

18F-Fluciclovine Avid Axillary Lymph Nodes After COVID-19 Vaccination on PET/CT for Suspected Recurrence of Prostate Cancer

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There are no potential conflicts of interest to disclose.

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Abstract: Abnormal increased FDG avidity of axillary lymph nodes has become a frequent diagnostic dilemma on PET/CT in the current climate of global vaccinations directed against SARS-CoV-2. This is due to the inflammatory response evoked by vaccines and the non-specific nature of 18F-Fludeoxyglucose (FDG), which includes increased uptake in both malignant and inflammatory processes. Similarly, 18F-Fluciclovine (Axumin), an amino acid analog indicated for the assessment of biochemical recurrence of prostate cancer, may also demonstrate non-specific inflammatory uptake. We report a case of 18F-Fluciclovine PET/CT obtained for concern of prostate cancer which demonstrated isolated avid lymph nodes in the left axilla. Screening questionnaire revealed that the patient had received the second dose of the Pfizer-BioNTech COVID-19 Vaccine in his left shoulder recently and hence the uptake was determined to be reactive.

Introduction: Abnormal axillary lymph node avidity associated with vaccination was first reported in 2003 on FDG PET/CT of healthy individuals who had received the killed influenza vaccine in a study assessing lymphocyte activation (1). Since then, similar findings have been reported from numerous other vaccinations (2). This is due to the inflammatory response elicited by vaccines and the resulting upregulation of glucose transporters by activated immune cells (3). With the widespread implementation of vaccinations in response to the pandemic, there has been a marked increase in this phenomenon resulting in significant diagnostic challenges with 18F-FDG PET/CT (2).

Case: A 65-year-old man underwent surgery for prostate cancer. Subsequent pathologic evaluation revealed a Gleason score of 7 (3+4) with evidence of peri-neural invasion and 1 of 5 local lymph nodes positive for spread. There was no seminal vesicle invasion or extra capsular extension, and the surgical margins were negative. Overall stage was IVA (pT2, N1, M0). At 4 months after surgery, there was a persistent detectable prostate specific antigen (PSA) of 1.0 ng/mL, and Fluciclovine PET/CT was performed for further assessment. The exam revealed four foci of avidity, maxSUV of 3.2, in the left axilla localizing to mildly enlarged but morphologically normal lymph nodes (Figure 1). The remainder of uptake was physiologic, with no other sites of pathologic radiotracer avidity. A review of the intake questionnaire showed he had received the Pfizer-BioNTech COVID-19 Vaccine in his left shoulder seventeen days prior and hence the uptake was determined to be reactive. Subsequent clinical follow-up revealed an undetectable PSA at 6 months and again at 9 months, confirming the benign nature of this finding and the absence of residual malignancy.

Discussion: While 18F-FDG is by far the most frequently used radiotracer in PET/CT, several additional radiotracers are in clinical use to include 18F Fluciclovine for imaging men with suspected prostate cancer recurrence. Fluciclovine is an amino acid analog and is taken up by prostate cancer (4). However, like FDG, Fluciclovine uptake can be increased in inflammatory processes due to uptake by white blood cells. Given this, false positive uptake has been reported in nonmalignant entities such as pneumonia, lymphadenitis and ring worm infection (4-5). Like with FDG, Fluciclovine uptake by inflammatory processes tends to be mild compared to malignancy, and most commonly has an intensity less than normal bone marrow (as in this case, with L3 aveSUV of 3.5). Hence, it is to be expected that, like with FDG, low-grade avidity by axillary nodes is a potential finding on Fluciclovine PET/CT following Covid-19 vaccination.

Recently, several prostate-specific membrane antigen (PSMA) PET tracers have received approval for use in the United States as an additional means for detecting prostate cancer. Despite their excellent performance, these too can demonstrate nonspecific uptake by inflammatory diseases such as pneumonia and hence it is likely only a matter of time before a case of Covid-19 vaccination related uptake in axillary lymph nodes is reported with these agents (6).

Conclusion: The case underlines the importance of correlating exam findings with disease pathophysiology, radiotracer mechanism of action and clinical history to optimize PET/CT interpretation accuracy.

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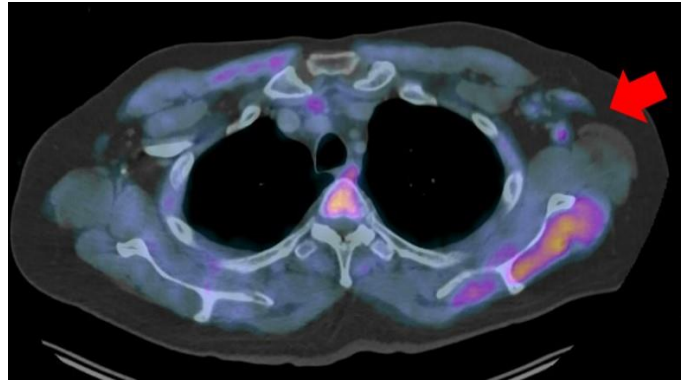
A**B****C**

FIGURE1 - A: Maximum intensity projection (MIP) revealed four foci of unexpected avidity in the left axilla (arrow). The remainder of uptake was physiologic. B: Axial CT and C: axial fused PET/CT images show the avidity to localize to four mildly enlarged but morphologically normal lymph nodes (arrows). Remaining images confirmed no other sites of potentially pathologic radiotracer avidity (not shown).