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Demonstration of recurrent dedifferentiated liposarcoma of the spermatic cord by FDG-PET

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We present a rare case of recurrent dedifferentiated liposarcoma of the spermatic cord which was clearly depicted by FDG-PET imaging. Preceding the FDG study, it was difficult to discriminate whether a mass detected by CT was recurrent tumor or postradiation necrosis. The FDG-PET finding was informative in relation to the extent of a viable tumor. We suggest that FDG-PET seems to be useful in differentiating recurrent tumor from radiation necrosis in patients with liposarcoma after therapy.

Key words: 2-deoxy-2-[^{18}F]fluoro-D-glucose, positron emission tomography, liposarcoma, radiotherapy, spermatic cord

INTRODUCTION

PARATESTICULAR TUMORS, which are occasionally reported as purely testicular mesenchymal tumors, arise principally from the spermatic cord, epididymis or tunica vaginalis.[1] Primary malignant paratesticular tumors are infrequent in occurrence, accounting for only 22% of all paratesticular tumors.[2] Liposarcoma of the spermatic cord is even less frequent, comprising less than 7% of paratesticular sarcomas.[3,4] Liposarcomas are, in general, slow-growing tumors, but they have a tendency to recur after surgery. There have been several sporadic case reports so far.[5–10]

Positron emission tomography (PET) with 2-deoxy-2-[^{18}F]fluoro-D-glucose (FDG) has been used for detecting viable tumor tissues on the basis of increased glycolysis in tumor cells. It is a noninvasive, diagnostic imaging method, and is capable of detecting many kinds of viable malignant tumor masses.[11] FDG-PET is also useful for differentiating a necrotic mass from a recurrent, viable tumor in patients who have received radiotherapy and chemotherapy.[12–17]

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FDG-PET is also known to be an effective technique for visualizing viable soft tissue sarcomata, including liposarcoma. To the best of our knowledge, however, no investigators have reported recurrent liposarcoma detected by FDG-PET. We describe a rare case with a recurrent dedifferentiated liposarcoma arising from the spermatic cord which was clearly depicted by FDG-PET.

CASE REPORT

A 72-year-old man with a body weight of 111.6 kg was admitted for investigation of a bulky mass which he had noticed in his left scrotal area ten days earlier. He had a 21-year history of repeatedly recurrent liposarcoma in the spermatic cord, since the diagnosis was first established. He had undergone six prior tumor resections, including orchiectomy and scrotectomy, and one course of radiotherapy.

The histological types of the lesion were benign lipoma the first time, and liposarcoma without lipoblastic differentiation at the time of the first recurrence seven years later. All of the recurrent tumors were surgically resected, but the histological feature of the last recurrence was low-grade liposarcoma. Radiation therapy was delivered to the scrotal, inguinal, perineal, and pelvic regions in 35 fraction for a total dose of 63 Gy 13 months before an FDG-PET study.

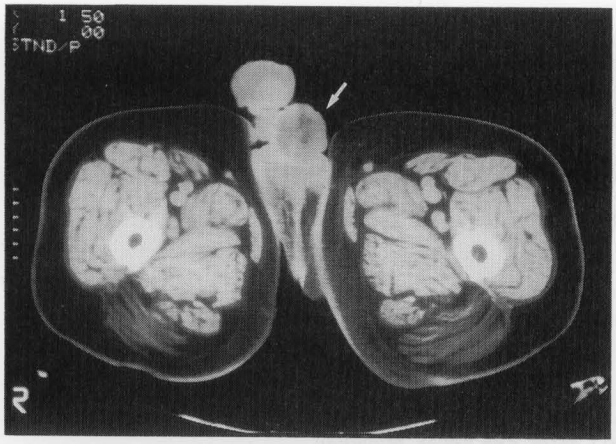

Fig. 1 CT with contrast media reveals a heterogeneous, low-density mass at the base of the penis (arrow).

MRI was not implemented, but pelvic CT with contrast media showed that there was a complex, heterogeneous mass without fat density about 4 cm in diameter at the base of the penis. This appeared to extend into the upper scrotum (Fig. 1). These findings were different from those of the previous studies which showed a relatively homogeneous mass with fat density. There was no evidence of associated significant pelvic or inguinal lymphadenopathy on CT.

Written informed consent was obtained prior to the FDG-PET study. Retrograde irrigation of the urinary bladder was performed during the study by inserting a double lumen Foley catheter (12 F) and hanging a bag of sterile saline with 1,500 m*l* for irrigation then draining the fluid to completely empty the bladder. After the transmission images were obtained, the patient was positioned so that the scanner field of view (approximately a 10 cm field of view: Siemens CTI 931) was at the imaging level believed to include the mass; then dynamic scan acquisition over 60 minutes was performed after intravenous injection of approximately 10 mCi FDG (370 MBq). PET images were reconstructed from projection data, and transaxial, coronal and sagittal sections were obtained with 15 contiguous slices with a slice thickness of 6.7 mm and an spatial resolution of 6.1 mm FWHM in the center of the field of view. All data were reconstructed in a 128 × 128 image matrix. The final inplane resolution in reconstructed and Hann-filtered images was 8 mm FWHM. The standardized uptake value (SUV) and SUV-Lean were defined as follows[18];

SUV = decay-corrected dose/cc tumor/ injected dose/ patient weight

SUV-lean = decay-corrected dose/cc tumor/ injected dose/patient lean body mass (g)

SUV and SUV-lean images were reconstructed from projection data obtained at post-injection times of 60–70 minutes, and SUV and SUV-lean were calculated from regions of interest (ROI) drawn on the most active areas in the tumors.

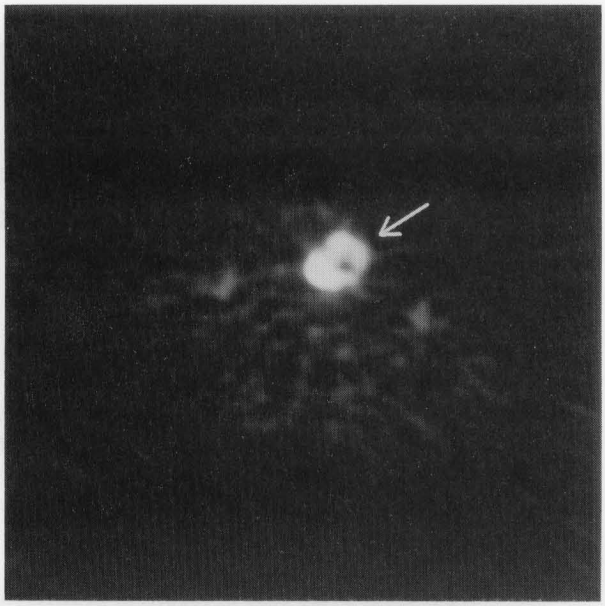

Fig. 2a There is an intense focal uptake of FDG in the cranial scrotal region (arrow) on a transaxial section through the cranial portion of the scrotum. Note the ring-like uptake with a photon-deficient area in the central part.

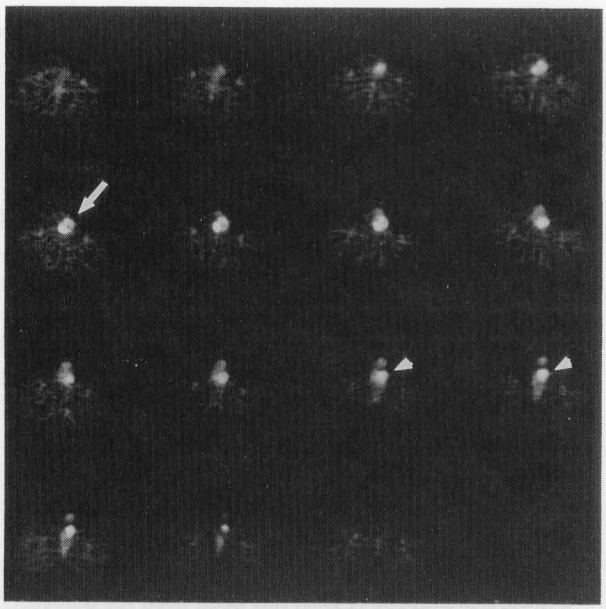

Fig. 2b FDG-PET transaxial sections sequentially from the lower pelvis to the inguinal region. An intense, focal uptake of FDG is noted in the caudal left hemiscrotal region (arrowhead), as well as an intense, ring-like uptake of FDG in the cranial scrotal region (arrow). The two lesions are contiguous to each other. There is also urethral activity (urinary FDG) in front of the symphysis pubis.

On FDG-PET scanning, an intense, focal, but ring-like uptake in the cranial scrotal region was noted (Fig. 2a, 2b). There was also an intense local uptake in the caudal left

hemiscrotal region (Fig. 2b), but there was no increased accumulation in the regional lymph nodes. The SUV-lean value was 8.09 in the most radioactive area of the tumors, of which the ROI was created over the rim of the FDG accumulation, and 5.19 in the urine without lavage of the bladder, while those of SUV were 11.3 and 7.2, respectively.

The patient underwent penectomy with perineal urethrostomy. The surgical gross section showed that there were exophytic tumors measuring $5 \times 4.5 \times 4$ in the left and $3.5 \times 3 \times 2.5$ cm in the right hemiscrotum. The parenchyma of the exophytic tumors had a yellow fleshy homogeneous architecture, but with central necrosis which extends to within 0.5 cm of the underlying deep margin. Histopathological examination revealed dedifferentiated liposarcoma, grade III, with free margins. Some nodules were residual well-differentiated liposarcoma; other areas were dedifferentiated and had the appearance of malignant fibrous histiocytoma.

DISCUSSION

Most well-differentiated liposarcomas are easily diagnosed by diagnostic methods since portions of the tumor containing fat have a low density area on CT and high signal intensity on a T_1-weighted magnetic resonance image (MRI). But, a well-differentiated liposarcoma can have the same characteristics as an atypical benign lipoma on both CT and MRI. Therefore neither CT nor MRI can reliably differentiate the two entities.[19,20] Further, liposarcoma consisting mostly of nonlipomatous portions does not show characteristic findings on CT or MRI.[21,22]

FDG imaging is known to be useful in detecting various malignant tumors by virtue of increased glycolysis. In some reports the grade of tumors was correlated with FDG uptake.[23–25] In our case, the value of SUV-lean was very high (8.09) in the most radioactive area of the tumor. In creating an ROI of a lesion, it is important to set it over the most intense activity area alone since less intense areas of lesions often represent necrosis and/or intratumor bleeding. We believe that FDG imaging and its SUV-lean may be useful in differentiating liposarcoma from atypical benign lipoma, although there is some controversy in this area.[23–26]

FDG has also been used extensively in treatment monitoring. Many studies suggest the usefulness of FDG-PET in the assessment of therapeutic effects before and after the completion of radiotherapy and/or chemotherapy, especially for brain tumor, colorectal cancer and breast cancer.[12–16] The FDG incorporation in tumors after the successful completion of radiotherapy is generally modest, but is intense in residual tumor and viable recurrent tumors after treatment by surgery, radiotherapy and chemotherapy. In responding patients with breast cancer, SUV, the kinetic rate constant (k_3) value and the influx constant (K) value for FDG as well as FDG uptake all decrease promptly, with the decrease preceding decreases in tumor size.[17]

Postradiation necrosis is, in general, indistinguishable from recurrent tumor on CT and MRI. In the case of our patient, who had received radiotherapy, CT revealed a heterogeneous, non-fat, dense mass which suggested postradiation necrosis because the finding was quite different from those of the previous CT studies. Nevertheless, the intense incorporation of FDG was very informative and useful in terms of differentiating a viable recurrent tumor from radiation necrosis. Generally speaking, the timely detection of local recurrence of a malignant tumor after combined surgery and chemo-radiotherapy is also difficult. We believe that sequential studies with FDG-PET would provide timely and accurate prognostic information on cancer patients receiving combined therapies.[27]

To summarize, we present a rare case with repeatedly recurrent dedifferentiated liposarcoma of the spermatic cord which was clearly depicted by FDG imaging. CT showed a complex, heterogeneous mass in the area which had received radiotherapy. The FDG-PET finding was very informative in relation to the differentiation between radiation necrosis and viable recurrent tumor. We suggest that FDG-PET will be useful in monitoring patients with liposarcoma after treatment, especially radiotherapy.

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