Reactive Axillary Lymphadenopathy to COVID-19 Vaccination on F18-FDG PET/CT

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Abstract: In this report, we present F18-FDG PET/CT findings of reactive left axillary and supraclavicular hypermetabolic lymphadenopathy, as well as ipsilateral delta muscle injection site radiotracer uptake related to recent COVID-19 vaccination in a patient with osteosarcoma. With growing number of patients receiving COVID-19 vaccine, recognition of benign characteristic F18-FDG PET/CT image findings will ensure staging/restaging accuracy and avoid unnecessary biopsy.

Running title:

Reactive Axillary Lymphadenopathy to Vaccination

Introduction: Reactive lymphadenopathy is a recognized side effect related to vaccination. With mRNA based COVID-19 vaccines, efficacy depends on the activation of dendritic cells after administration. These activated antigen presenting cells must then migrate to the draining lymph nodes and present the translated protein to the nodal based B and T cells in order to create robust humoral and cell mediated adaptive immunity (*1*). As more oncological patients start to receive COVID-19 vaccines, it is important to recognize the benign F18-FDG PET/CT imaging features immediately after vaccination to ensure staging accuracy and prevent unnecessary biopsies.

Case: A 40-year-old woman with history of metastatic left proximal tibia osteosarcoma underwent surveillant F18-FDG PET/CT scan. There was no suspicious radiotracer uptake for tumor recurrence. However, multiple morphologically benign appearing hypermetabolic lymph nodes were visualized at left axillary and supraclavicular regions, as well as focal uptake in left deltoid muscle (Fig 1). Upon further interview, patient revealed receiving her second dose of the BNT162b2 vaccine against SARS-CoV-2 (Pfizer/BioNTech) the day prior to F18-FDG PET/CT scan. She also endorsed left upper arm injection site pain, intense body aches, headaches and slight fever. Combined with inoculation history and characteristic imaging features, as well as exclusion of tracer injection at ipsilateral arm, a diagnosis of reactive lymphadenopathy secondary to COVID-19 vaccination was achieved.

Reactive lymphadenopathy is one of the well-documented reactions following intramuscular injection of COVID-19 vaccine, and likely secondary to robust vaccine-elicited immune response (*2,3*). The efficacy of mRNA COVID-19 vaccine depends on encoding dendritic cell migration to draining lymph nodes in order to kickstart the complex humoral and cell mediated response, and establishment of immunity ultimately (*2*). There are rich draining lymph nodes at axillary region which may show immediate response following vaccination (*4,*

5). F18-FDG is a glucose analog and non-specifically trapped in metabolically active tumor cells and benign conditions such as infection and inflammation, which may lead to false-positive interpretation in oncological F18-FDG PET/CT scan (*6*). The most common etiologies of hypermetabolic axillary lymph nodes in F18-FDG PET/CT scan are malignancies, reactive change and lymphatic drainage of radiotracer extravasation, etc.

Conclusion: With more oncological patients receiving mRNA COVID-19 vaccines, it is important for nuclear radiologist to recognize these benign characteristic F18-FDG uptakes after vaccination. A detailed COVID-19 vaccination history, including the inoculation time, injected arm and side effects, should be acquired prior to F18-FDG PET/CT scan to ensure staging/restaging accuracy and to avoid unnecessary biopsy procedure.

References

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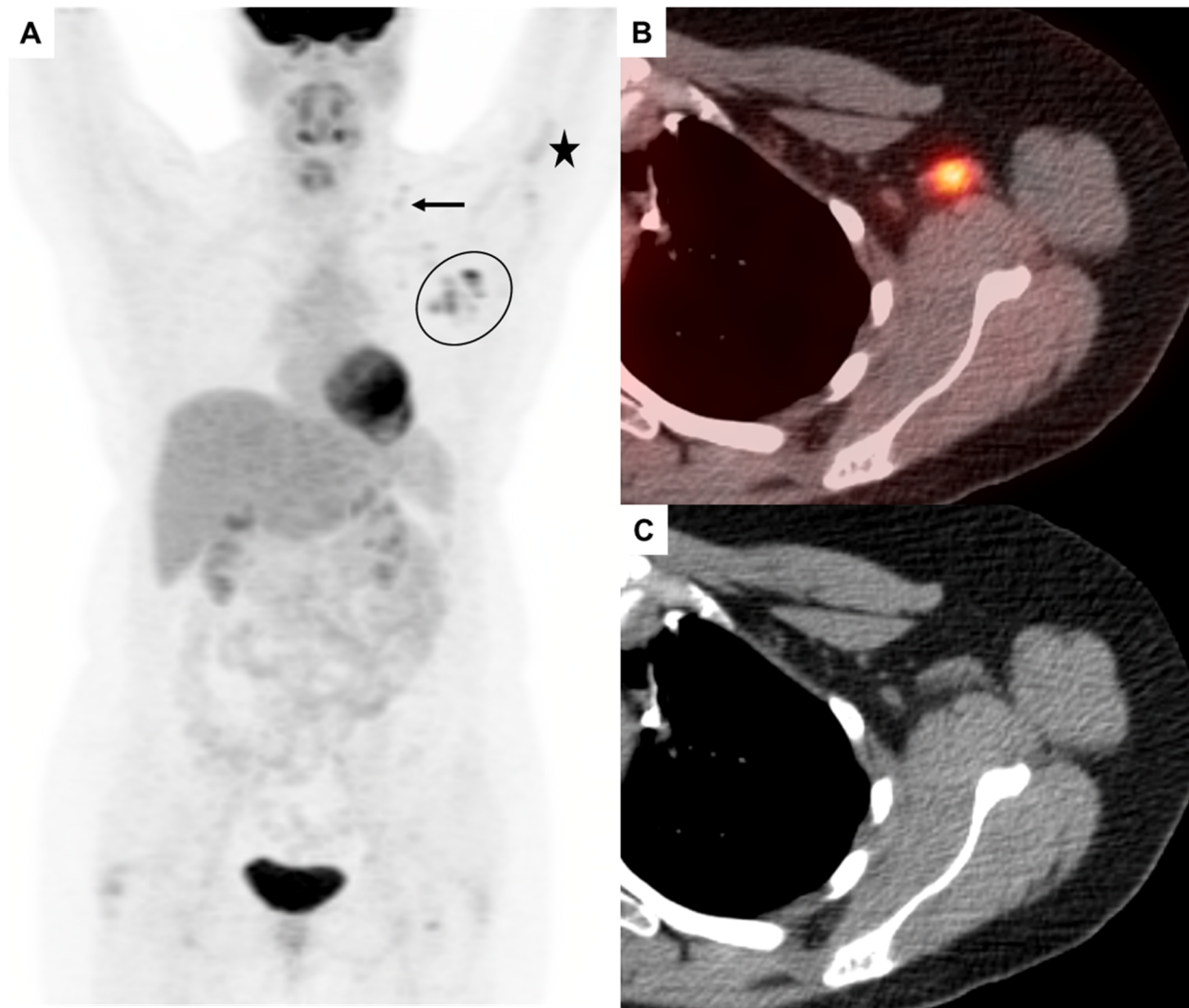
Figure caption: Maximal intensity projection (A) image demonstrates cluster of hypermetabolic left axillary lymph nodes (ellipse circle), supraclavicular lymph nodes (arrow) and faint intramuscular radiotracer uptake (star). Fused axial F18-FDG PET/CT image (B) and axial CT image (C) of one representative benign CT appearing left axillary lymph node demonstrate increased uptake with max SUV 7.1.