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Short research communication

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Abstract

Background: COVID-19 was first reported in Egypt on 14 February 2020 and continues to be a major threat to public health.

Aims: We studied the incidence of incidental positron emission tomography/computed tomography (PET/CT) signs of COVID-19 in asymptomatic cancer patients and compared this with the number of reported COVID-19 cases during the same period.

Methods: We included all cancer patients who underwent PET/CT at Misr Radiology Center, Cairo, between 2 May and 7 August 2020.

Results: There were 479 patients who underwent PET/CT primarily for follow-up, and 66 (13.78%) of them showed radiological signs of COVID-19, with the peak incidence in weeks 7–8 of the study. This coincided and strongly correlated with the peak incidence of COVID-19 in Egypt (Pearson's correlation coefficient test = 0.943).

Conclusion: The incidence of incidental PET/CT signs of COVID-19 was in accordance with the officially reported incidence of COVID-19 in Egypt between 2 May and 7 August 2020. These results could be helpful for implementing and adjusting public health and social measures during the COVID-19 pandemic.

Keywords: COVID-19, cancer, positron emission tomography, computed tomography, Cairo, Egypt

Citation: Abdel-Kawi M; Taalab K; Hussien N; Ghandour A; Abdelazeem A; Romeih M; et al. Incidence of incidental positron emission tomography and computed tomography signs of COVID-19 in asymptomatic cancer patients in Egypt. East Mediterr Health J. 2023;29(1):57–62. https://doi.org/10.26719/emhj.23.006 Received: 04/06/21; accepted: 19/10/22

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Introduction

In December 2019, cases of unexplained pneumonia were reported in Wuhan, China (1). The disease was caused by the novel SARS-CoV-2 and later named COVID-19 by the World Health Organization (2–4). In Egypt, the first case of COVID-19 was reported on 14 February 2020, followed by an increasing number of new cases and deaths that reached a peak in mid-June 2020, with approximately 1700 new cases and 90 deaths daily (2,5).

Many patients with COVID-19 are either in the subclinical phase or remain asymptomatic throughout the course of the disease. These patients present a challenge theoretically for epidemiological modelling of disease transmission, and practically for the protection of uninfected people and healthcare staff (6). The lungs are the site most affected by SARS-CoV-2 (7), and the most common symptoms, after fever, are severe respiratory manifestations (8). Radiological tools such as chest computed tomography (CT) are crucial for diagnosis of COVID-19 in patients with false-negative results for reverse transcription polymerase chain reaction (RT-PCR) (9). The chest CT findings of COVID-19 resemble those of viral pneumonia (10), with appearance of multifocal ground-glass opacity and consolidation, predominantly with a peripheral distribution (11,12), and a reported sensitivity of 98% (13,14).

18F-fluorodeoxyglucose (FDG) PET/CT is considered an essential tool in assessing solid and haematological malignancies (15). There are reports of incidental radiological findings of COVID-19 in 18F-FDG PET/CT for staging or follow-up of cancer patients who are asymptomatic or have mild symptoms of COVID-19 (16). Identification of these asymptomatic but potentially infective patients has attracted particular attention (6,17).

The objective of this study was to compare the incidence of incidental signs of COVID-19 in asymptomatic cancer patients undergoing PET/CT for staging or follow-up, with the number of cases of COVID-19 reported by the Egyptian Ministry of Health and Population between 2 May and 7 August 2020.

Methods

We performed a retrospective and prospective review of medical records and follow-up of cancer patients who underwent PET/CT staging or follow-up at a radiology referral centre in Cairo, Egypt, between 2 May and 7 August 2020. The study included 479 patients with breast, gastrointestinal, genitourinary, gynaecological, haematological, lung, or other cancers. The following data were collected for each group: demographic data, including age and gender; medical reason for the investigation; presence of any signs or symptoms of COVID-19 before or at the time of the study; and whether there were any incidental confirmed PET/CT signs of COVID-19. Records of patients with positive PCR for COVID-19 and patients with fever, cough, and shortness of breath were excluded.

All patients underwent dedicated PET/CT for staging or follow-up evaluation using an Ingenuity TF128 multislice PET/CT scanner (Philips, Eindhoven, Netherlands). This was followed by diagnostically enhanced CT. The CT characteristics of the lesions were identified according to internationally standard nomenclature (18). The typical CT findings for COVID-19 included ground glass opacity, patches of consolidation, and others (e.g. lymph node enlargement, and

pleural effusion) (19). All patients with incidental radiological findings of COVID-19 by PET/CT were referred to a pulmonologist for further assessment. They were all confirmed to have COVID-19 based on the presence of mild symptoms (e.g. loss of taste and smell, headache, diarrhoea, sore throat, aches, and pains), together with typical CT findings and laboratory results. No PCR testing was performed in these patients because of the mild form of the disease. All appropriate safety measures and procedures were observed with these potentially infective patients.

All procedures were performed in accordance with the ethical standards of the institutional or national research committee, or both, and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This study was approved by the Research Ethics Committee for Human Research in the Faculty of Medicine, Helwan University, Cairo, Egypt.

Data were collected, coded, and analysed using SPSS version 21 (IBM, Armonk, NY, USA). Descriptive statistics included frequency, percentage, mean and standard deviation, and analysis of variance. The Chi-Square test was used to test the significance of the association between categorical variables. Pearson's correlation coefficient test was used to determine the correlation between the number of cases of COVID-19 discovered in our study and the number reported by the Egyptian Ministry of Health and Population between 2 May and 7 August 2020. The accepted level of significance was $P \leq 0.05$.

Results

The mean age of all 479 patients was 55.9 (14.23) years, with a significant difference among the different types of cancer (P Table 1).

Sixty-six (13.78%) patients who underwent PET/CT showed positive signs of COVID-19 (Table 2). Table 2 shows the distribution of positive cases according to cancer type.

Incidentally discovered cases were tracked according to the week of examination. These cases were compared with the official number of positive COVID-19 cases reported by the Egyptian Ministry of Health and Population (Figure 1). The graphs revealed a gradual increase in cases from week 1, with none in our study and 2600 in the official records. Both graphs reached a peak in week 7, with 22 cases in our study and 10 900 in the official records. There was a gradual decline in the number of cases in week 8, with 11 cases in our study and 10 500 in the official records. There were no cases in weeks 12 and 14 in our study, and there 1100 cases in

week 14 in the official records. Pearson's correlation coefficient test = 0.9439 indicated a strong positive correlation.

Discussion

Our study showed that the incidence of incidental PET/CT signs of COVID-19 was in accordance with the officially reported incidence of COVID-19 in Egypt between 2 May and 7 August 2020. The age and sex of the studied patients, which included adult and geriatric patients of both sexes, showed significant differences among the different types of cancer.

Unlike other medical investigations, PET/CT for cancer patients cannot be postponed. The newly emerged COVID-19 resulted in a pandemic and a public health emergency that affected nearly every country around the world (20). Patients with cancer are considered vulnerable to infection because of their immune status, and were at higher risk of acquiring COVID-19 (21).

The coexistence of tumours and infectious diseases or noninfectious inflammatory diseases poses a serious medical challenge, especially in medical imaging. PET/CT is an unparalleled tool in detecting active infectious/inflammatory diseases and managing neoplasms (22,23). As a noninvasive imaging method, PET/CT plays an essential role in evaluating inflammatory and infectious pulmonary diseases, monitoring disease progression and treatment effects, and improving patient management. Qin and colleagues recently observed FDG uptake in patients with COVID-19 (24). Significant FDG uptake was observed in patients with Middle East respiratory syndrome coronavirus (MERS-CoV) infection that progressed to pneumonia (25). Chefer et al. used PET/CT to observe rhesus macaques and simulate the host response to MERS-CoV infection (26).

The results of our study demonstrated the diagnostic accuracy of PET/CT in infectious and inflammatory diseases. A recent study confirmed high specificity of 93.8% and accuracy of 92.9% for using PET/CT in COVID-19 diagnosis (27). Despite all these findings, the contribution of PET/CT may be limited to clinical settings where infections are suspected, because of the cost and availability of examination. Studies using standardized diagnostic algorithms are needed to determine the utility of PET/CT in such situations and optimal timing of the examination, and to assess its impact on management decisions and patient-relevant outcomes.

Several reports have suggested higher number of COVID-19 cases in Egypt than that announced by the Egyptian authorities, raising suspicion regarding the actual number of

COVID-19 cases in Egypt (5,28,29). In this study, we measured the incidence of incidental signs of COVID-19 in PET/CT examinations in asymptomatic patients and compared that with the number of positive COVID-19 cases in the official weekly reports. Our study showed an increasing trend in the incidental PET/CT findings, which was parallel to the trend in confirmed COVID-19 cases in Egypt. The number of incidentally diagnosed cases of COVID-19 reached a peak during weeks 7 and 8 (June 13–26 2020), followed by a decrease in cases, which was in accordance with the trend in the officially reported number of cases in Egypt during the same period. A clear correlation was noted throughout the study period between the incidental diagnosis of COVID-19 and the number of officially reported cases. Our study group consisted of patients with advanced cancer who required PET/CT examinations, and they were more susceptible than the general population to infection. This should be considered when assessing the results of this study as an indicator of COVID-19 infection in the community.

This study had some limitations. First, we were unable to obtain the results of RT-PCR testing for COVID-19 for most of the patients because of the difficulty in following up outpatient test results after PET/CT. Second, imaging interpretation was often not blinded to the clinical scenario, which may have influenced reporting of the PET/CT results. Differential verification and incorporation biases were likely to have caused overestimation of test performance; thus, the summary estimates should be interpreted with caution.

Conclusion

The incidence of incidental radiological signs of COVID-19 in asymptomatic cancer patients undergoing PET/CT for assessment of disease status was in accordance with the number of COVID-19 cases officially reported in Egypt between 2 May and 7 August 2020. These results could be helpful for implementing and adjusting public health and social measures during the COVID-19 pandemic.

Funding: None

Competing interests: None declared.

Incidence des signes fortuits de COVID-19 détectés au moyen de la tomographie par émission de positons et de la tomodensitométrie chez des patients asymptomatiques atteints de cancer en Égypte

Résumé

WHO EMRO | Incidence of incidental positron emission tomography and computed tomography signs of

Contexte : La COVID-19 a été signalée pour la première fois en Égypte le 14 février 2020 et demeure une menace majeure pour la santé publique.

Objectifs : Nous avons étudié l'incidence des signes fortuits de COVID-19 détectés au moyen de la tomographie par émission de positons/de la tomodensitométrie (TEP/TDM) chez des patients asymptomatiques atteints de cancer. Puis, nous avons comparé cette incidence au nombre de cas de COVID-19 notifiés pendant la même période.

Méthodes : Nous avons inclus tous les patients atteints de cancer qui ont subi une TEP/TDM au Misr Radiology Center, au Caire, entre le 2 mai et le 7 août 2020.

Résultats : Au total, 479 patients ont subi une TEP/TDM principalement à des fins de suivi, et 66 (13,78 %) d'entre eux ont présenté des signes radiologiques de COVID-19, avec un pic d'incidence au cours des semaines sept et huit de l'étude. Cela a coïncidé et était fortement corrélé avec le pic d'incidence de la COVID-19 en Égypte (test du coefficient de corrélation de Pearson = 0,943).

Conclusion : L'incidence des signes fortuits de COVID-19 détectés par TEP/TDM était conforme à l'incidence officiellement notifiée de la COVID-19 en Égypte entre le 2 mai et le 7 août 2020. Ces résultats pourraient être utiles pour mettre en œuvre et ajuster les mesures sociales et de santé publique durant la pandémie de COVID-19.

حدوث علامات الإصابة بكوفيد **-19** عن طريق التصوير المقطعي المحوسب بين مرضى السرطان بدون أعراض في مصر

مصطفى عبد القوي، خالد طلب، نيرفانا حسين، أحمد غندور، عمرو عبد العظيم، مروة رومية، محمد القصاص

الخلاصة

: جرى الإبلاغ عن كوفيد -19 لأول مرة في مصر في 14 فبراير / شباط 2020 ، ولا تزالالخلفية
هذه الجائحة تمثل تهديدًا كبيرًا للصحة العامة
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479 : (13.78%) 66 19- 7-8 .(0.943 =) 19- .

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