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Incidental and simultaneous finding of pulmonary thrombus and COVID-19 pneumonia in a cancer patient derived to ^{18}F-FDG PET/CT. New pathophysiological insights from hybrid imaging ☆

Federico Ferrando-Castagnetto, MD[1,*], *Cristina Gamila Wakfie-Corieh, MD*[2], *Alba María Blanes García, MD*[2], *Martha García García-Esquinas, MD*[2], *Rosa María Couto Caro, MD*[2], *José Luis Carreras Delgado, PhD*[2]

[1] *Department of Cardiology, University Cardiovascular Center, Hospital de Clínicas Dr. Manuel Quintela, Facultad de Medicina, Universidad de la República, Montevideo, Uruguay*

[2] *Department of Nuclear Medicine, Hospital Clínico San Carlos, Madrid, Spain*

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ABSTRACT

Cancer patients require a careful clinical follow-up during the coronavirus disease 2019 (COVID-19) pandemic. Although hybrid fluorine-18 Fluorodeoxyglucose (^{18}F-FDG) positron emission tomography-computed tomography (PET/CT) is not routinely used in the management of COVID-19 patients, it could play a complementary role of other laboratory and radiological data in selected cases. We describe an asymptomatic cancer patient derived to ^{18}F-FDGPET/CT with simultaneous findings of COVID-19 pneumonia and pulmonary thrombus, discussing its possible mechanisms and prognostic implications.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causing the coronavirus disease 2019 (COVID-19) spread quickly all over the world from a first outbreak in Wuhan, China. Most patients infected from COVID-19 present as asymptomatic or mild forms, but some develop severe complications as acute respiratory distress syndrome, kidney or cardiac injury or thromboembolic events [1]. As large case series confirmed the higher risk of these complications in cancer patients [2], a careful clinical follow-up, selecting most useful diagnostic techniques and deciding the best opportunity for onco-specific treatments is very relevant in this subpopulation.

Although fluorine-18 Fluorodeoxyglucose (^{18}F-FDG) positron emission tomography-computed tomography (PET/CT) is not routinely used in the management of COVID-19 patients, it could play a complementary role of other laboratory and radiological data in selected cases [3].

☆ Competing interest: The patient provided written informed consent for the PET/CT. No specific consent is available for publication. No personal data is presented in the hole text and/or figure, fulfilling anonymity standards.

* *Corresponding address*.
E-mail address: federico.ferrando@gmail.com (F. Ferrando-Castagnetto).

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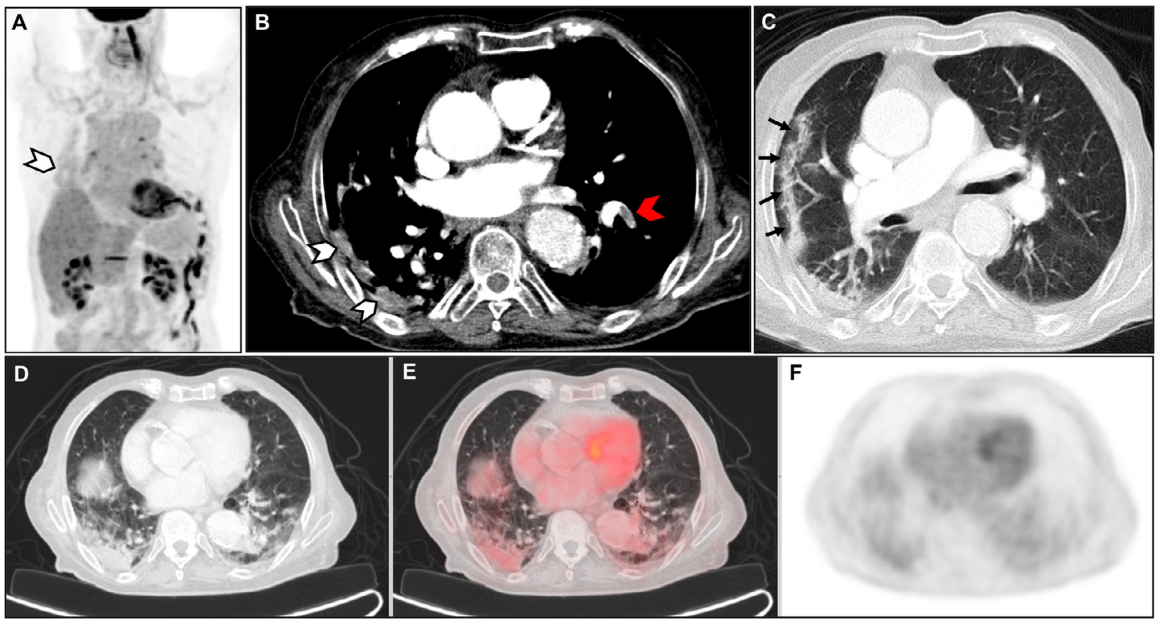

Fig. 1 – Tomographic and molecular chest findings PET maximum intensity projection (MIP) image (A) revealed increased accumulation of FDG, predominantly in the right lung (white arrowhead). On axial images (lung and mediastinal windows, B and C), a thrombus was depicted within a left lower lobe segmental branch (red arrowhead) in addition to basal right lung infiltrates (white arrowheads). Axial CT (lung window, D), PET-CT and PET images show bilateral ground-glass opacities and lineal right subpleural bands (black arrows) with FDG uptake (SUVmax: 3.2).

In addition, whole-body PET/CT can detect several nonexpected complications of COVID-19 and provide new insights about pathogenic and host response against SARS-CoV-2 infection. We describe an asymptomatic cancer patient with simultaneous findings of COVID-19 pneumonia and pulmonary thrombus in ^{18}F-FDGPET/CT, discussing its possible mechanisms and prognostic implications.

Case report

An 88-year-old man with a medical history significant for stable angina pectoris and chronic moderate aortic insufficiency, carrying left atrium and stage IV melanoma. ^{18}F-FDGPET/CT was performed to monitor his oncological pathology. He had no fever or cough during the previous 15 days. ^{18}F-FDGPET/CT (Fig. 1A): suspected malignant lymphadenopathies in left preauricular, bilateral cervical regions, mediastinal in aortopulmonary window, the largest was 9 mm with intense ^{18}F-FDG uptake (SUVmax: 8.1), and bilateral hilar. No changes were observed compared to the previous study (August 2018). Chest CT (Fig. 1) found changes suggestive of COVID-19 viral pneumonia with category 5 for COVID-19 Reporting and Data System (CO-RADS 5) and segmental acute pulmonary embolism (PE). In the emergency room: axillary temperature: 37.2°C, blood pressure: 142/83 mm Hg, heart rate: 95 bpm, normal respiratory rate, oxygen saturation: 92% on room air, improving to 97% after adding oxygen supply by nasal cannula (3 L/min). End-inspiratory crackles were noted in both thorax bases, predominating on right lung. Electrocardiogram: sinus rhythm, PR interval: 240 ms, narrow QRS complex, non-deep T-wave inversion in C4-C5, normal corrected QT. Blood sampling: hemoglobin: 13.9 $\times$ 10^3/L, leukocytes 7,400 $\times$ 10^3/L (neutrophils: 5,700, 77.8%; lymphocytes: 800, 10.2%), platelets: 252,000/mm^3, C-reactive protein: 2.19 mg/dL, LDH: 950 U/L, ALT: 18 U/L, AST: 32 U/L, fibrinogen: 433 mg/dL, D-dimer: 69,892 ng/mL, ferritin: 343 ng/mL, creatine kinase: 292 U/L, Troponin I: 0.46 ng/mL, N-terminal pro-brain natriuretic peptide: 361 pg/mL. Nasopharyngeal exudate was positive for SARS-CoV-2. During admission, he received ceftriaxone, azithromycin, and methylprednisolone with good clinical response, being discharged 5 days later, prolonging subcutaneous treatment with enoxaparin at home.

Discussion

The true prevalence of COVID-19 pneumonia in asymptomatic cancer patients referred to PET/CT is unknown. Only available data are derived from a few small case series of subjects with suspicious tomographic findings and none/partial laboratory confirmation [4–6], reporting a frequency of tomographic suggestive findings ranging broadly from 8.5% [5] to 39% [6], and confirmed COVID-19 pneumonia in 4% and 8% of studies, respectively.

The biochemical profile was highly suggestive of COVID-19 pneumonia in our case, in line with the results of a recent meta-analysis [7]. These common, nonspecific laboratory abnormalities are related to the cytokine storm brought on by SARS-CoV-2 infection, with progressive activation of neutrophils, monocytes, and T-helper cells. Chest CT suggested this infection while laboratory results were available.

The quasi optimal sensitivity of CT (98%) supports its use for screening COVID-19 in suspected cases, particularly in those whom first genetic essay was negative [8]. The inflammatory host response against viral infections as SARS-CoV-2 could induce a prothrombotic state in some patients [9], with increased levels of D-dimers in 36% of patients with COVID-19 pneumonia [10], that could be explained by the imbalance between procoagulant and anticoagulant homeostatic mechanisms.

The incidental diagnosis of lung infiltrates and PE in cancer patients with COVID-19 is a very unusual finding observed in in PET/CT. This diagnostic association has been scarcely documented, mainly through anecdotical reports of complicated symptomatic patients [11]. We think these simultaneous pulmonary changes in the absence of symptoms provide some clues about pathogenic of COVID-19, and also raise special prognostic and therapeutics concerns. Thrombotic complications were observed in 31% of critically ill patients with COVID-19 [12], but their prognostic implications have not been defined in asymptomatic cancer patients. While high-risk acquired thrombotic factors as age, cardiac disease and cancer suggest an embolic mechanism in our patient, the temporal concomitance raise the hypothesis that a local prothrombotic environment could favors the development of in situ arterial thrombosis. Another evidence is provided by CT findings of an interstitial COVID-19 pneumonia located in the same affected lobe than vascular involvement. This uncommon mechanism is suggested by the presence of intra-alveolar fibrin clots observed in animals and humans with severe respiratory forms of COVID-19 [9]. However, as deep venous thrombosis was not explored during the pandemic clinical setting and high-resolution CT angiography scan is not applied during PET/CT scans, it was not possible to accurately define if these imaging changes respond to a localized in situ thrombosis or a true PE. Whatever the mechanism, it is reasonable to consider this event as a marker of poor prognosis. In the meanwhile, our case report advocates raising the suspicious of an underlying thromboembolic event in asymptomatic cancer patients with COVID-19 pneumonia exhibiting very high levels of serum D-dimers. Once confirmed, these patients should be treated with nonfractioned low weight heparin or new oral anticoagulants, in accordance to the updated clinical guidelines.

During the high local rate of COVID-19 infection in Spain, the health system optimized the allocation of resources while applying the recommendations of scientific societies, with the intention of carrying out safer diagnostic and therapeutic procedures. Despite this situation, some priority oncological indications were still being carried out in selected patients. Our clinical case highlights that medical staff should pay special attention to incidental findings suggesting COVID-19 pneumonia and/or PE in PET/CT studies of cancer patients.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.radcr.2020.07.032.

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