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Solitary Relapse of Desmoplastic Small Round Cell Tumor Detected by Positron Emission Tomography/Computed Tomography

An 18-year-old male presented with a large pelvic mass and extensive abdominal disease; biopsy showed pathologic and chromosomal findings of desmoplastic small round cell tumor (DSRCT).¹ He was in complete remission (CR) after 10 months of aggressive multimodality treatment: six cycles of high-dose cyclophosphamide (4,200 mg/m²) with either doxorubicin (75 mg/m²) -vincristine² (four cycles) or topotecan (8 mg/m²) -vincristine³ (two cycles), one cycle of high-dose cisplatin (200 mg/m²) -irinotecan (250 mg/m²), two major surgical procedures to resect tumor,⁴ and whole abdominal-pelvic radiation therapy (3,000 Gy).⁵ The radiation therapy was delivered in conjunction with irinotecan (250 mg/m² divided over 5 days) because of that agent's anti-DSRCT activity,⁶ its radiosensitizing effect,⁷ and its modest toxicity.⁸ Autologous peripheral blood stem cells were infused after radiation therapy/irinotecan to minimize myelosuppression. At 26 months from completion of therapy, surveillance computed tomography (CT) revealed a 3.5- × 3.4-cm lesion in the liver, extending to the hepatorenal fossa. Re-treatment consisted of two cycles of irinotecan (250 mg/m²) plus temozolomide (750 mg/m²),⁸ resection of residual viable DSRCT, and two cycles of ifosfamide (9 g/m²) plus carboplatin (800 mg/m²) plus etoposide (500 mg/m²).⁹ At 18 months from completion of retrieval therapy, and three months after hybrid [¹⁸F]fluorodeoxyglucose (¹⁸FDG) -positron emission tomography (PET)/CT showed ongoing CR, another surveillance hybrid PET/CT study unexpectedly revealed ¹⁸FDG uptake (standardized uptake value [SUV], 2.3) in the left posterior midthigh along the semitendinosus muscle without a corresponding CT abnormality and considered to be artifactual. Four months later, the same site had increased focal ¹⁸FDG uptake (SUV 10.5; Fig 1). The isolated, localized lesion, which measured 2.2 × 2.0 × 2.7 cm, was resected with clean margins (5.5 years from initial diagnosis). It had the striking pathologic appearance that gives DSRCT its name: nests of small round blue cells within abundant desmoplastic stroma (Fig 2).

This patient fit the classic clinical picture of DSRCT: peak age in the second and third decades of life, bulky abdominal and pelvic masses, and five to one male predominance. His disease also had the classic biology of DSRCT: a unique chromosomal translocation t(11;22)(p13;q12), which fuses the Ewing sarcoma gene with the Wilms tumor gene (WT1)¹; and polyphenotypic differentiation, evidenced by coexpression of epithelial, mesenchymal, and neural markers with immunostaining positive for keratins, desmin, epithelial membrane antigen, vimentin, CD56, CD57, and CD99 (focal), and negative for chromogranin, synaptophysin, leucocyte common antigen, calreti-

Fig 1.

nin, and smooth muscle actin.¹ Yet, despite the array of clinical and biologic features characteristic of this high-grade sarcoma, thought to arise from serosa, the solitary recurrence was found in the soft tissue of the thigh. That site is not an expected area of relapse of DSRCT and is

Fig 2.

therefore not targeted for surveillance monitoring of patients with this cancer. The same holds for other soft tissue sarcomas which rarely metastasize to soft tissues in limbs.^{10,11} Metastatic DSRCT typically involves distant lymph nodes, liver, and lungs; spread to bones and bone marrow is rare. That natural history partly explains why the unexpected finding in this patient of ¹⁸F-FDG uptake in a routine surveillance PET/CT to assess the pelvis, abdomen, and thorax was dismissed as spurious. Falsely positive ¹⁸F-FDG uptake in the lower leg of a patient with sarcoma has in fact been reported.¹² Chemotherapy resistance and the massive, nonlocalized tumor burden account for the poor prognosis of DSRCT.^{1,2,4,5,13-15} High-dose conventional chemotherapy and aggressive surgery can achieve CR, which ought to be consolidated by RT, such that long-term survival or cure is possible.^{2,16,17} Surgery after chemotherapy shows persistence of peritoneal or omental studding not seen by CT; hence, the need for more sensitive means to evaluate response and confirm remission. For that purpose, we have resorted to hybrid PET/CT. As regards assessing extent of disease, PET/CT has superior overall sensitivity and specificity to PET or CT alone in a variety of adult cancers, with an impact on clinical decisions¹⁸; emerging experience strongly suggests the same will apply to pediatric tumors.^{12,19-21} PET may also yield useful clinical information beyond anatomic localization of disease: PET's depiction of the metabolic state of tumor could correlate with the proliferative or malignant potential of disease and might provide prognostic insights.^{22,23}

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