Radiology Case Reports

Volume 2, Issue 2, 2007

Posttraumatic Pseudolipoma (Fat Necrosis) Mimicking Atypical Lipoma or Liposarcoma on MRI

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We report a case of a 53-year-old female who presented with a painless mass over her left greater trochanter. Evaluation with MRI and ultimately biopsy led to a diagnosis of fat necrosis. If this diagnosis had been considered with greater confidence, a conservative approach could have been taken and biopsy avoided. In patients with lesions demonstrating classic locations and imaging features of fat necrosis, observation without biopsy is appropriate.

Introduction

Fat necrosis occurs in many locations and in association with numerous disease processes. Necrosis within the subcutaneous fat has been reported in association with pancreatitis, collagen vascular diseases, myeloproliferative disorders, asphyxia, hypothermia, subcutaneous injections and trauma (1-6). Some forms of fat necrosis may be related to disruption of blood supply with resultant cell death or traumatic production of humoral factors that induce fat cell maturation. Patients typically present with a palpable mass. A clinical history of trauma is not always present. Lesions may have a variable appearance on imaging, ranging from small, spiculated, nonencapsulated lesions to large, encapsulated mass-like lesions, necessitating differentiation from malignant soft tissue tumors. We present a case of subcutaneous fat necrosis initially felt to be suspicious for an atypical lipoma or liposarcoma, and propose that the characteristic location and appearance of these lesions may help suggest a benign diagnosis and guide conservative management in some cases.

Citation: Burkholz KJ, Roberts CC, Lidner TK. Posttraumatic pseudolipoma (fat necrosis) mimicking atypical lipoma or liposarcoma on MRI. Radiology Case Reports. [Online] 2007;2:98.

Abbreviations: MRI, magnetic resonance imaging, CT, computed tomography, FSE, fast spin echo, STIR, short tau inversion recovery

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Published: June 29, 2007

DOI: 10.2484/rcr.v2i2.98

Case Report

A 53-year-old female presented for evaluation of a palpable mass over her left greater trochanter. She recalled falling on her left hip two months earlier. The mass was not painful. She had no systemic complaints. Her past medical was remarkable for a high-grade leiomyosarcoma in the lateral compartment of the left calf, treated three years earlier with wide excision, adjuvant chemotherapy and radiation. She had no evidence of recurrent or metastatic disease. Physical examination revealed an obese female with a palpable, approximately 5 x 3 cm lesion over the left greater trochanteric region. The mass was superficial and mobile. It was not tender to palpation. The overlying skin was normal. The range of motion at her left hip was normal.

MRI of the pelvis revealed a 4.1 x 4.6 x 4 cm round lesion of predominantly fat signal intensity in the superficial adipose tissue overlying the left greater trochanter. The lesion had a thin 1-2 mm soft tissue capsule and a few tubular soft tissue elements at its caudal aspect, which appeared to be blood vessels (Figure 1). There was a mild amount of

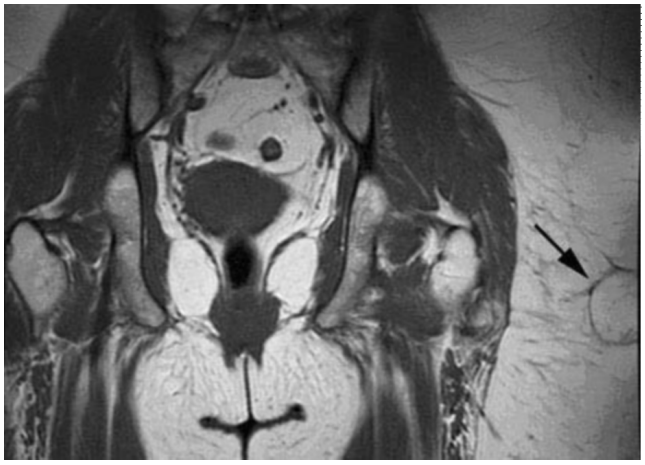

Figure 1A. Posttraumatic pseudolipoma. Coronal T1 weighted images show a mass (arrow) in subcutaneous adipose tissue at the level of the left greater trochanter.

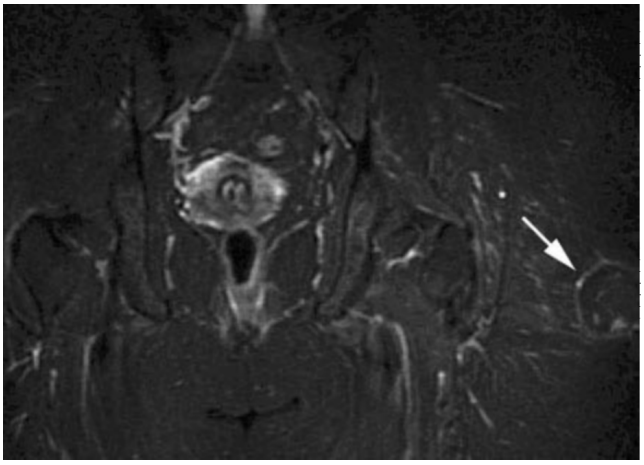

Figure 1B. Posttraumatic pseudolipoma. Coronal T1 weighted images show a mass (arrow) in subcutaneous adipose tissue at the level of the left greater trochanter. Note the thin peripheral T1 hypointense capsule and a few tubular non-fatty elements within the lower part of the mass

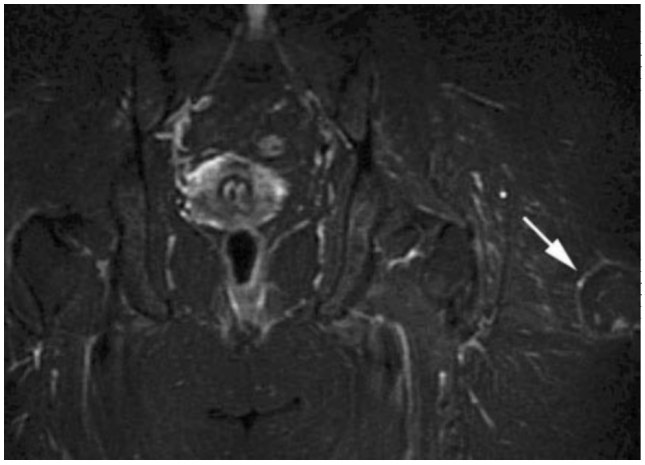

Figure 2. Posttraumatic pseudolipoma. Coronal STIR demonstrates the hypointense mass (arrow) matching the signal of subcutaneous fat. Hyperintense signal is present along the periphery of the mass, and within a few tubular elements at the inferior part of the mass, representing small vessels.

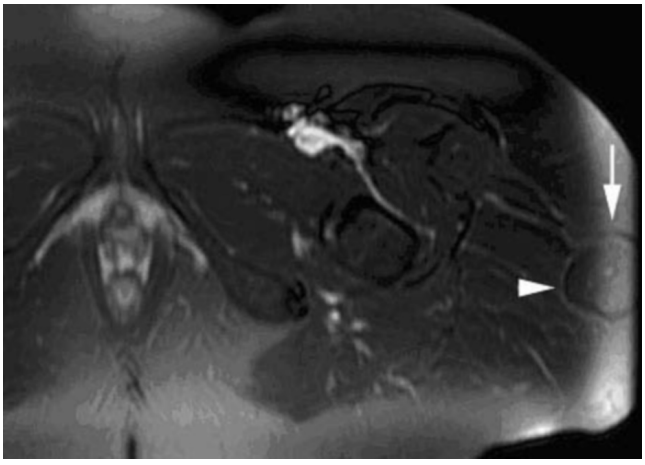

Figure 3. Posttraumatic pseudolipoma. Axial FSE T2 with fat suppression. Mass (arrow) is isointense to subcutaneous fat, with a thin high T2 signal capsule (arrowhead). Note poor fat suppression at the periphery due to field inhomogeneity from patient's large body habitus.

edema surrounding the well-defined margin (Figures 2 and 3). Post-intravenous gadolinium, there was enhancement of the blood vessels at the caudal aspect of the lesion but no enhancement of the remainder of the lesion (Figure 4). The underlying femoral cortex and marrow signal was normal. Due to the patient's large body habitus, the patient's side touched the bore of the magnet which resulted in field inhomogeneity and suboptimal fat suppression.

Due to the patient's history of previous high grade leiomyosarcoma, an aggressive treatment plan was favored. The patient underwent an ultrasound-guided biopsy of her lesion. Multiple 18g core biopsy samples were obtained for pathologic evaluation. The biopsy revealed nonviable adipose tissue with clusters of histiocytes, foam cells, and multinucleated giant cells compatible with fat necrosis (Figure 5). There were no malignant cells. A single six month follow-up MRI of her left hip showed minimal post biopsy changes within the area of fat necrosis. She has returned to normal surveillance of the previously excised calf malignancy.

Discussion

Fat necrosis mimicking an atypical lipoma or liposarcoma

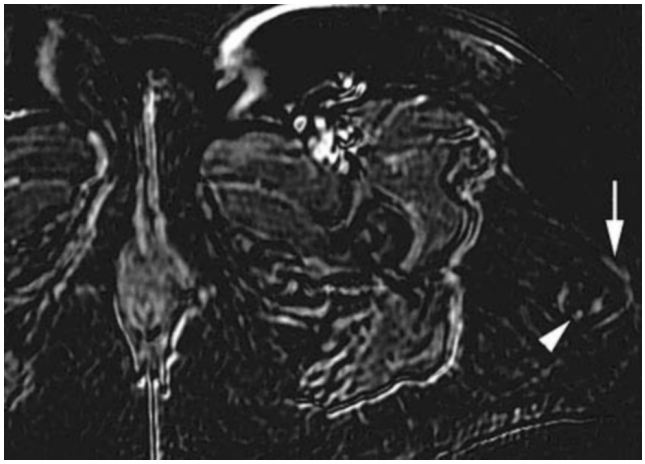

Figure 4. Axial pre and post gadolinium subtraction image. Mass has mild peripheral enhancement (arrow) and enhancement of small vessels (arrowhead). Subtraction post-processing was utilized due to poor fat suppression.

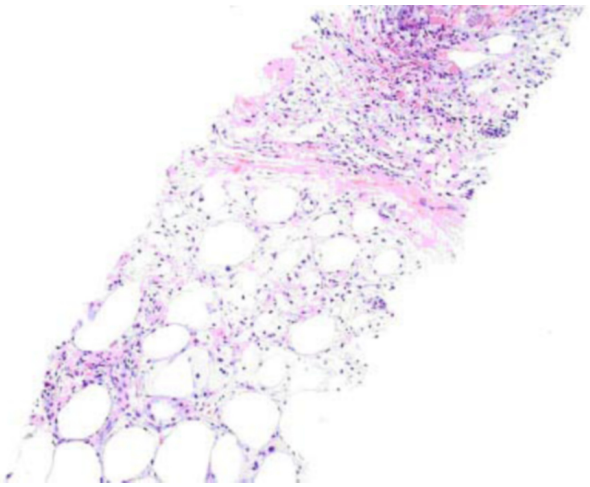

Figure 5A. Posttraumatic pseudolipoma. Photomicrograph of biopsy specimen shows fat necrosis (Hematoxylin-eosin; 100x).

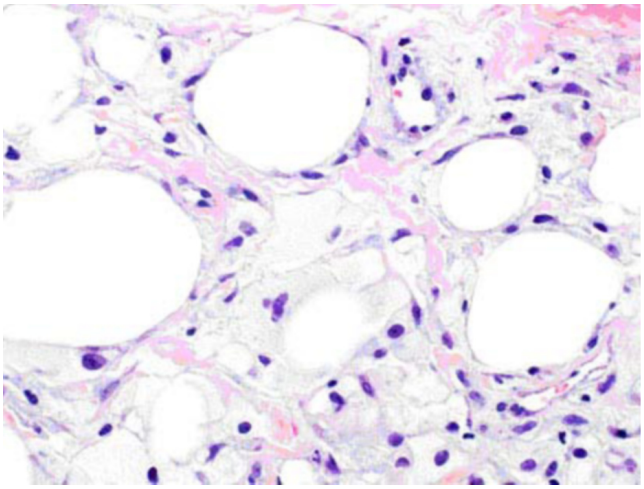

Figure 5B. Posttraumatic pseudolipoma. Photomicrograph of biopsy specimen shows nonviable adipose tissue with clusters of foamy histiocytes (Hematoxylin-eosin; 400x)

has previously been described in the abdomen and pelvis in both intraperitoneal and retroperitoneal locations, as well as in the extremities (7-9). In patients presenting with palpable masses of the extremity, initial workup frequently includes CT or MR imaging. The differential diagnosis includes both benign and malignant fat containing lesions, including liposarcoma. The clinical history can be confusing, as patients often may not recall a history of trauma to the area, especially when there is a long interval between the traumatic event and presentation.

Pathogenesis

In cases of traumatic fat necrosis, it has been postulated that the traumatic event produces humoral factors which induce pre-adipocytes to mature, producing an unencapsulated mass (10). In trauma related cases, fat necrosis occurs in subcutaneous adipose tissue overlying pressure points or in areas subject to trauma, such as the greater trochanter. An alternate cause of traumatic pseudolipoma is herniation of fat through a fascial tear (11). The pathogenesis of general subcutaneous fat necrosis is somewhat controversial (12). It seems to be related to rapid vascular insufficiency and subsequent fibrous capsule formation (13). Local or systemic events, such as pancreatitis, causing compromise in the blood supply of the subcutaneous tissues result in necrosis of adipose tissue and induce an inflammatory response (6, 14). Fat necrosis has been reported in patients with collagen vascular diseases, such as systemic sclerosis, likely the result of small vessel-related ischemia in the subcutaneous adipose.

Imaging

The lack of a discrete mass has been previously described as a criterion for fat necrosis (5, 10); however, another series reported mass-like features not infrequently (15). Encapsulated fat necrosis can be difficult to differentiate from neoplastic processes, such as atypical lipoma or liposarcoma, based on imaging alone, due to the mass-like appearance and variable amount of non fatty elements representing granulation tissue and fibrosis. The presence of thick (> 2 mm) septa having moderate to marked enhancement within a fatty mass is suspicious for a liposarcoma (16). Internal septa were not present in the current case. The characteristic location of a mass occurring over a pressure point or bony protuberance, in this case the greater trochanter, may suggest the possibility of fat necrosis.

Fat necrosis has a similar imaging appearance as mature adipose tissue, demonstrating high signal intensity on T1-weighted images, intermediate to high signal intensity on fast spin echo (FSE) T2-weighted images and low signal on short tau inversion recovery (STIR) sequence (17). The

high T1-weighted signal is a helpful finding, as there are a relatively small number of lesions which contain either fat or blood to produce this high signal (18). The lesion may have or lack a pseudocapsule. Fibrous or granulation tissue comprising the pseudocapsule surrounding the lesion or within the lesion is low in signal intensity on T1 and FSE T2-weighted images and intermediate to high signal intensity on the STIR sequence, corresponding to reactive fibrous tissue. In our case, the low T1 signal fibrous pseudocapsule of the lesion gave it the appearance of an encapsulated mass. Fat necrosis has central low signal on fat-suppressed sequences. Enhancement of the fibrous pseudocapsule after gadolinium injection is a frequent finding, as in our case. This is most likely due to vascularization of fibrous or granulation tissue (15). Nodular appearing non-fatty elements have been reported in fat necrosis, however an atypical lipoma or liposarcoma must be considered in these cases, and workup of these lesions should proceed. Calcification of fat necrosis has been reported, and is best appreciated with radiographs or CT. Fat necrosis can also demonstrate gallium uptake (19) on nuclear medicine studies.

Histology

In the pathology literature, names such as nodular-cystic fat necrosis, mobile encapsulated lipoma, and encapsulated fat necrosis have been offered to describe this entity. Microscopically, typical findings of fat necrosis include necrotic adipose tissue surrounded by lipid-filled macrophages and scattered chronic inflammatory cells.

Conclusion

Fat necrosis can sometimes be difficult to distinguish from an atypical lipoma or liposarcoma on imaging. However, typical imaging features in combination with a characteristic location can suggest this diagnosis. This diagnosis can be further supported by a clinical history of trauma. While lesions occurring in the retroperitoneum, deep thigh musculature, or other deep locations typical of liposarcoma require biopsy for definitive diagnosis, lesions occurring in subcutaneous adipose tissue overlying bony protuberances are more likely to represent fat necrosis, and can be appropriately monitored with imaging, thus avoiding biopsy.

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