

## CLINICAL PRESENTATION AND RADIOLOGY QUIZ QUESTION

A 57 year old woman with a history of multiple aches and pains undergoing treatment for polymyalgia rheumatica notes swelling in her thigh. There is ill-defined thigh fullness on physical examination.

Which of the following imaging studies would be the *least* appropriate first step in evaluation of the patient's thigh?

- (a) plain films of the thigh
- (b) nuclear medicine bone scan examination
- (c) ultrasound of the thigh
- (d) magnetic resonance imaging of the thigh

<b>RADIOLOGY QUIZ QUESTION, ANSWER, AND EXPLANATION</b>
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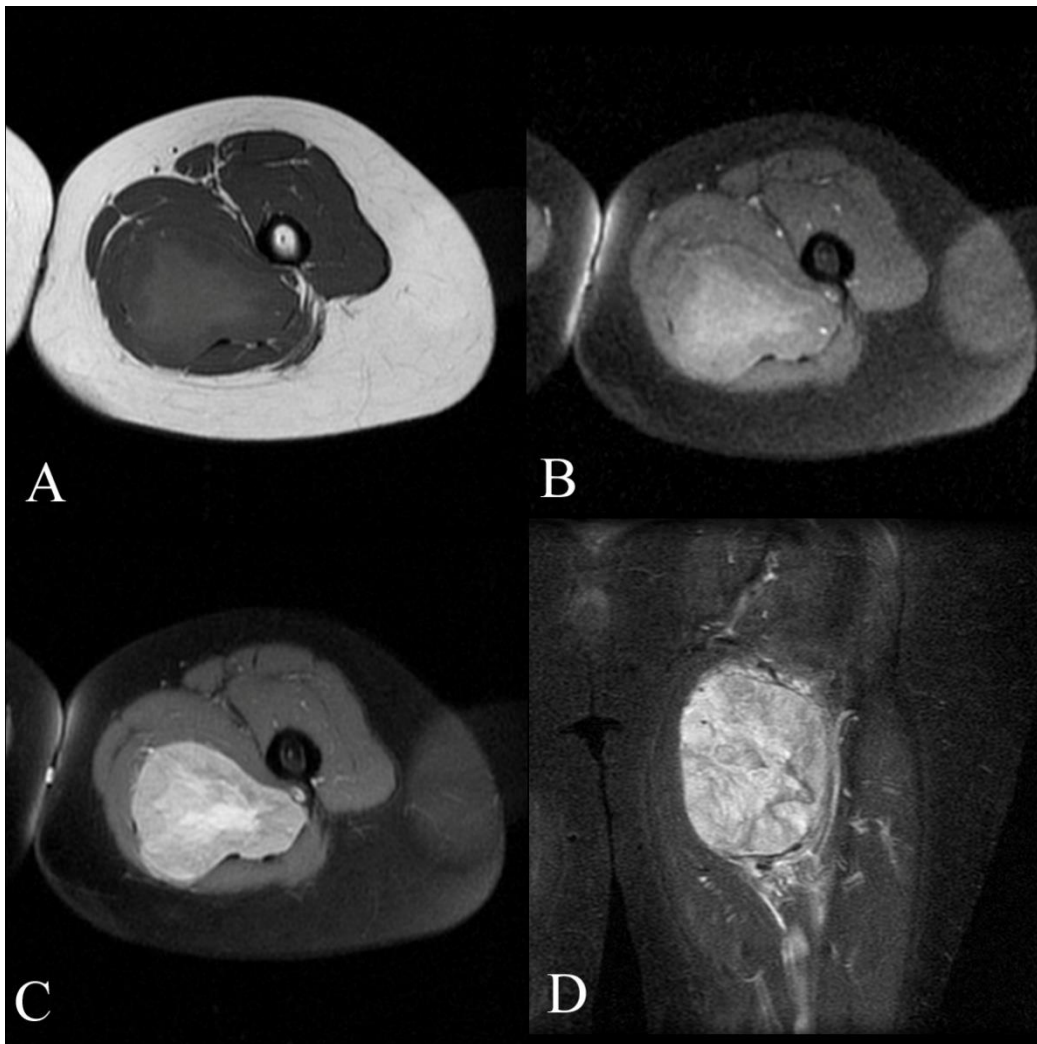
- (a) plain films of the thigh
- (b) nuclear medicine bone scan examination
- (c) ultrasound of the thigh
- (d) magnetic resonance imaging of the thigh

Answer: (b), nuclear medicine bone scan examination is the *least* appropriate first step to evaluate a possible soft tissue mass of the thigh. Nuclear medicine bone scan examinations are generally performed to further investigate known skeletal abnormalities, and to stage (and restage) malignancy that is metastatic to bone (for example, breast and prostate carcinoma).

Plain films of the thigh may be helpful to determine whether the patient's ill-defined thigh fullness actually represents a bony abnormality. Even if the abnormality is predominantly "soft tissue," plain films can demonstrate characteristic calcifications (phleboliths) in hemangiomas and show a characteristic pattern of calcification/ossification in myositis ossificans. Therefore, (a) is a reasonable first step in evaluation of a possible thigh mass. Ultrasound of the soft tissues is often helpful in determining whether a mass is present and whether a lesion represents a simple cyst, and whether a lesion has vascular flow in it. Therefore, (c) is a reasonable first step. Magnetic resonance imaging is often the preferred initial step in imaging soft tissue lesions which require imaging evaluation. Magnetic resonance imaging can determine whether a lesion is present, whether the lesion represents a simple lipoma, and the location of the lesion. It is often possible to supply a relatively short differential diagnosis for the lesion based on the imaging characteristics at magnetic resonance imaging.

## IMAGING STUDY AND QUESTIONS

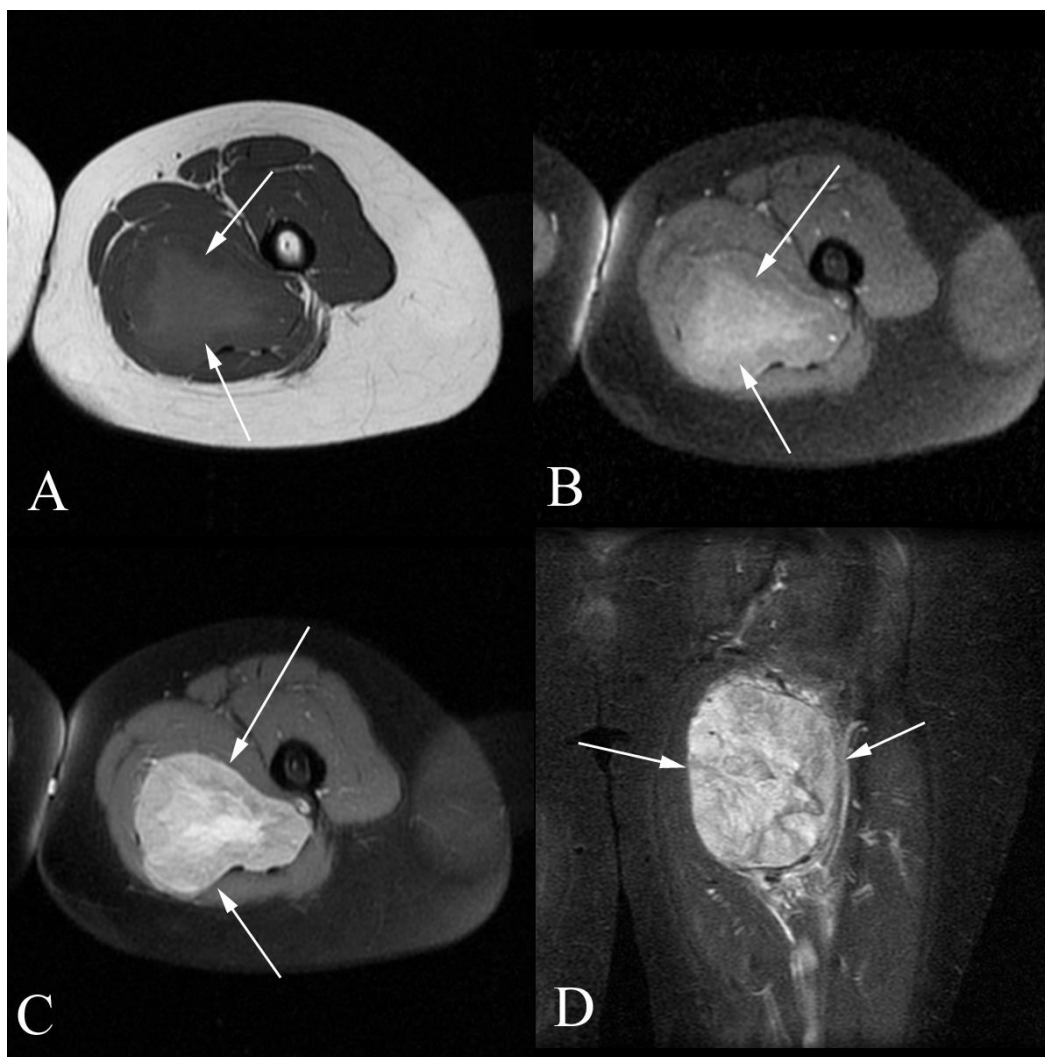
The patient underwent imaging:



Imaging questions:

- 1) What type of study is shown?
- 2) Are there any abnormalities?
- 3) What is the most likely diagnosis?
- 4) What is the next step in management?

## IMAGING STUDY QUESTIONS AND ANSWERS



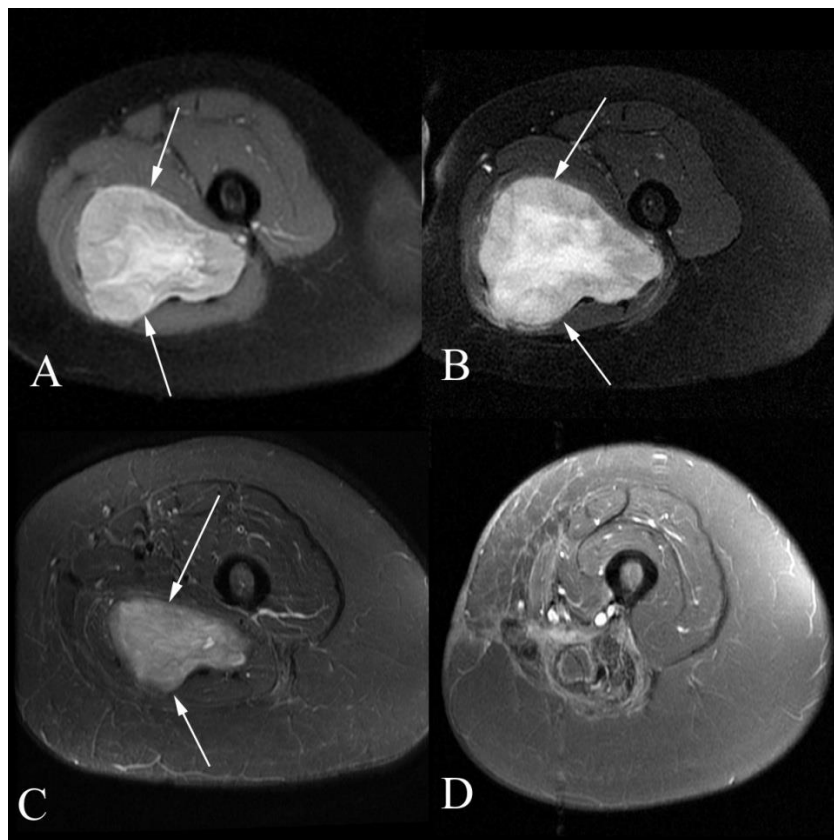
### Imaging questions:

- 1) What type of study is shown? Magnetic resonance imaging of the thigh. A is an axial T1-weighted image, B is an axial T1 fat-suppressed post-contrast image, C is an axial proton density fat suppressed image, and D is a coronal short-tau inversion recover (STIR) image.
- 2) Are there any abnormalities? Yes. There is a large mass in the adductor compartment (arrows).
- 3) What is the most likely diagnosis? Malignant soft tissue tumor. Differential diagnosis includes malignant fibrous histiocytoma (the most common soft tissue malignancy of the extremities), liposarcoma, leiomyosarcoma, synovial cell sarcoma, metastatic disease, and infection.
- 4) What is the next step in management? Consultation with orthopedic oncology and biopsy.

## PATIENT DISPOSITION, DIAGNOSIS, AND FOLLOW-UP

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The patient was referred from her primary care provider to an orthopedic oncologist. The orthopedic oncologist obtained a biopsy of the lesion which proved to be a myxofibrosarcoma (high grade). Because of the large size of the lesion and location of the tumor directly adjacent to the sciatic nerve, primary resection was not performed. The patient underwent neoadjuvant chemo- and radiation therapy prior to surgery (see below), after which the lesion was resected in its entirety. Analysis of the resected tumor demonstrated 100% tumor necrosis and tumor free margins. Follow-up studies done four years later showed no recurrence of disease and the patient remains well six years following surgery.



57 y/o woman with a myxofibrosarcoma of the thigh before and after neoadjuvant chemotherapy and radiation and then following surgery. A. Initial axial fat-suppressed T2 weighted image shows a tumor in the right adductor magnus muscle (arrows). B. Follow-up axial fat-suppressed T2 weighted image shows slight tumor growth after 3 weeks of neoadjuvant chemo- and radiation treatment. C. Further follow-up axial fat-suppressed T2 weighted image shows tumor shrinkage after an additional six weeks of neoadjuvant therapy. The patient had the tumor resected six weeks later. D. Post-op axial fat suppressed T1 weighted contrast-enhanced MR shows no residual tumor.

## SUMMARY

**Presenting symptom:** The patient presented with a relatively large mass in the thigh. While the mass was sizable, it was located deep within a muscle and was surrounded by ample adipose tissue (note the layer of subcutaneous fat on the axial MR images in the figure), making it challenging to palpate a discrete lesion.

**Imaging work-up:** Soft tissue masses of the extremities are often benign and require no imaging. Ganglion cysts (particularly around the wrist) typically arise near a joint or tendon and represent an outpouching of synovium which may have lost connection with the parent joint; treatment consists of aspiration/injection or resection. Other soft tissue lesions usually requiring no imaging include post-traumatic hematomas, areas of silicone injection, and nodules associated with rheumatoid arthritis, sarcoidosis, or vasculitis. When the cause of a soft tissue nodule is not obvious and imaging is required, plain films, ultrasound, and magnetic resonance all have a role to play and the choice of which method varies with location and local expertise. The role of imaging is generally to determine 1) whether a lesion is truly present; 2) the relationship of the lesion to the adjacent neurovascular structures; 3) whether the lesion is contained within a fascial-bounded compartment; and 4) the histology of the lesion.

**Establishing the diagnosis:** When a large soft tissue mass is identified, as in this case, imaging may be able to establish a histologic diagnosis of lipoma (if the lesion is composed entirely of fat) but usually does not provide a specific histologic diagnosis. In such cases biopsy is necessary to establish a diagnosis. Note that undertaking a biopsy on a lesion which may be malignant should only be performed *following* consultation with a surgeon (preferably, the orthopedic oncologist who will be providing definitive treatment). This follows from the fact that the biopsy tract will need to be included in the surgical resection if the lesion is excised, and therefore the route and manner of biopsy need to be planned to allow subsequent resection.

**Take-home message:** Most soft-tissue masses do not require biopsy. Plain films, ultrasound, and magnetic resonance imaging all have a role to play in evaluation of soft tissue masses that require imaging, and the choice of which method to use for initial imaging varies with local custom and expertise.

### FURTHER READING

Crim JR, Seeger LL, Yao L et al. Diagnosis of soft-tissue masses with MR imaging: can benign masses be differentiated from malignant ones? *Radiology* 1992; 185:581-586.

Renfrew, DL. Single joint pain. Chapter 14 of *Symptom Based Radiology*, Symptom Based Radiology Publishing, Sturgeon Bay, WI, 2010, available for no charge at [www.symptombasedradiology.com](http://www.symptombasedradiology.com).

Sheon RP. Ganglia and nodules. UpToDate, accessed 11/2/09.