Thigh Pain in a 73-year-old Man

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History and Physical Examination

A 73-year-old man with hemophilia was referred for evaluation of acute on chronic left hip and thigh pain. The patient had mild chronic discomfort in his proximal left thigh for several years, and although no prior records were available, he reported an MRI was performed 7 years earlier for evaluation of his pain and a soft tissue mass was identified. He did not recall any specific treatment given at that time. One month before his current presentation, he awoke with acute pain in his thigh, although he had no history of injury. His pain was exacerbated with weight-bearing and improved with rest. He was evaluated by his local physician, and the radiographs showed a bone abnormality with loss of lateral cortical bone in his femur.

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He was instructed to walk with crutches and was referred for further evaluation and treatment. His medical history revealed Type A hemophilia and a left TKA 23 years earlier that required perioperative clotting factor products.

Physical examination revealed a soft tissue fullness in the proximal left thigh that was tender to palpation and a well-healed anterior left knee incision from his TKA. The skin was normal and range of motion in his lower extremity was satisfactory. The patient was intact from a neurovascular standpoint, but he had weakness and pain associated with left knee extension.

Imaging studies were performed and included radiographs, MRI, and CT of the femur. The radiograph of the chest was unremarkable.

Based on clinical history, physical examination, and imaging studies, what is the differential diagnosis?

Imaging Interpretation

A radiograph of the left hip (Fig. 1) showed a large non-mineralized mass in the lateral left thigh with remodeling of the adjacent lateral femoral cortex. MRI of the thigh confirmed a large mass with relatively homogeneous high signal intensity on the T1-weighted spin-echo image (Fig. 2A) and a ring of prominent decreased signal intensity at the periphery of the mass, and in multiple nodules, on a gradient MR image (Fig. 2B). Contrast enhanced MRI (Fig. 3), with a subtraction technique, distinguished areas of enhancement from areas of increased signal intensity simulating enhancement. MRI also showed an intensely enhancing focus of abnormal signal in the proximal femoral shaft (Fig. 4). CT imaging (Fig. 5), performed to evaluate the osseous architecture more fully, identified the presence of an occult oblique fracture.

Differential Diagnosis

Pleomorphic soft tissue sarcoma
Hemophilic pseudotumor
Metastatic disease
Soft tissue sarcoma associated with hematoma

Fig. 1 An anteroposterior radiograph of the hip and thigh shows a soft tissue mass in the later aspect of the thigh (asterisk) with associated osseous erosion (arrow).

Fig. 2A–B (A) A coronal T1-weighted spin-echo and (B) an axial gradient MR image of the left thigh show a large complex mass (large asterisks) with predominantly increased signal intensity in (A) and marked loss of signal at the periphery of the lesion in (B). Also intraosseous abnormality (A, small asterisk) and multiple peripheral nodules (B, arrows) can be seen.

The patient underwent ultrasound-guided needle biopsy of the soft tissue mass in the left thigh.

Based on the clinical history, physical examination, radiographic images, and histologic picture, what is the diagnosis and how should the lesion be treated?

Histology Interpretation

The needle biopsy showed muscle and fibrotic tissue. During the subsequent surgical exploration and resection of the mass, we obtained tissue specimens from several areas for histologic evaluation. Tissue from the soft tissue mass and tissue immediately adjacent to the bone was a hematoma (Fig. 6). Femoral canal reamings showed bone and reactive stroma. All specimens were negative for neoplasm.

Diagnosis

Hemophilic pseudotumor, with secondary nondisplaced stress fracture of the left proximal femur.

Discussion and Treatment

The differential diagnosis based on clinical and radiographic data included a pleomorphic soft tissue sarcoma, hemophilic pseudotumor, metastatic disease, and soft tissue sarcoma with hematoma. Although metastatic disease to bone with a secondary soft tissue mass and/or hematoma was a consideration, radiographs showed the changes in the lateral femur were more consistent with remodeling and not metastatic disease to bone. Imaging studies could not

Fig. 3A–B (A) An axial fat-suppressed gadolinium-enhanced T1-weighted spin-echo MR image and (B) a subtraction MR image, obtained by software subtraction of the precontrast from the postcontrast image, shows persistent enhancement of the anterior nodule (anterior arrow). (B) The increased signal within the mass and in the posterior nodule (posterior arrow) are no longer present on the subtraction images.

Fig. 4 A coronal fat-suppressed gadolinium-enhanced T1-weighted spin-echo MR image shows the enhancing intraosseous focus (small asterisk). A large mass is evident in the lateral thigh (large asterisk).

distinguish between a soft tissue sarcoma, soft tissue sarcoma with hematoma, and a hemophilic pseudotumor. Histologic evaluation of the preoperative needle biopsy specimen and tissue obtained at the time of surgery showed no tumor and established the diagnosis of hemophilic pseudotumor.

Hemophilic pseudotumor is a rare complication of this bleeding disorder [1–3, 5–7, 9, 11–13] and tends to present

as a slowly progressing soft tissue mass in adults [2, 4, 10, 13]. An intramuscular injury initiates the formation of a hematoma that may become large given the patient's bleeding disorder. The large size of the hematoma limits the body's ability to reabsorb the blood products, and a capsule develops around the hematoma creating a pseudotumor [2, 4, 5, 9–11, 13]. There may be continued bleeding into the hematoma, resulting in progressive enlargement of the mass and various signal patterns on MRI [3, 5, 9, 11]. Pseudotumors typically are found in the vastus lateralis, soleus, or iliopsoas muscles [10]. In children, pseudotumors may be more aggressive and typically are located in the distal extremities, such as the distal forearm, leg, wrist, or ankle [1, 2, 4–6, 10, 12].

Several types of pseudotumors can occur, depending on the location in which the hematoma develops. An osseous pseudotumor occurs when there is continuous bleeding into a bone, usually in the femur, pelvis, tibia, or metacarpals [5, 6, 9, 11, 12]. These pseudotumors also can occur in any portion of tubular bones. They are well-defined, unilobular or multilobular lesions of variable sizes and may simulate various neoplasms, such as giant cell tumor, desmoplastic fibroma, plasmacytoma, metastasis, solitary bone cysts, aneurysmal bone cysts, brown tumors, and Echinococcosis [1, 5, 9, 11]. Subperiosteal pseudotumors occur when patients have hematomas develop under their periosteum that cause increased pressure and bone damage [2, 3, 5, 9–12]. Soft tissue pseudotumors are classified as intramuscular and extramuscular [9, 11].

The treatment of pseudotumors depends on the patient's symptoms and location of the soft tissue mass [3–6, 11]. Treatment with clotting factors may limit the size of a pseudotumor and is recommended for acute symptoms [9]. Although the natural history of pseudotumors is not well defined, lesions involving the more distal extremity [1] and those in children [1] or adults younger than 40 years [8] appear to have a more favorable prognosis with

Fig. 5A–B (A) Sagittal and (B) coronal reformatted CT images of the femur show the osseous remodeling of the posterior lateral cortex (A, white arrow) and occult fracture with associated increased density (black arrows).

Fig. 6 A photomicrograph of tissue obtained from the hematoma shows blood and fibrin (Stain, hematoxylin and eosin; original magnification, $\times 200$).

stabilization of the lesion or even resolution without intervention. Pseudotumors can remain quiescent for years and then become acutely symptomatic owing to additional bleeding with compromise of adjacent tissues and development of a fistula or infection [1].

Surgical removal often is recommended to prevent continued growth of the pseudotumor and the potential for compromise of adjacent tissues [1, 8, 9]. Percutaneous drainage is not recommended owing to the potential for development of chronic draining fistulas and possibly fatal sepsis [1, 9]. In a patient with a favorable age (14 years) and location (hand), radiation therapy was reported as being effective [12]. In general, surgical treatment should be considered for symptomatic patients. Results of surgical

treatment generally result in symptom improvement or resolution [3, 11, 13].

This patient presented with an intramuscular soft tissue tumor of the left proximal thigh, with secondary erosion of the adjacent femur, ultimately resulting in stress fracture. In view of the clinical history of hemophilia, the diagnosis of a chronic expanding hematoma (hemophilic pseudotumor) was suspected for the soft tissue mass. The MRI showed extensive hemosiderin deposition at the periphery of the mass, which supported this diagnosis. However, contrast enhanced MRI subtraction technique confirmed the presence of small foci of enhancement at the periphery of the soft tissue mass, which was concerning and raised the possibility of a hemorrhagic sarcoma with associated hematoma [14]. Identification of a separate intraosseous abnormality made this a greater concern, and in view of the patient's age, an undifferentiated pleomorphic soft tissue sarcoma with osseous involvement was considered the most likely primary sarcoma, although the time militated against this diagnosis. The identification of an intraosseous lesion also raised the possibility of metastatic disease. Subsequent methylene diphosphate scintigraphy (not shown) showed no other areas of osseous involvement.

This case also serves to illustrate the complementary use of CT and MRI and how MRI protocols can be adapted to answer specific clinical questions and identify the most appropriate site for biopsy. Although many soft tissue masses have a nonspecific signal intensity, the lesion in this case had increased signal intensity on T1-weighted (Fig. 2A) and T2-weighted (not shown) spin-echo MR images, typical of subacute or chronic hemorrhage. In general, chronic hematomas also show a rind of hemosiderin-laden tissue, which may be quite extensive.

Fig. 7A–B Postoperative anteroposterior radiographs of (A) the hip and thigh and (B) the knee taken 6 weeks after surgery show femur stabilization with intramedullary device.

Hemosiderin is readily recognized on MRI by the identification of “blooming,” the characteristically increased loss of signal from hemosiderin-laden tissue on gradient images (Fig. 2B), which was quite marked in this case. Although MRI is excellent for identifying subacute hemorrhage by its increased signal intensity, the distinction of hemorrhage from contrast enhancement may be more problematic. This difficulty can be overcome by a simple subtraction technique, in which the precontrast image is electronically subtracted from the postcontrast image (Fig. 3A), clearly distinguishing between the increased signal intensity seen with enhancing tissue and subacute blood (Fig. 3B). This technique is especially helpful in identifying the appropriate location for biopsy in certain hemorrhagic lesions and was used to direct the biopsy in this case. Finally, although MRI is excellent for assessment of the marrow, subtle fractures occasionally may be difficult to assess, and in such cases high-resolution CT scanning is invaluable.

Hematology consultation was performed before biopsy and surgical intervention. The patient received clotting factor before surgery. The pseudotumor was resected, and the femur was stabilized with a reconstruction-type intramedullary nail (Fig. 7). Additional clotting factor was administered after surgery for 7 days, and by the seventh day, the wound drain output had ceased. There were no apparent postoperative complications. The patient was discharged the following day with stable hemoglobin, and when examined at his sixth-week postoperative visit, he continued to do well. At the most recent followup 5 months after surgery, the patient denied pain or swelling and had normal range of motion of his hip and knee with normal quadriceps strength on clinical testing. He has resumed

playing golf; his discomfort prohibited him from playing for the year before surgery.

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