Case 1
Recurrent High-Grade Sarcoma

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History

A 74-year-old female with left lower leg sarcoma, treated by below-knee amputation, has a new palpable lump at the stump, concerning for recurrence (Fig. 1.1).

Diagnosis

Recurrent high-grade sarcoma

Findings

- Moderately well-circumscribed lesion at the medial aspect of the left stump which has low signal on T1-weighted images and intermediate signal on T2-weighted images (arrows).
- Post-contrast image demonstrates heterogeneously avid contrast enhancement, mostly peripheral (arrowheads).
- PET/MR fusion images show heterogeneous abnormal FDG uptake within this soft tissue lesion along the distal portion of the tibial stump consistent with recurrence.

Discussion

Sarcomas are malignant cancers that arise from mesenchymal origins. They can arise in the muscle, bone, fat, or connective tissue. Sarcomas most often present as a mass. There are various histopathological subtypes which manifest as different clinical presentations and diagnoses. It is important to assess the grade of the tumor as it impacts staging, prognostic, and treatment implications.

MR imaging is the primary modality of choice to evaluate sarcomas, especially those arising in the soft tissues. MR can reliably identify tumor depth beneath fascial planes, tumor size, growth, and internal signal characteristics. Generally, high-grade tumors show isointense signal on T1-weighted images, heterogeneously high signal on T2-weighted images, and heterogeneous enhancement on post gadolinium images. Poorly defined tumor margin and peritumoral contrast enhancement on MRI indicate a more invasive and aggressive tumor implying a higher-grade pathology.

FDG PET imaging can reliably distinguish between low-grade and high-grade sarcomas by
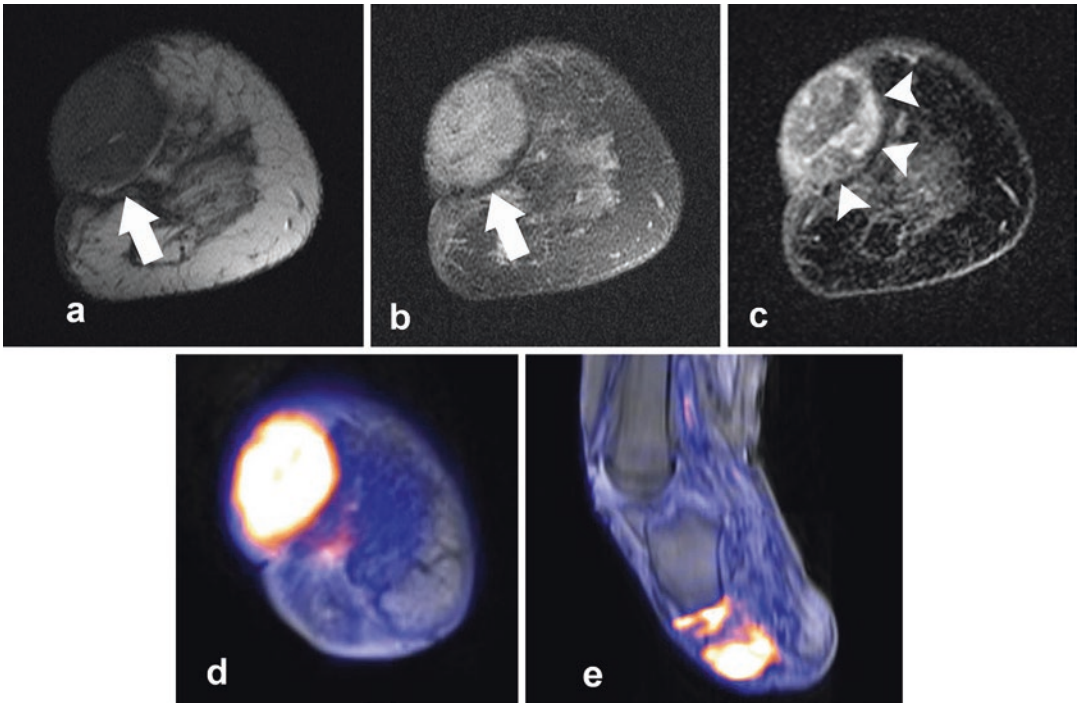
Fig. 1.1 T1 TSE axial of stump (**a**), T2 TSE with fat suppression axial of stump (**b**), T1 GRE with fat suppression post-gadolinium contrast axial of stump (**c**), PET/MR T1 VIBE axial fusion (**d**), and PET/MR T1 VIBE sagittal fusion of left knee (**e**)

the intensity of FDG uptake. FDG can detect small areas of high-grade differentiation in a large mass helping to direct biopsy targets. FDG PET is effectively used for sarcoma tumor staging and monitoring treatment response. Combined PET/MR provides excellent evaluation of the sarcoma tumor and surrounding soft tissues, as well as provides functional metabolic activity to aid in accurate tumor grading and staging. It can detect satellite lesions away from the main mass and distant metastases allowing for complete evaluation in one study.

Suggested Reading

Eary JF, Conrad EU. Imaging in sarcoma. J Nucl Med. 2011;52:1903–13.

Zhao F, Ahlawat S, Farahani SJ, Weber KL, Montgomery EA, Carrino JA, et al. Can MR imaging be used to predict tumor grade in soft-tissue sarcoma? Radiology. 2014;272:192–201.