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TOPIC HIGHLIGHT

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Postoperative reactive lymphadenitis: A potential cause of false-positive FDG PET/CT

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Abstract

A wide variety of surgical related uptake has been reported on F18-fluoro-2-deoxy-D-glucose positron emission tomography/computed tomography (FDG PET/CT) scan, most of which can be differentiated from neoplastic process based on the pattern of FDG uptake and/or anatomic appearance on the integrated CT in image interpretation. A more potential problem we may be aware is postoperative reactive lymphadenitis, which may mimic regional nodal metastases on FDG PET/CT. This review presents five case examples demonstrating that postoperative reactive lymphadenitis could be a false-positive source for regional nodal metastasis on FDG PET/CT. Surgical oncologists and radiologists should be aware of reactive lymphadenitis in interpreting postoperative restaging FDG PET/CT scan when FDG avid lymphadenopathy is only seen in the lymphatic draining location from surgical site.

Key words: Lymphadenitis; F18-fluoro-2-deoxy-D-glucose positron emission tomography/computed tomography; False-positive; Lymphadenopathy

Core tip: On restaging F18-fluoro-2-deoxy-D-glucose (FDG) positron emission tomography/computed tomography for oncologic patients, a potential problem we may be aware is postoperative reactive lymphadenitis, which may mimic regional nodal metastases. The size and intensity of FDG uptake of the lymph nodes cannot be reliably used for differentiation of reactive lymphadenitis from regional nodal metastasis. Surgical oncologists and radiologists should be aware of reactive lymphadenitis when FDG avid lymphadenopathy is only seen in the lymphatic draining location from surgical site.

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INTRODUCTION

Today metabolic imaging positron emission tomography/computed tomography (PET/CT) with F18-fluoro-2-deoxy-D-glucose (FDG) has gained widespread clinical applications in oncology, and is accepted as a standard care in many malignancies. FDG is an analog of glucose and is used as a tracer of glycolysis. Malignant tissue and cells often demonstrate increased rate of glycolysis for rapid proliferation, due to increased number of glucose transporter protein and increased intracellular hexokinase and phosphofructokinase levels[1,2]. FDG uptake is semi-quantitatively measured in the form of the standardized uptake value (SUV). However, FDG is not cancer-specific. Increased FDG uptake can be seen in many benign diseases or non-neoplastic conditions, most of which are inflammation or infection[3-7].

Surgical resection of tumor is a first or best treatment in many malignancies. Postoperative PET/CT is often

Figure 1 Axial image of F18-fluoro-2-deoxy-D-glucose positron emission tomography/computed tomography obtained 3 mo postoperatively in a 55-year-old woman with history of T2aN0Mx myxofibrosarcoma of the left ankle. Compared to preoperative image, there was a new 2.3 cm left inguinal lymph node with intense uptake (SUV 8.0, arrows), suspicious for nodal metastasis. Biopsy of the node revealed reactive lymphadenitis. SUV: Standardized uptake value.

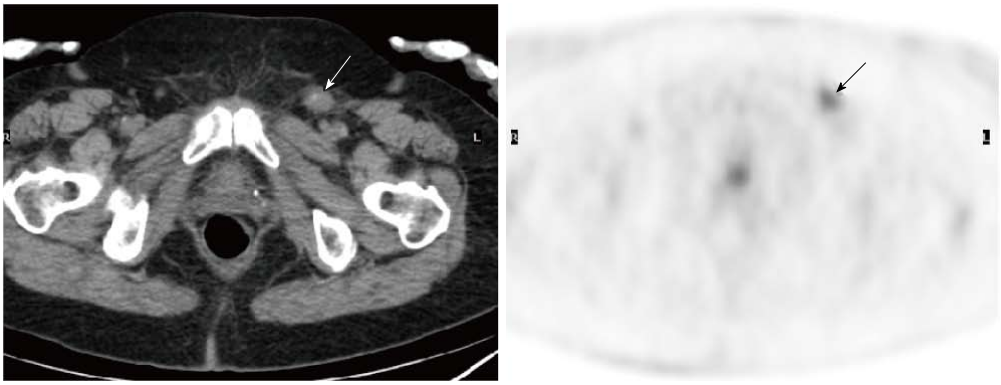

Figure 2 Axial image of F18-fluoro-2-deoxy-D-glucose positron emission tomography/computed tomography obtained 5 mo postoperatively in a 68-year-old woman with history of vulvar squamous cell carcinoma. Compared to preoperative image, there was a new 1.5 cm left inguinal lymph node with increased uptake (SUV 4.9, arrows). Incisional biopsy of the node suggested lymphadenitis. SUV: Standardized uptake value.

obtained for restaging or detection of residual/recurrent disease. Although it is generally recommended that follow-up scan should be obtained at least 6 wk following surgery when postsurgical inflammation has subsided, a wide variety of types of surgical related uptake have been reported on FDG PET/CT scans[8-14]. Most of them can be differentiated from neoplastic process based on the pattern of FDG uptake and/or anatomic appearance on the integrated CT, although some may cause false-positive interpretation.

A more potential postoperative false-positive FDG PET/CT finding is reactive lymphadenitis, which is encountered in clinical practice but is not well described in the literature. The followings are a few case examples of postoperative reactive lymphadenitis, which all mimic regional nodal metastases on FDG PET/CT.

CASE EXAMPLES

Case 1

A 55-year-old woman had history of T2aN0Mx sarcoma of the left ankle, status post surgical resection with free margins. A preoperative FDG PET/CT was negative for regional lymphadenopathy. Repeat FDG PET/CT 3 mo postoperatively showed a new 2.3 cm left inguinal lymph node with intense uptake, suspicious for nodal metastasis. Biopsy of the node revealed reactive lymphadenitis (Figure 1).

Case 2

A 68-year-old woman had history of vulvar squamous cell carcinoma, status post lesion resection and left inguinal node dissection. Repeat FDG PET/CT 5 mo postoperatively showed a new 1.5 cm left inguinal lymph node with increased uptake, suspicious for nodal metastasis. Incisional biopsy of the node suggested lymphadenitis (Figure 2).

Case 3

A 16-year-old woman had alveolar soft tissue sarcoma of the left knee, status post surgical resection and chemoradiation. Preoperative image was negative for inguinal lymphadenopathy. Repeat FDG PET/CT 6 mo postoperatively showed a new 1.4 cm left inguinal lymph node with intense uptake, suspicious for nodal metastasis. Incisional biopsy indicated lymphadenitis (Figure 3).

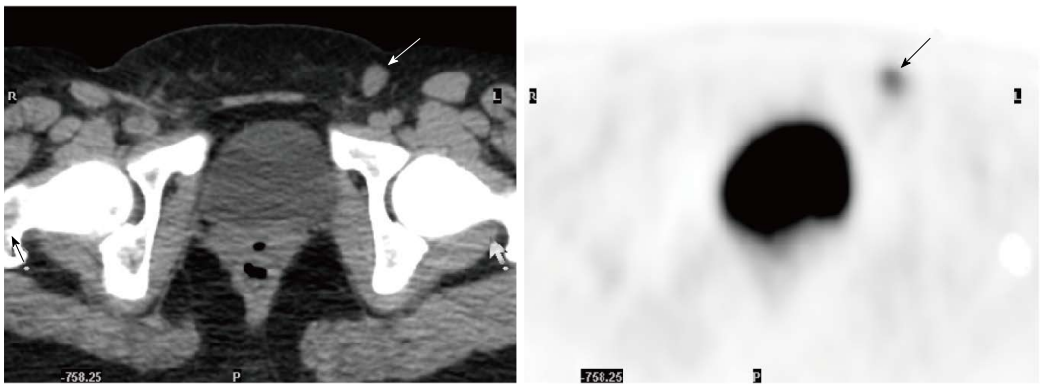

Figure 3 Axial image of F18-fluoro-2-deoxy-D-glucose positron emission tomography/computed tomography obtained 6 mo postoperatively in a 16-year-old woman with alveolar soft tissue sarcoma of the left knee. Compared to preoperative image, there was a new 1.4 cm left inguinal lymph node with intense uptake (SUV 5.2, arrows). Incisional biopsy confirmed lymphadenitis. SUV: Standardized uptake value.

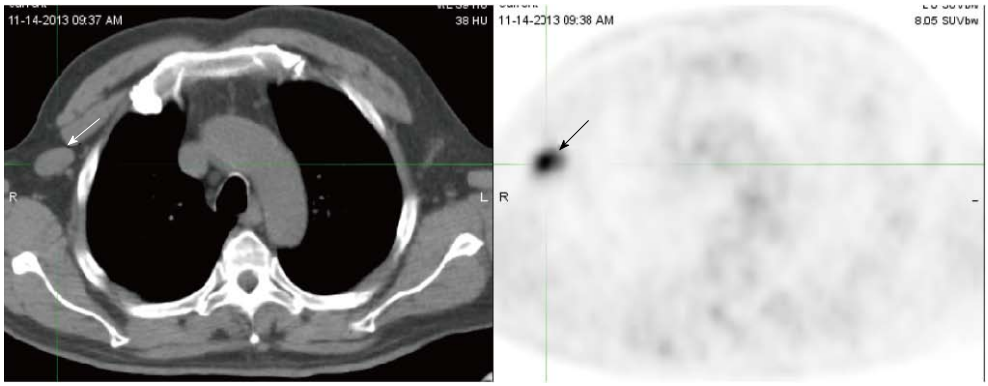

Figure 4 Axial image of F18-fluoro-2-deoxy-D-glucose positron emission tomography/computed tomography obtained 6 mo postoperatively in a 60-year-old man had history of tongue cancer. The image demonstrated a 2.6 cm x 1.5 cm right axillary lymph node with intense uptake (SUV 6.1, arrows), suspicious for metastasis. Biopsy of the node suggested chronic lymphadenitis with reactive lymphoid hyperplasia. SUV: Standardized uptake value.

Case 4

A 60-year-old man had history of tongue cancer, status post chemotherapy, radiation and bilateral neck dissection. The patient developed osteoradionecrosis of the jaws after radiation therapy. FDG PET/CT 6 mo postoperatively demonstrated a 2.6 cm × 1.5 cm right axillary lymph node with intense uptake (SUV 6.1, arrows), suspicious for metastasis. Biopsy of the node suggested chronic lymphadenitis with reactive lymphoid hyperplasia (Figure 4).

Case 5

A 77-year-old woman had history of right breast cancer, status post lumpectomy. FDG PET/CT 3 mo postoperatively showed a few FDG avid right axillary lymph nodes, the largest 1.6 cm with SUV 5.1 (arrows), highly suspicious for regional nodal metastases. Subsequent biopsy was indicative of reactive lymphadenitis (Figure 5).

DISCUSSION

Postoperative FDG PET/CT is often obtained for restaging or detection of residual/recurrent tumor. Increased FDG uptake can be seen in the surgical site in the early postoperative period as a consequence of leukocyte infiltrate and granulation tissue involved in would healing and absorption of necrotic debris and hematoma. Various kinds of postoperative complications have been reported on FDG PET/CT. Makis *et al*[14] reported 9 cases with incidental infectious or inflammatory findings on FDG PET/CT, in patients with prior surgical intervention that was part of the management of oncologic care. These included surgical wound infection, fistulas, abscess, and mesh infection. On image interpretation, most of surgery-related changes and/or inflammation can be identified without many difficulties based on the pattern of FDG uptake and CT findings.

Inflammatory/infectious lymphadenitis has been well recognized with increased FDG uptake on PET/CT, such as in the tuberculosis[15,16], Kikuchi disease[17,18], toxoplasmosis[19], various viral infections including HIV[20,21], *etc.* False-positive lymph nodes had also been reported[22-24] on FDG PET/CT in oncologic patients. Tsukada *et al*[22] reported a case with false-positive mediastinal lymph nodes on FDG PET/CT in rectal cancer patient. Ataergin *et al*[23] reported 3 cases of tuberculosis lymphadenitis detected on FDG PET scan in patients with concomitant cancer diagnosis. Park *et al*[24] described false-positive tu-

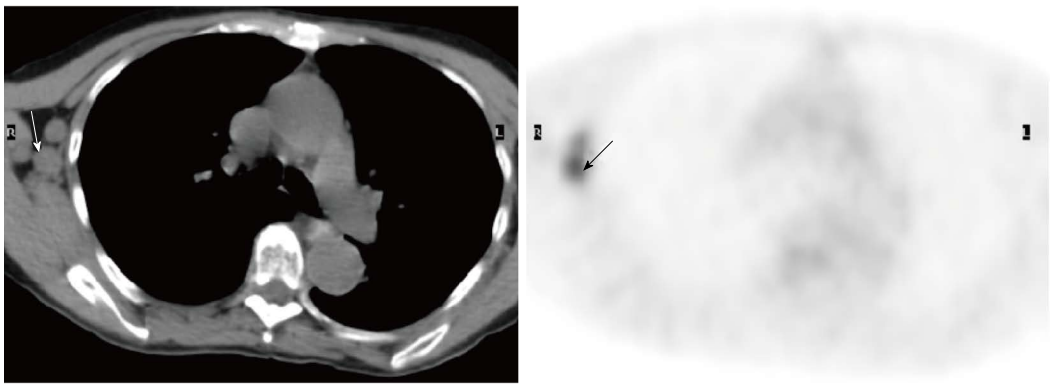

Figure 5 Axila image of F18-fluoro-2-deoxy-D-glucose positron emission tomography/computed tomography obtained 3 mo postoperatively in a 77-year-old woman had history of right breast cancer. There were a few FDG avid right axillary lymph nodes, the largest 1.6 cm with SUV 5.1 (arrows), all new compared to prior images. The findings were highly suspicious for regional nodal metastases. Subsequent biopsy was indicative of reactive lymphadenitis. SUV: Standardized uptake value.

berculous mediastinal lymphadenitis on FDG PET/CT in a melanoma patient. In all these cases, however, false-positive lymphadenitis on FDG PET/CT was not related to primary tumors in the locations, and not secondary to surgical resections of primary tumors.

Postoperative lymphadenitis is not well defined in the literatures. Regional lymphadenopathy may develop postoperatively due to an inflammatory response to the surgery, but it is typically days after the surgery and less than 1.0 cm in size[25]. In the case examples above, FDG PET/CT was all obtained 3, 5, and 6 mo postoperatively when postoperative reaction and/or inflammation has subsided in general. The regional FDG avid lymph nodes were all located in the ipsilateral side of primary tumors and surgical procedures, and were new compared to preoperative PET/CT scans. Although FDG avid lymphadenopathy was only seen in the single location on the lymphatic draining route from the primary lesion and surgical site, CT features such as large size and solid appearance, and high FDG avidity of the lymph nodes were all suspicious for regional nodal metastases. However, surgical pathology revealed reactive lymphadenitis most likely secondary to surgical procedure. In these cases, the differentiation between regional nodal metastasis and reactive lymphadenitis was very challenging based on imaging only, and pathological diagnosis might be warranted. SUV cannot reliably discriminate between inflammation/infection and tumor.

CONCLUSION

Surgical oncologists and radiologists should be aware of reactive lymphadenitis on interpreting postoperative re-staging FDG PET/CT scan when FDG avid lymphadenopathy is only seen in the lymphatic draining location from surgical site. The size and intensity of FDG uptake of the lymph nodes cannot be reliably used for differentiation of reactive lymphadenitis from regional nodal metastasis. Postoperative reactive lymphadenitis could be a potential false-positive source for regional nodal metastasis on FDG PET/CT.

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