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## Case Report

# COVID-19 pneumonia presenting as a single pulmonary nodule in a kidney transplant recipient: A case report and literature review ☆,☆☆,★

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## Introduction

In December 2019, the outbreak of Severe Acute Respiratory Syndrome coronavirus 2 (SARS CoV2) which is the cause of coronavirus disease 19 (COVID-19) has begun in Wuhan, China's Hubei province [1]. The clinical presentations of the novel infection in general population are considered to be fever, dry cough, fatigue, nausea [2]. Patients with underlying diseases and co-morbidities may end up to acute respiratory distress syndrome, and eventually death [3]. The diagnosis of the disease is based on clinical features of the disease, laboratory abnormalities including elevated C-reactive protein, lymphopenia and elevated lactate dehydrogenase which would be confirmed by reverse transcriptase polymerase chain reaction (RT-PCR) test [4]. In this regard, the role of medical imaging,

especially chest x-ray and chest computed tomography (CT) scan, is crystal clear [5].

The main chest CT findings in patients with COVID-19 are bilateral ground-glass opacities, consolidations, and septal thickenings [6]. Previous studies have also mentioned that COVID-19 patients could have the CT characteristic features of architectural distortion in a peripheral distribution, ground glass pulmonary nodules and discrete nodules, and multifocal organizing pneumonia [5].

Immunocompromised patients commonly present atypical presentations of viral diseases [7]. For instances, herpes simplex virus and cytomegalovirus had led to esophageal symptoms in patients with human immunodeficiency virus (infection) [8]. Furthermore, previous investigations have reported that viral infection could result pulmonary nodules

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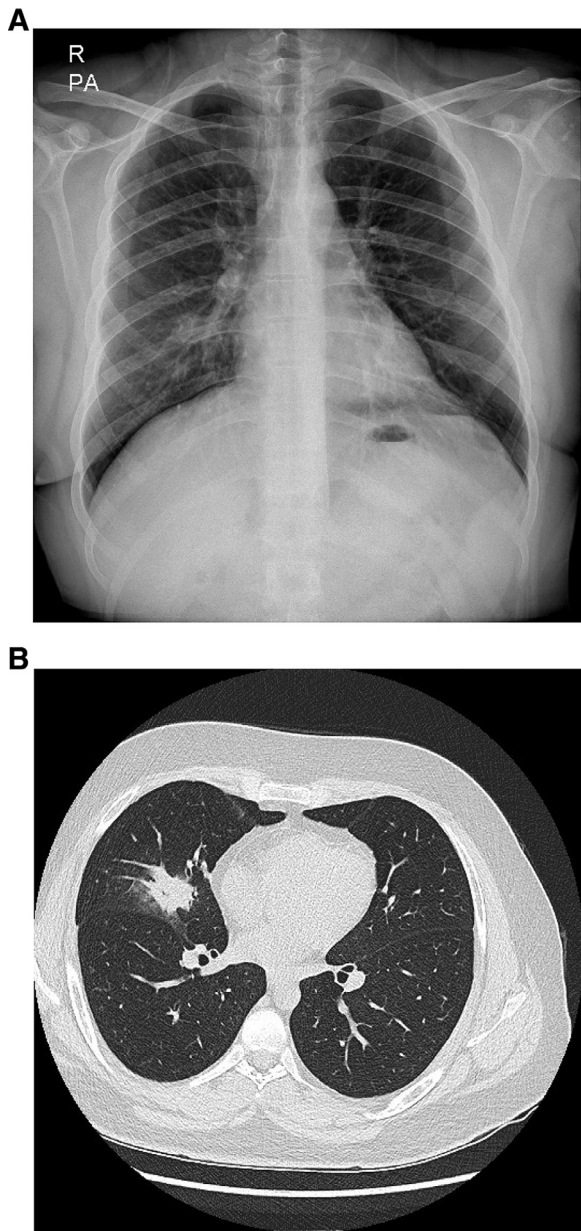
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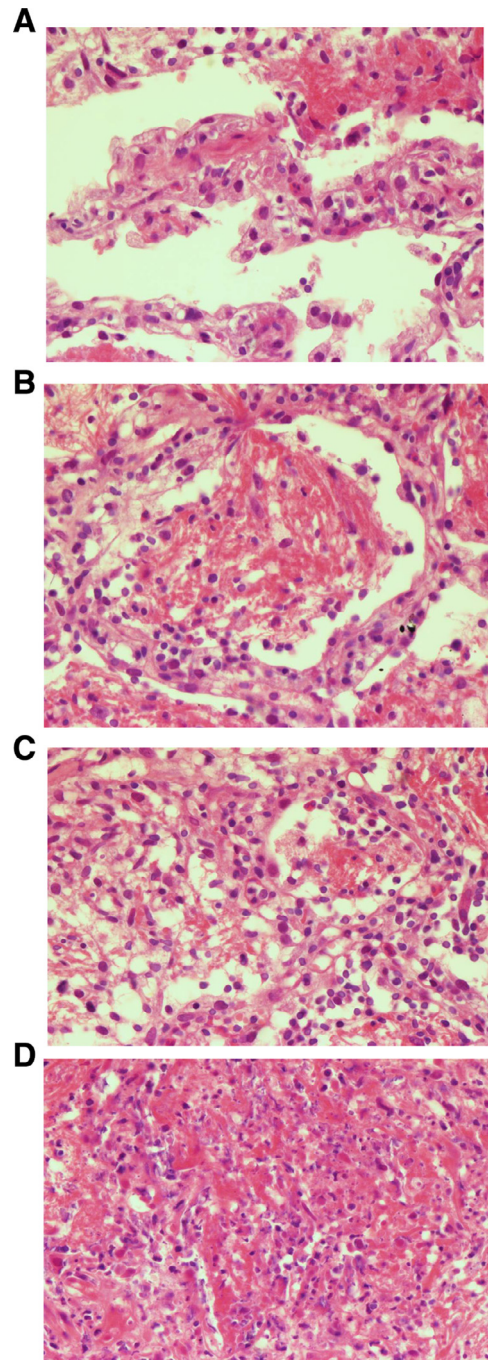
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**Fig. 1 – A:** plain PA chest X-ray reveals a small pulmonary nodule in right lower lobe. **B:** spiral chest CT scan axial section at level of pulmonary veins demonstrates a 29 × 27 mm solid nodule with faint peripheral halo of ground glass density.

in immunocompromised patients [9]. Considering the SARS CoV-2, a prior investigation has noticed that the infection in immunocompromised patients may cause gastrointestinal symptoms including nausea, vomiting, and diarrhea [10]. Conversely to the fact that these patients are more susceptible to the infections, there is limited information regarding the features of COVID-19 in immunocompromised population (Figs. 1 and 2).

Here we report a case of kidney transplant recipient who receives immunosuppressive regimen who was infected with SARS CoV-2. The patient presented the disease as a solitary



**Fig. 2 – Microscopic examination from peripheral border to the center of the lesion show, A:** Alveolar wall edema, congestion, infiltration of lymphocytes, neutrophils and eosinophils and fibrin material deposition, **B:** Alveolar spaces filled by fibrinoid material deposition admixed with mixed inflammatory cells infiltration, **C:** Early alveolar destruction with infiltration of inflammatory cells and fibrinoid material deposition, **D:** Complete destruction of alveolar spaces with necrosis.

pulmonary nodule, raising the suspicion of metastases of renal cell carcinoma (RCC). Percutaneous biopsy was done for



the patient and the specimen was sent for further evaluation, which diagnosed COVID-19.

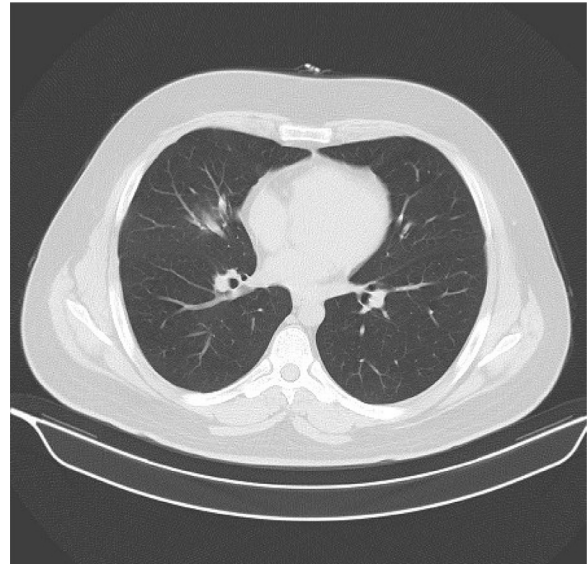
### Case report

The patient is a 37-year-old man who received live-related renal transplantation for bilateral nephrectomy due to RCC last year, after 3 years of hemodialysis. He is a known case of Von Hippel-Lindau who developed bilateral RCC about 4 years ago and underwent subsequent bilateral nephrectomy. He is on immunosuppressive regimen for a year, since renal transplantation. His medications are as followed: Tacrolimus (1 mg twice a day, orally), Mycophenolate Sodium (500 mg twice a day, orally) and Prednisolone (5 mg daily, orally). On May 1, 2020, he referred to his doctor with mild dyspnea. On physical examination the patient was febrile (38.4°C) and was complaining of shortness of breath. Initial laboratory data were remarkable for mild leukopenia (WBC:  $3.5 \times 10^9/L$  with 19% lymphocytes) and elevated CRP. The subsequently performed chest CT scan revealed a  $29 \times 27$  mm ill-defined solid pulmonary nodule with faint peripheral halo located in superior aspect of the right lower lobe. Despite the suspicion for COVID-19 infection, the primary RT-PCR of the nasopharynx sample was falsely negative. Hence the patient was referred to our center for percutaneous pulmonary nodule biopsy under guide of CT scan. The histopathologic findings revealed alveolar wall edema and congestion. Infiltration of lymphocytes, neutrophils, and eosinophils along with fibrin material deposition. No sign of malignancy was seen. Afterwards, the repeated RT-PCR result was positive for COVID-19 infection. The patient was discharged with conservative treatment and immunosuppressant adjustments. In 2 weeks follow-up CT scan, decrease in size of the nodule was evident alongside the clinical improvement (Fig. 3)

### Discussion

Chronic immunosuppression in transplant recipient population is an important risk factor for development of serious viral infections [11]. Earlier studies have mentioned that the previously known corona viruses including severe acute respiratory syndrome (SARS-CoV) and Middle East respiratory syndrome (MERS-CoV) may result in several complications in solid organ transplant recipients [[12],[13]]. These complications are progressive respiratory symptoms, acute renal failure in kidney recipient patients [13]. Furthermore, influenza infections are more severe and lethal in immunocompromised patients [14].

The first reported renal transplant recipient infected with COVID-19 pneumonia was a 52-year-old man from Wuhan, China, whom clinical and para clinical characteristics were similar to those of nontransplanted patients [15]. Another study also mentioned the same conclusion, as it has found that the clinical, laboratory and radiological characteristics of COVID-19 in immunocompromised patients are similar to the normal population [11]. The dominant chest CT fea-



**Fig. 3 – Axial section of spiral chest CT scan at level of left atrium in 2 weeks' follow-up. Significant resolution of the pulmonary nodule is noted leaving a patch of ground glass opacity in superior aspect of right lower lobe.**

tures of these immunocompromised patients are typical multiple patchy ground glass densities, multifocal patchy opacities, and consolidation of subsegmental areas, in both lungs [16–18].

The CT halo sign has been typically seen in fungal infections, vasculitis, organizing pneumonia, and viral infections [19]. The most common cause of CT halo sign in immunocompromised and immunocompetent patients are pulmonary aspergillosis and malignancy [20],[21]. Solid nodules with a peripheral halo of ground glass are reported in a range of 0%-26% in COVID-19 patients and are considered as an atypical imaging presentation so far [22–26].

Here we report a case of kidney transplant recipient, on immunosuppressive regimen who has presented with a single pulmonary nodule. The patient had done nephrectomy 4 years ago, and received the kidney transplantation 1 year ago. To the best of our knowledge, this is the first report, that presents an immunocompromised patient who shows the COVID-19 as a single pulmonary nodule with peripheral halo.

The results of the real-time RT-PCR test for COVID-19 should be interpreted cautiously, and in cases with negative RT-PCR who shows has the clinical features, several tests should be done [27]. In such cases of negative initial RT-PCR, chest CT scan has a comparable diagnostic performance [28]. In our patient, a case of previous RCC, the negative results of the initial RT-PCR assessment and the atypical imaging presentation, misled the physician and resulted in suspicion for metastasis rather than COVID-19 pulmonary involvement.

We suggest that during the SARS CoV-2 pandemic, the patients who has pulmonary nodule with peripheral halo should be evaluated regarding the COVID-19. However, more investigations with higher study population are needed in this regard for a comprehensive conclusion. On the other hand, the imaging characteristics of COVID-19 in immunocompromised pa-

tients and solid organ recipients may differ from the general population and are yet to be investigated.

## Ethical Considerations

All experiments were performed according to the Institutional Review Board (IR.sums.med.rec.1395.s125) guidelines that approved by the ethics committee of Shiraz University of Medical Sciences.

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