Imaging in Soft Tissue Sarcomas: Current Updates

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KEYWORDS

• Soft tissue sarcomas • CT • MRI • Liposarcoma • Leiomyosarcoma

KEY POINTS

- Differentiation of benign and malignant soft tissue tumors as well as differentiating various histologic subtypes of sarcoma on imaging alone is challenging.
- Patient demographics, pertinent clinical data, location of the mass, multiplicity of lesions, growth pattern, and specific imaging findings may help to narrow down the differential.
- Tissue sampling remains the gold standard for definitive diagnosis; the optimal biopsy site and route depends on imaging findings and is determined with the surgical/orthopedic oncologist.
- Certain soft tissue sarcomas have characteristic imaging features: fat in adipocytic sarcomas, high T2 signal intensity in myxoid tumors, low T2 signal intensity in tumors with fibrosis and flow voids in highly vascular tumors.

INTRODUCTION

Soft tissue sarcomas (STS) are rare, accounting for only 1% of malignant tumors, with an estimated incidence of 2.7 per 100,000. However, it is a heterogeneous group with more than 50 subtypes exhibiting varying clinical behavior from indolent to highly aggressive. Although the majority arise in the extremities, the retroperitoneum, trunk, and head and neck are also common locations.[1–3]

Patient age is an important discriminating factor in the differential diagnosis of STS. The most common STS in adults are gastrointestinal stromal tumors (GIST), followed by unclassified pleomorphic sarcoma, liposarcoma (LPS), and leiomyosarcoma (LMS), and myxofibrosarcoma (MFS), whereas in the pediatric population, rhabdomyosarcomas (RMS) constitutes the most common STS. Certain histologic subtypes

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like synovial sarcoma, alveolar soft part sarcoma (ASPS) and Ewing sarcoma tend to occur predominantly in young adults. Imaging plays an important role in the diagnostic workup of STS, including tissue characterization, guiding biopsy, staging, and pretreatment planning of STS. Although most STS have nonspecific imaging features, certain STS can have a characteristic imaging appearance, which can help in their diagnosis. Furthermore, certain histologic subtypes have a unique metastatic pattern, like nodal metastases in synovial sarcoma and brain metastases in ASPS, which can aid in their primary diagnosis as well as posttreatment surveillance.

A comprehensive review of the imaging findings of all STS is beyond the scope of this paper. In this paper, we illustrate pertinent imaging characteristics of commonly occurring STS and some uncommon sarcomas with unique imaging characteristics, and provide an overview of role of imaging in intraabdominal sarcomas and extremity STS (ESTS).

SPECIFIC HISTOLOGIC SUBTYPES BASED ON THE WORLD HEALTH ORGANIZATION CLASSIFICATION

Adipocytic Tumors: Liposarcomas

The major changes in the recent 2013 World Health Organization (WHO) classification has been the removal of the terms 'round cell LPS' and 'mixed-type LPS' and introduction of new subtype "LPS, not otherwise specified."[1] Round cell LPS are currently thought to represent high-grade myxoid LPS, and mixed-type LPS are considered variant of dedifferentiated LPS based on molecular testing.[1,4]

Atypical lipomatous tumor/well-differentiated liposarcoma

ALT and well-differentiated LPS are intermediate (locally aggressive) neoplasms that do not metastasize. ALT and well-differentiated LPS have a predilection for the extremities, retroperitoneum, and paratesticular and the inguinal regions[5] (**Fig. 1**). Although imaging findings of lipoma and ALT/well-differentiated LPS overlap, owing to the predominant fat component, features that favor ALT/well-differentiated LPS over lipoma include age greater than 60 years, lesion size greater than 10 cm, lower

Fig. 1. A 76-year-old man with retroperitoneal well-differentiated liposarcoma. Coronal contrast enhanced computed tomography of the abdomen reveals a large multicompartmental intraabdominal mass (*arrows*) with predominantly fat attenuation compressing and displacing the ureter medially (*arrowhead*). The thick internal septations and mass effect differentiate the mass form the normal intraabdominal fat. Surgical resection included right nephrectomy.