

[¹⁸F]-FDG uptake in soft tissue dermatome prior to herpes zoster eruption: An unusual pitfall

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Authors report on a case of [¹⁸F]-fluorodeoxyglucose ([¹⁸F]-FDG) uptake in the soft tissue of a patient referred for [¹⁸F]-FDG coincidence detection emission tomography (CDET) in a search for recurrence of colorectal cancer. A herpes zoster eruption occurred in the same site within two days, but was spontaneously resolved. To the best of our knowledge this is the first description of a false positive [¹⁸F]-FDG result in relation to a viral infection of soft tissue. It shows that interpretation of subcutaneous foci has to be cautious in patients with or without a past history of herpes zoster even in pain-free areas and prior to skin eruption.

Key words: [¹⁸F]-FDG, CDET gamma camera, false positive, herpes zoster

INTRODUCTION

[¹⁸F]-Fluorodeoxyglucose ([¹⁸F]-FDG) positron emission tomography (PET) is of high accuracy and cost effectiveness for many malignancies, but several benign conditions can induce [¹⁸F]-FDG uptake that could lead to pitfalls and misinterpretation. Knowledge of them is therefore important to avoid false-positive results and also for the pathophysiological information they provide on glucose metabolism in these conditions.

We report a case of soft tissue uptake in a dermatome prior to herpes zoster eruption.

CASE REPORT

A 63-year-old man was referred to our department for [¹⁸F]-FDG scan by coincidence detection emission tomography (CDET) to search for an occult recurrence of a colon carcinoma.

He had a past history of right colon adenocarcinoma stage D2 of Aster-Coller classification that was operated in April 1996: right colectomy with surgical removal of a centimetric hepatic metastasis and lymphadenectomy showing lymph node involvement in 8/20 proximal nodes and 1/20 nodes. Surgery was followed by adjuvant chemotherapy with association of 5 fluorouracil (5FU) and folinic acid, each two weeks for 18 cycles lasting from May 1996 to January 1997.

In August 1997, a hepatic hilar lymph node recurrence was detected on abdominal computed tomography (CT) scan with carcino-embryonic antigen (CEA) levels at 32.5 ng/ml (normal < 10 ng/ml); a modified regimen of levamisole and 5FU was reconducted from August 1997 until May 1998 with a complete response assessed by normalized levels of CEA and disappearance of the CT images.

In August 1998, the CEA levels increased to 32.7 g/ml without anomalies at physical examination, chest and abdominal CT scans and colonoscopy.

An immunoscintigraphy with Tc-99m sodium pertechnetate labeled anti-CEA antibodies did not show abnormal foci of uptake. The patient was then referred to our department for FDG-CDET.

After an eight hour fast and 30 minutes of complete rest supine to avoid muscular uptake, 240 MBq of [¹⁸F]-FDG

Received December 22, 2000, revision accepted June 27, 2001.

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was injected intravenously through an infusion line of saline. The acquisition of images started 45 minutes later, on a Picker XP 2000 dual head gamma camera equipped with PCD coincidence detection and 19 mm thick crystals.

A whole body imaging was realized at first by rectilinear scanning, at a speed of 6 cm/min over 171 cm length

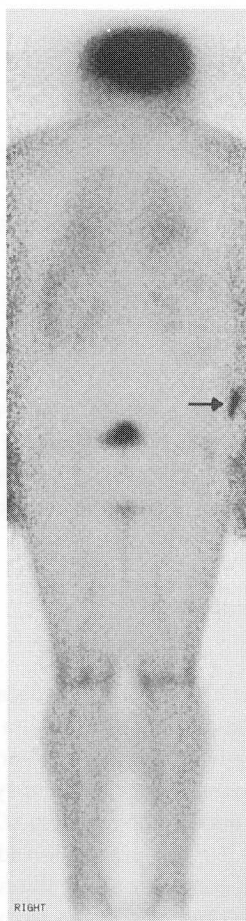


Fig. 1 Whole body scan: coronal slices from front to back showing FDG accumulation in soft tissue of the left flank (arrow).

which lasted 30 minutes, followed by two tomoscintigraphic acquisitions on the pelvis and abdomen.

Each tomoscintigraphy involving a field of 35 cm was performed in 60 steps of 3°, lasting 60 seconds, with a 20% window over the 511 keV photopeak and corrected for decay. The gamma camera characteristics and imaging protocols have been detailed elsewhere.¹

The whole body scan (Fig. 1) showed an intense focus of [¹⁸F]-FDG uptake in the superficial soft tissue of the left flank, over the iliac bone crest. No other pathological focus was seen. Tomoscintigraphy of the pelvis (Fig. 2) confirmed the intense uptake of the superficial soft tissues of the left flank. Urinary contamination or an injection artifact was excluded. The patient did not complain of pain in this area and the physical examination of the skin was normal. It was concluded that, in the absence of other sites of abnormal uptake, this focus could correspond to a sub-cutaneous metastasis of colon carcinoma. The cutaneous metastases of colon carcinoma are unusual but cases have been reported in the literature.^{2,3}

Two days later, the patient presented with a vesicular eruption of herpes zoster or “shingles” within the T12 left dermatome, corresponding to the site of the [¹⁸F]-FDG focus. It was the first occurrence of herpes zoster in the patient’s history and no other skin anomaly related to herpes zoster was found by the dermatologist.

Less than one week later, the eruption disappeared and the skin returned to its previous state, without specific therapy and before reintroduction of chemotherapy. The [¹⁸F]-FDG focus was then considered to be a false positive.

Two weeks after the [¹⁸F]-FDG-CDET scan, the CEA levels increased to 133 ng/ml and the CT scan of the abdomen showed a recurrence of pathological lymph nodes in the hepatic pedicle, the biggest measuring 30 × 20 mm. No lesion was reported at CT in the site of FDG uptake. The same regime of chemotherapy was then restarted.

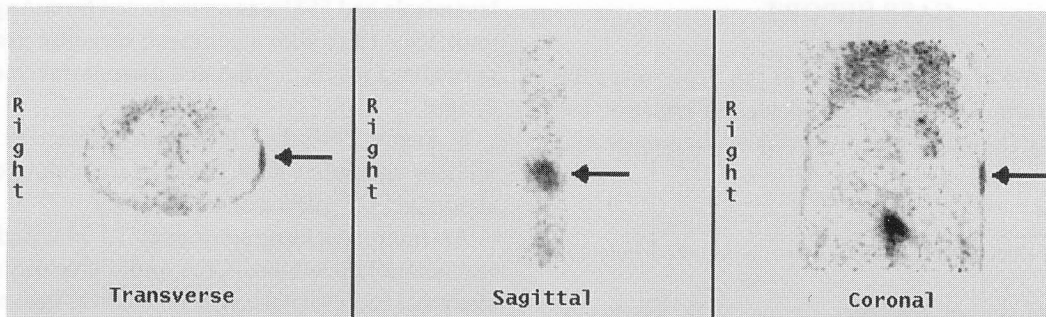


Fig. 2 Tomoscintigraphy of the pelvis: transaxial and coronal slices confirming FDG uptake of the soft tissue of the left flank (arrow).

DISCUSSION

This observation of [^{18}F]-FDG uptake prior to herpes zoster eruption is peculiar in some clinical aspects and gives the opportunity to discuss non-tumoral [^{18}F]-FDG uptake in infection and in skin and its potential pathophysiological mechanisms in this case.

Herpes zoster is an acute viral infection of the sensory ganglia and the corresponding cutaneous area of innervation, which reactivates from the dorsal root ganglia.⁴ The disease is characterized by unilateral vesicular eruption within a dermatome, T3 to L3 are most frequently involved.⁴ The onset of the disease is heralded by pain within the dermatome that may precede lesions by 48 to 72 hours, followed by an erythematous maculopapular rash, which evolves rapidly to vesicular lesions.⁴ In the normal host, these lesions may remain few in number and continue to form only for a period of 3 to 5 days. The total duration of the disease is generally between 7 and 10 days; but it may take as long as 2 to 4 weeks before the skin returns to normal.

The present observation matched the typical description in most aspects (T12 dermatome, spontaneous resolution in one week), but was unusual in the complete absence of pain or other symptoms preceding the skin eruption that could have drawn attention and avoided misinterpretation.

[^{18}F]-FDG uptake due to benign conditions can be a major problem in cancer localization.⁵ Several causes of pitfalls have been reported⁵⁻⁷ among them active infectious diseases, either from bacterial or from fungal origin.⁷ Viral infection has been reported only in the brain with herpes encephalitis.⁸

On the other hand, various benign causes of [^{18}F]-FDG uptake in skin and soft tissue have been reported in relation to a biopsy site, surgical wound, abscess, amputation stump or decubitus ulcer.^{6,7}

To the best of our knowledge, no similar case of [^{18}F]-FDG uptake has been reported but there had been an incidental visualization of cutaneous herpes zoster infection in a patient having a cerebral scintigraphy with Tc-99m HMPAO⁹ but in that case, the skin uptake corresponded to an area of vesicular eruption within the trigeminal and ophthalmic nerves dermatomas. In contrast, the sub-cutaneous [^{18}F]-FDG uptake occurred in the present case prior to any eruption.

MECHANISM OF UPTAKE

The exact mechanism of [^{18}F]-FDG uptake in the present case is not well understood but some hypotheses can be proposed:

1) Hypermetabolism: The metabolic activity related to the thymidine kinase enzyme is highly glucose consuming¹⁰ and the [^{18}F]-FDG uptake could reflect the intense viral replication in the subcutaneous tissue prior to erup-

tion as supported by the expression of varicella-zoster virus early replication proteins in cutaneous nerves.¹¹⁻¹³

Our observation could be another indirect proof of active viral synthesis at the subcutaneous level.

2) Hyperemia and expanded extracellular space: as proposed by Hirano et al.,⁹ to explain the increased accumulation of Tc-99m HMPAO in a patient with a 6-month history of herpes zoster infection presenting a large area of red swelling and vesicular skin eruption in the surface of the soft tissue. In our case, no edema and no swelling were visible or palpable at the site of FDG uptake.

3) Activation of inflammatory cells and/or cellular immunity: related to tissue damage resulting from immune complex deposition¹⁴ with [^{18}F]-FDG uptake by inflammatory and immune cells as reported in other different circumstances: activated macrophages,¹⁵ neutrophils¹⁶ or T-cell lymphocytes.¹⁷

The recent animal model of latent infection with zoster virus¹⁸ and the use of positron emission tomography imaging of adenoviral-directed reporter gene expression in living animals with [^{18}F]-fluoro-ganciclovir as a substrate for the herpes simplex virus 1 thymidine kinase enzyme reported by Gambhir et al.,¹⁹ may contribute to the understanding of the exact mechanism of skin recurrence and the significance of [^{18}F]-FDG accumulation.

CONCLUSION

This case should be kept in mind for the interpretation of subcutaneous foci of [^{18}F]-FDG accumulation. The patient's skin should be carefully examined and the patient questioned for a past history of herpes zoster infection, but a false-positive accumulation of [^{18}F]-FDG is possible even without any previous eruption of herpes zoster or painful dermatoma, as in the present case.

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