A Multimodal Approach to Evaluate for Cardiac Metastasis in a Case of Non-Small Cell Lung Cancer

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Background

Cardiac metastases have been found in up to 9.1% of autopsies of patients with advanced cancer (1).

The most common primary malignancies associated with cardiac metastasis reported in the literature are lymphomas, melanoma, breast cancer, and lung neoplasms (2-4).

There are no established guidelines for noninvasive diagnosis of cardiac metastasis.

Case Description

- An 84-year-old male with mitral valve prolapse/ mitral regurgitation, and a 40-pack-year smoking history, is diagnosed with non-small cell lung cancer.
- An ^{18}F-FDG PET-CT identified an FDG-avid left upper lobe mass, mediastinal adenopathy, and an intra-cardiac focus of FDG avidity suggestive of cardiac metastasis.
- The patient refused further evaluation with cardiac MRI (CMRI).
- Echocardiogram was inconclusive.
- Patient began immunotherapy with anti-PD-1 therapy (pembrolizumab), and after three cycles, there was decreased FDG avidity on follow-up PET-CT at the primary site and resolution of intra-cardiac focus.
- Several months later, intra-cardiac avidity returned on PET-CT. The patient consented to CMRI at this point (10 months since diagnosis), which did not show the presence of a malignant mass.

Results and Figures

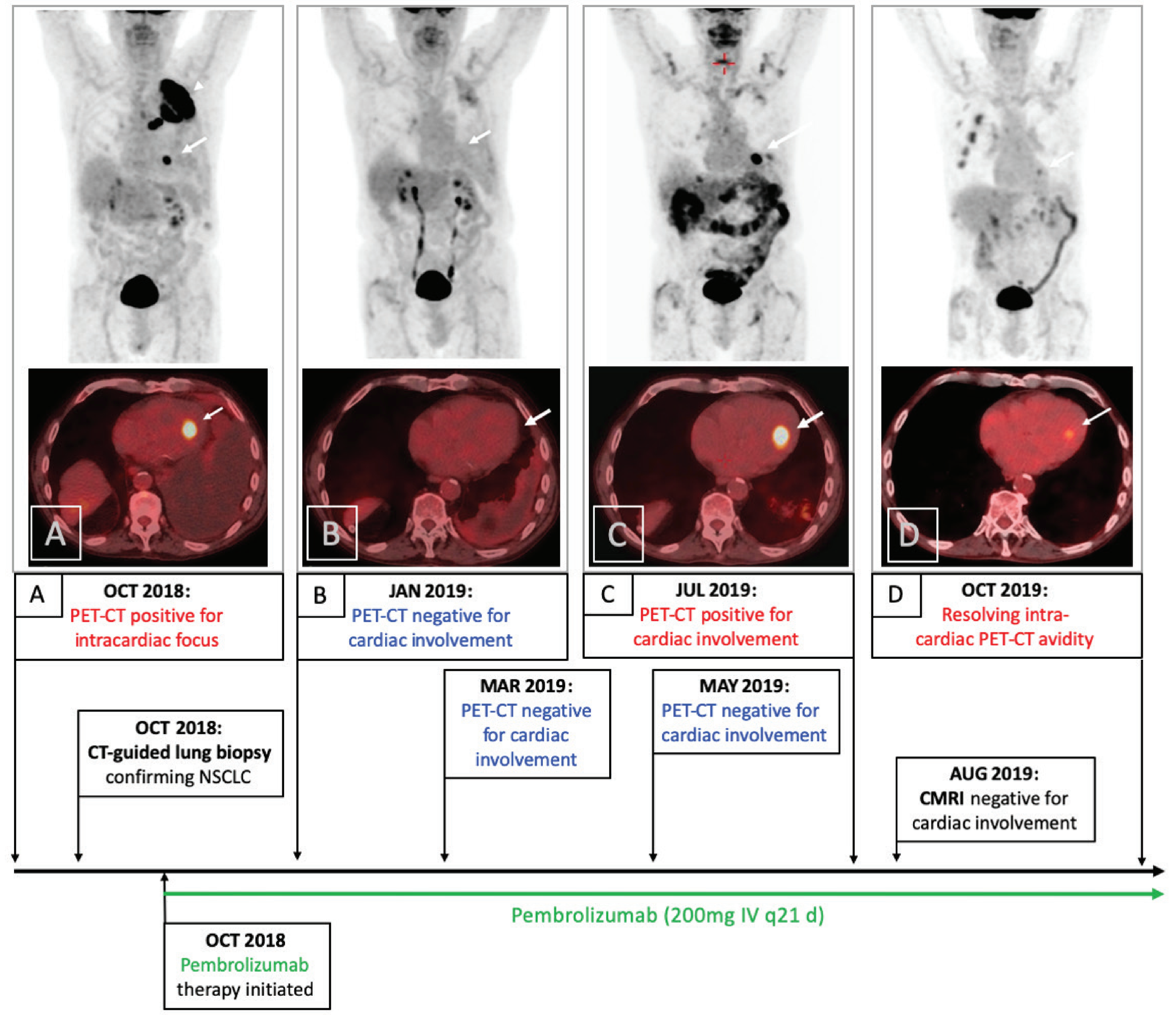

Figure 1: Timeline presenting 18F-FDG PET-CT avidity in relation to diagnosis and initiation of therapy.

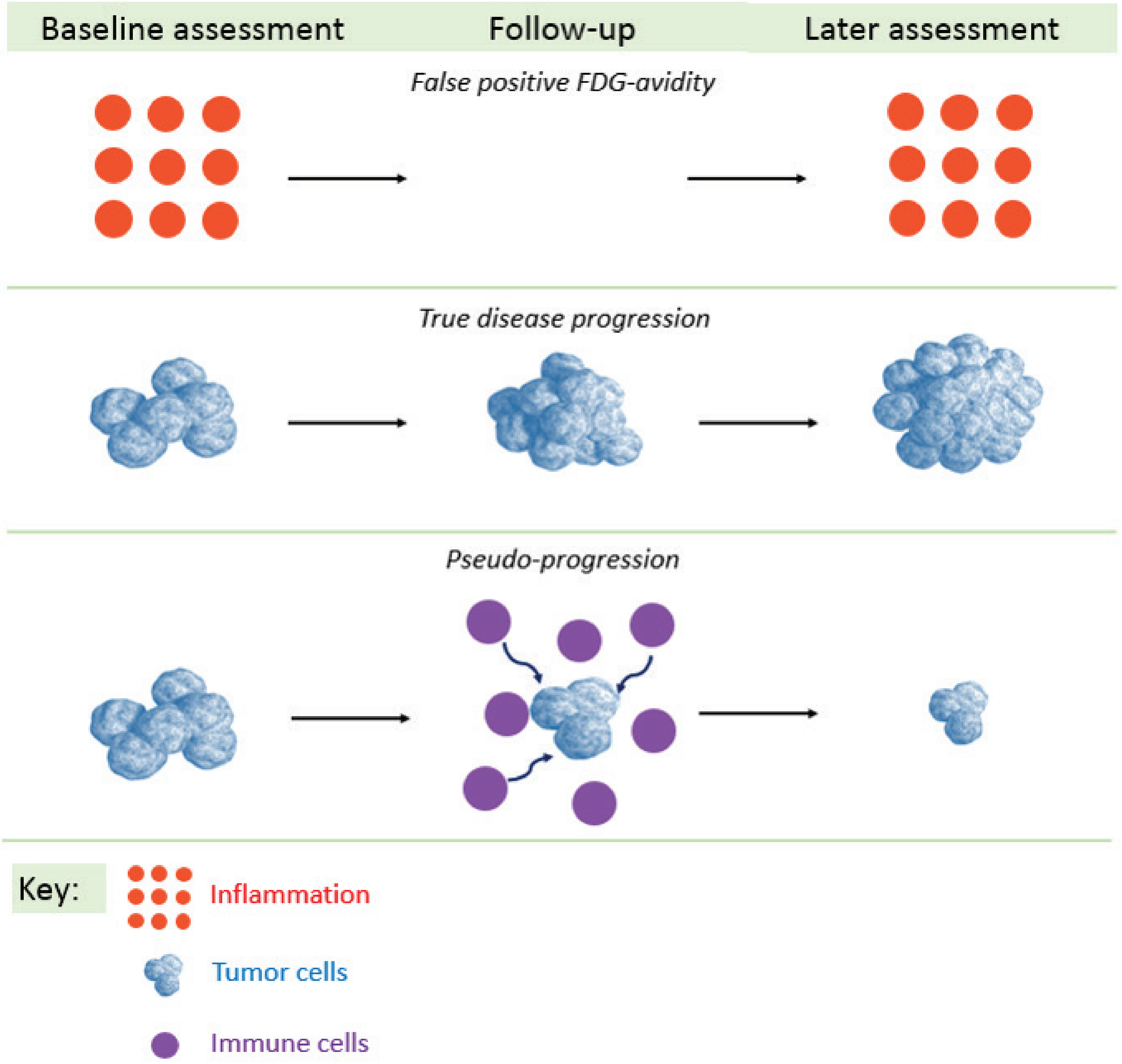

Figure 2: Differential diagnoses for FDG avidity on follow-up PET-CT scans.

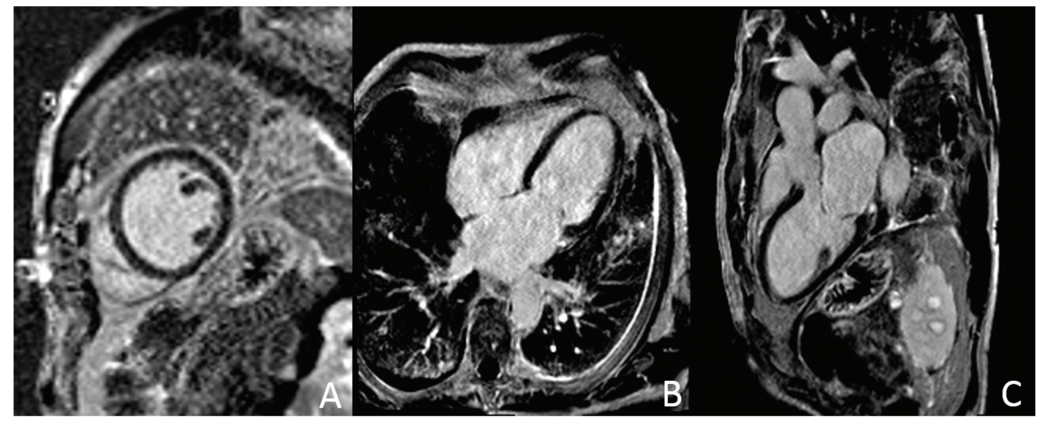

Figure 3: Left ventricle short axis (A), 4-chamber (B) and 3 chamber (C) inversion recovery images of contrast enhanced cardiac MR showing normal nulling of the myocardium with no evidence of gadolinium enhancement to suggest myocardial mass or lesion.

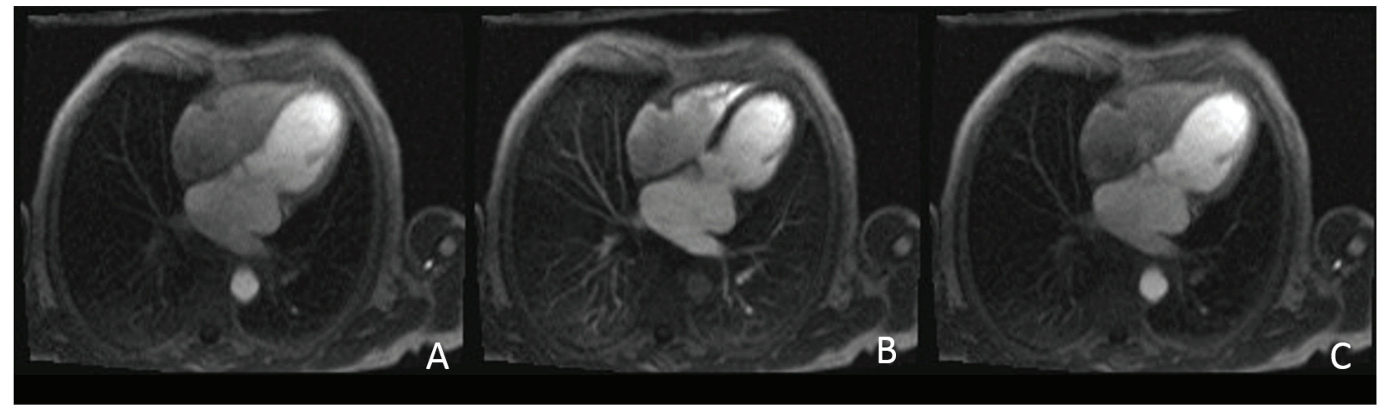

Figure 4: 4-chamber view cardiac MR dynamic 1st pass perfusion images after IV administration of gadolinium demonstrating normal gadolinium distribution and no ventricular mass.

Discussion

Definitive diagnosis with tissue examination (e.g. biopsy or surgical specimen) often too risky in elderly patients with comorbidity.

Echocardiography alone limited by poor acoustic window in certain patients, no tissue characterization, and operator-dependence (5).

PET-CT alone lacks specificity; falsely-positive in infection, ischemia (6), atherosclerosis (7) and hypertrophy (8).

Pseudo-progression, which describes recurrent avidity on PET-CT due to immune cell infiltration of a tumor milieu (reported in patients on different immunotherapies in the literature) also on the differential.

Conclusion

Intra-cardiac FDG avidity does not necessarily indicate metastatic involvement. Pseudo-progression and false positives should be considered in PET-CT. Multimodal imaging including CMRI allows for optimal evaluation FDG-avidity. Definitive diagnosis through surgical pathology or endomyocardial biopsy is not always available or feasible.

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The authors have no conflicts of interest to disclose.