A, Buitrago Tellez C, Tolnay M, et al. Focal myositis of the iliopsoas muscle–a benign pseudotumour: ultrasound appearance in correlation with CT and MRI. Ultraschall Med 2006;27:180–184.
7. Shaprio MJ, Applebaum H, Besser AS. Cervical focal myositis in a child. J Pediatr Surg 1986;21:375–376.
8. Azuma T, Komori A, Nagayama M. Focal myositis of the tongue. J Oral Maxillofac Surg 1987;45:953–955.
9. Kransdorf MJ, Jelinek JS, Moser RP Jr. Imaging of soft tissue tumors. Radiol Clin North Am 1993;31:359–372.
10. Kransdorf MJ, Temple HT, Sweet DE. Focal myositis. Skeletal Radiol 1998;27:283–287.
11. Toti P, Catella AM, Benvenuti A. Focal myositis–a pseudotumoral lesion. Histopathology 1994;24:171–173.
12. Ellis GL, Brannon RB. Focal myositis of the perioral musculature. Oral Surg Oral Med Oral Pathol 1979;48: 337–341.
13. Hansen LB, Baekgaard N, Reske-Nielsen E. Focal myositis of the rectus abdominal muscles. Acta Chir Scand 1985;151:77–80.
14. Maguire JK Jr, Milford LW, Pitcock JA. Focal myositis in the hand. J Hand Surg Am 1988;13:140–142.
15. Lim KL, Robson K, Powell RJ. Focal myositis: an unusual cause of bilateral upper eyelid swellings. Postgrad Med J 1993;69:876–878.
16. Naughton M, Jessop JD, Williams BD. Idiopathic recurrent non-suppurative focal myositis: a report of two cases. Br J Rheumatol 1993;32:1101–1104.
17. Caldwell CJ, Swash M, Van der Walt JD, et al. Focal myositis: a clinicopathological study. Neuromuscul Disord 1995;5:317–321.
18. May DA, Disler DG, Jones EA, et al. Abnormal signal intensity in skeletal muscle at MR imaging: patterns, pearls, and pitfalls. Radiographics 2000;20:Spec No:S295–315.
19. Dinauer PA, Brixey CJ, Moncur JT, et al. Pathologic and MR imaging features of benign fibrous soft-tissue tumors in adults. Radiographics 2007;27:173–187.
20. Lecouvet F, Vande Berg BV, Malghem J, et al. Myositis ossificans and other ossifying lesions of the soft tissues. JBR-BTR 2001;84:268–269.
21. Smith AG, Urbanits S, Blaivas M, et al. Clinical and pathologic features of focal myositis. Muscle Nerve 2000;23:1569–1575.
22. Stacy GS, Dixon LB. Pitfalls in MR image interpretation prompting referrals to an orthopedic oncology clinic. Radiographics 2007;27:805–826. (discussion 827–828).
23. Kransdorf MJ, Murphey MD. Imaging of soft tissue tumors. In: Imaging of soft tissue tumors. Philadelphia, PA: Saunders, 1997:37–57.
24. Murphey MD, Gibson MS, Jennings BT, et al. Imaging of synovial sarcoma with radiologic-pathologic correlation. Radiographics 2006;26:1543–1565.