Radiology of Soft Tissue Tumors

Paul I. Mallinson, MBChB*, Hong Chou, MBBS, Bruce B. Forster, MD, Peter L. Munk, MD

KEYWORDS

• Soft tissue tumor • Sarcoma • Radiology • Biopsy

KEY POINTS

- Magnetic resonance imaging is the mainstay of diagnostic imaging for soft tissue masses, but plain film, ultrasonography, and computed tomography have roles. Nuclear medicine contributes to staging and detection of recurrence.
- A subset of lesions has specific imaging features that enable a confident radiological diagnosis with appropriate clinical correlation.
- Many soft tissue masses have nonspecific appearances and should be considered for biopsy in a specialist center.
- When a biopsy is required for definitive diagnosis, careful multidisciplinary planning is essential to avoid contamination of unaffected tissue, leading to recurrence and unnecessary amputations.

INTRODUCTION

Background

The soft tissue mass is a common complaint that raises concern and anxiety for malignancy in patients and physicians alike. However, incidence of benign tumors is estimated at 3000 per million population and a benign cause is found in 95% of patients presenting to primary care with a soft tissue mass.[1,2] It is important to establish a good clinical history and perform careful examination before imaging, as such masses may have a nonpathological explanation or nonsoft tissue etiology. These include the following:

- Normal anatomy
  - Ribs
  - The sternoclavicular joint, particularly after age-related degenerative hypertrophy

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Radiology Department, Vancouver General Hospital, Jim Pattison Pavilion, 899 West 12th Avenue, Vancouver, British Columbia V5Z 1M9, Canada
* Corresponding author.
E-mail address: dr_pmallinson@hotmail.com

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- Subcutaneous fat irregularity in larger patients
- The subcutaneous fat pad overlying the cervicothoracic junction

- Masses arising from a bone or abdominal organ
  - Old fractures
  - Bone tumors
  - Hepato/splenomegaly, gallbladder masses, and hernias
- Imaginary masses
  - Overanxious patient
  - Obesity
  - Family history of cancer

Important factors to note in the history are summarized in **Table 1**. In addition to these, the patient's age and the location of the lesion can further reduce the differential diagnosis.[3] For example, many mesenchymal tumor types occur in adults, angiomas occur in all ages, and dermatofibrosarcoma protuberans (DFSP) and epithelioid sarcoma peak in the 20 to 40 age range. DFSP often involves the skin, malignant fibrous histiocytoma is often deep, liposarcomas are usually found in the extremities and retroperitoneum, and epithelioid sarcoma is most common in the fingers, hands, and forearms.

These features help the referring physician decide on the necessity for imaging and the best initial modality to request (eg, a radiograph for a suspected bony mass or an ultrasound for soft tissue). This information allows the radiologist to appropriately protocol the requested studies to expedite patient care; for example, changing a modality or arranging the most appropriate sequences and orthogonal planes on magnetic resonance imaging (MRI). Furthermore, the information provides valuable clues as to the likely pathology, to correlate with the imaging. This can be particularly useful when faced with nonspecific imaging appearances.

All physicians should be wary of a history of trauma; although this is a common cause for a mass, sometimes the event has drawn the patient's attention to the affected area for the first time and can result in a misleading diagnosis.

Sarcomas

A rare, but perhaps the most feared, cause of a soft tissue mass is the soft tissue sarcoma. They are tumors of mesenchymal origin that histologically resemble, but do not necessarily arise from, the tissue they are named for. More than 50 histologically distinct subtypes exist. The major categories are summarized in **Table 2**.

Table 1
A list of useful features in the clinical history that may guide diagnosis

History Says…	Could Be
Previous or known primary malignancy	Metastasis or recurrence Radiation-induced sarcomas
Previous trauma or on anticoagulation	Hematoma or myositis ossificans
Painful lesion	Inflammatory or neural origin
Rapid increase in size	May be malignant
Stable size over long period	Likely benign
Variation in size	Hemangioma or ganglia
Multiple lesions	Lipomatosis or neurofibromatosis Metastases