CASE SERIES
ROLE OF CT CHEST AS FIRST CHOICE FOR EARLY DIAGNOSIS OF COVID-19 PNEUMONIA EVEN IN RT-PCR NEGATIVE CASE

Shoaib Asghar[1], Junaid Mustafa[1], Arsalan Ahmad Khan Durrani[2], Habib Ur Rehman[1], Sohaib Asghar[3], Muhammad Usama[3]

[1]Department of Medicine, [2]Department of Pulmonology, [3]Department of Neurology, Sheikh Zayed Medical College/ Hospital (SZMC/H), Rahim Yar Khan-Pakistan

The workup of corona virus disease (COVID-19) involves analyzing samples for acute or past presence of SARS-CoV-2 (virus). A detection of 2019 novel Corona virus (2019-nCov) by real-time reverse transcriptase polymerase chain reaction (RT-PCR) indicates current infection and positive IgG antibody level implies a prior infection. Imaging techniques like high resolution computed tomography (HRCT) chest and Xray chest helps in diagnosing and monitoring the disease. Most cases of 2019-nCov are mild and range from asymptomatic carriers to critical illness leading to acute respiratory distress, septic shock and multiorgan failure. We report two cases of COVID-19 who manifested with high grade fever, myalgias, cough and shortness of breath on minimal exertion. All baseline laboratory findings were normal. Initial RT-PCR was negative for oropharyngeal and nasopharyngeal swabs. CT Chest showing typical peripheral patchy and ground glass opacities bilaterally, other markers of infectivity followed by antibody titer confirms the disease.

Keywords: COVID-19; SARS-CoV-2; 2019-nCov; HRCT Chest; Real Time RT-PCR

INTRODUCTION

Corona virus disease (COVID-19) is a highly contagious disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). It is essential to recognize at an early stage so that patient can be isolated from the healthy population.[1] Early diagnosis is achieved by clinical assessment, biochemical analysis and radiological tools. Chest film and CT scan are the workhorse of imaging for lung parenchymal assessment in COVID pneumonia.

In recent studies, the sensitivity of chest CT for COVID-19 was found to be higher, up to 97% in a study with 1014 Chinese patients[1], but at the cost of low specificity (25%). Whereas, real-time reverse transcriptase polymerase chain reaction (RT-PCR) test is believed to be highly specific but with low 60–70% sensitivity.[1] Thus, emphasizing the role of HRCT as a Gold Standard screening tool for the diagnosis of Covid 19.[2,3,5] The clinical symptoms of COVID-19 patients classified into asymptomatic, mild, moderate, severe or critical disease. The common symptoms are fever, malaise, myalgia and upper respiratory symptoms. Some patients develop severe illness that leads to dyspnoea, hypoxemia and ultimately acute respiratory distress syndrome (ARDS).[2] Poor outcomes have been reported in elderly patients and patients with co-morbidities[4,5] like diabetes mellitus, obesity, cancer, hypertension, cardiovascular diseases and chronic respiratory diseases.

Imaging like high resolution computed tomography (HRCT) chest is advised for rapid triage of patients in a limited resource setting when point-of-care COVID-19 testing is not available or results are negative.[3] Chest CT can help in screening, early diagnosis and prognosis, especially in outbreak areas with high pre-test probability for disease.

The authors' present two out of many Covid-19 cases where HRCT chest recognizes early lung parenchymal changes in patients with mild symptoms and false negative real-time reverse transcriptase polymerase chain reaction (RT-PCR) assay. Study was conducted at the Covid Isolation Ward / Covid HDU, Shaikh Zayed Medical College / Hospital, Rahim Yar Khan in May-June 2020.

Case Presentation 1

The patient was a 53-year-old man with diabetes mellitus and hypertension, a bank employee, who was hospitalized in May 2020 for community acquired pneumonia. He presented with increasing breathlessness on exertion and three days history of fever, myalgias and dry cough. There was neither history of contact with suspected / confirmed case nor recent travelling. On examination, the patient was conscious, oriented, breathless with no chest pain or other signs of distress. His vitals were: BP 110/80 mmHg, pulse 89 beats/min, respiratory rate 28 breaths/min, SpO2 96% without oxygen, temperature 100F, blood sugar 145 mg/dl, within normal limits electrocardiogram and chest Xray PA view (Figure 1). His labs attached at Table-1
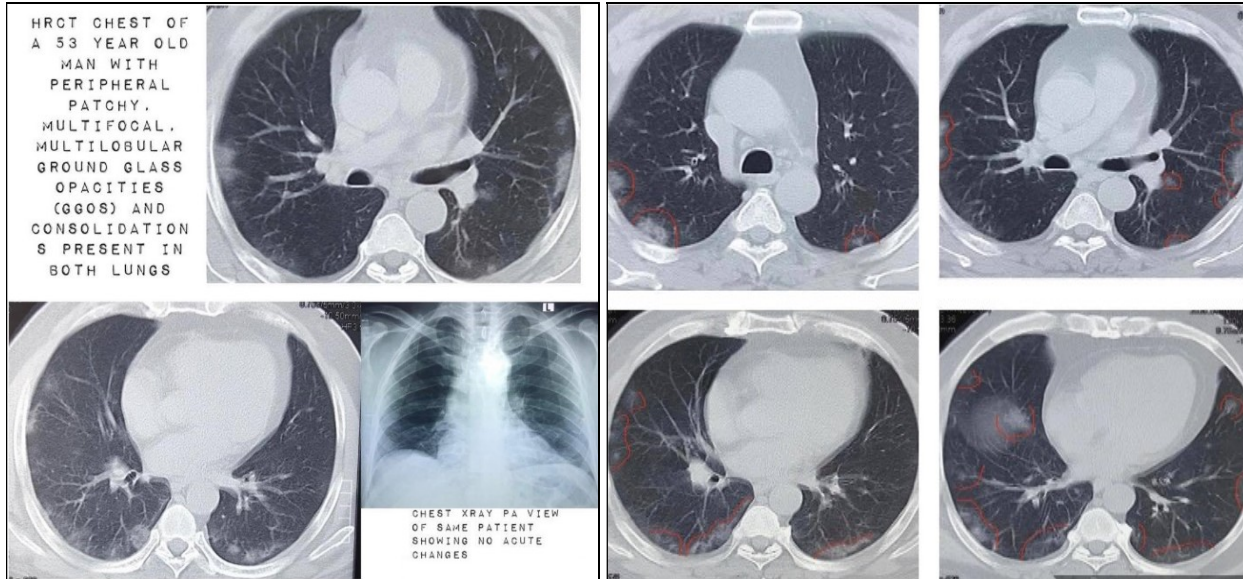
Figure-1

Figure-2

Figure-1, 2: HRCT chest of a 53-year-old man showing peripheral patchy, multifocal, multi-lobular ground glass opacities (GGOs) and consolidations present in both lungs (changes outlined RED)

Case Presentation 2

The patient was a 45-year-old man with diabetes mellitus and hypertension, a businessman, who was hospitalized in June 2020 for atypical pneumonia. He presented with high grade fever, productive cough, body aches and increasing breathlessness on minimal exertion. There was a history of contact with suspected case but no recent travelling. On examination, the patient was breathless with no other signs of distress. His vitals were: BP 130/90 mmHg, pulse 93 beats/min, respiratory rate 31 breaths/min, SpO2 94% without oxygen, temperature 101F, blood sugar 195 mg/dl, within normal limits electrocardiogram. Chest Xray PA view showing bilateral infiltrates with increased pulmonary markings (Figure-3). His labs attached at Table-1
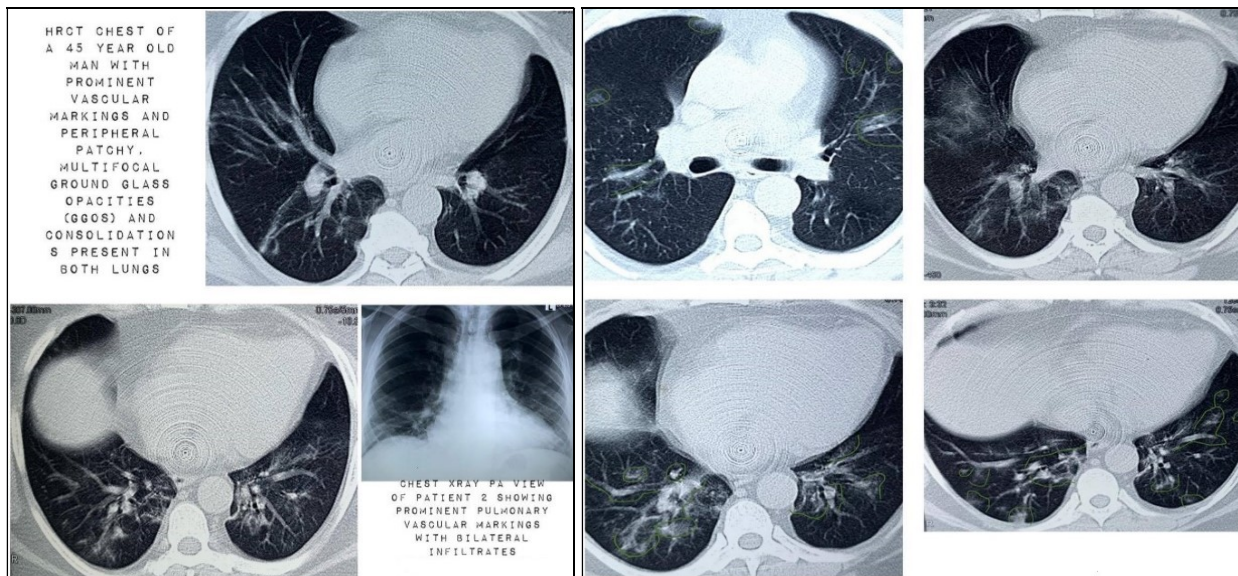

Figure-3

Figure-4

Figure-3, 4: HRCT chest of a 45-year-old man showing prominent pulmonary vascular markings, peripheral patchy, multifocal ground glass opacities (GGOs) and consolidations in both lungs (changes outlined green)

Table-1: Laboratory reports

Laboratory parameters (units)	Reports On Admission /		At Discharge		Reference values
	Case 1	Case 2	Case 1	Case 2	
Complete Blood Picture					
Hemoglobin (gm/dL)	14.9	14.2	15.1	14.1	13 – 18
WBC Count TLC (x 10⁹/l)	5.6	9.1	9.8	9.4	4.0 - 11.0
Differential leukocytic count (%)					
Neutrophil	66	70	65	60	40 – 75
Lymphocyte	24	24	27	35	20 – 50
Eosinophil	02	01	01	01	01 – 06
Monocytes	09	05	06	04	02 – 10
Platelet count (x 10⁹/l)	173	231	190	219	150 – 400
Liver function test					
Bilirubin (mg/dL) total	0.5	0.4	0.9	0.9	0.1-1.2
ALT (U/L)	32	90	42	110	5–45
AST (U/L)	44	75	54	95	5–45
Coagulation Profile					
Prothrombin time (s)	13	16	18	17	10-13
Renal Profile					
Serum Creatinine (mg/dL)	**1.31**	1.09	**1.4**	1.1	0.72-1.25
Serum urea (mg/dl)	36	20	40	26	10-50
Serum LDH (U/L)	**353**	**224**	125	**201**	135-214
Serum CRP (mg/dl)	**15.27**	**0.69**	**1.87**	**3.20**	<0.50
Ferritin (ng/mL)	**530**	**260**	**200**	**160**	5-148
D-Dimer (ng/mL)	**250**	**260**	200	**250**	250
Random Blood Sugar (mg/dl)	145	195	145	234	80-140
COVID-19 Testing	**Case 1**		**Case 2**		
Covid-2019 Real Time **RT-PCR** Assay (Case 1, Case 2)	**Not Detected**				Repeat after 3days **Not Detected**
Covid-19 **Total Antibody** (after 20days)	**Reactive**		**Reactive**		
Covid-19 **IgG Antibody** (after 24days)	Patient Value **8.04 (Reactive)**		Patient Value **6.32 (Reactive)**		Cut off Value 1.4

DISCUSSION

Early diagnosis is crucial for disease prevention and control[1]. In this study, we chose two out of many COVID-19 pneumonia cases and found that the diagnostic ability of CT chest in early diagnosis is rather high even in normal chest Xray and false negative RT-PCR cases.

The main advantages of CT scan is that its' results are reliable, practical and available almost immediately after scanning[7,8], in contrast to the PCR test, which may take up to 24–48 hours. During this time-frame, highly suspicious patients are kept in isolation, awaiting the PCR results. CT scan chest can easily pick early COVID-19 peripheral lung parenchymal changes[3,5] and predict improvement or worsening. It can play a role in triage of the patient as high risk of COVID-19 (suspicious CT) and low risk (non-suspicious CT).

The value of CT is, however, debated because of suspected lack of discriminatory value.[9,10] The sensitivity of PCR may be suboptimal, which makes it challenging to associate the two tests.[4] It would be interesting to investigate whether combining the results of CT chest with clinical manifestations would increase the discriminatory value, which is extremely important especially if patients have to be placed in isolation wards.[4,6]

It can be asserted that with changing pre-test probability, incidence and novel nature of the disease, the added value of the chest CT will change.[4] In recent studies, the sensitivity of chest CT for COVID-19 was found to be higher, up to 97% in a study with 1014 Chinese patients[1], but at the cost of low specificity (25%). Whereas, real-time reverse transcriptase polymerase chain reaction (RT-PCR) test is believed to be highly specific but with low 60–70% sensitivity.[1]

The hallmark CT feature of COVID-19 include multifocal, multi-lobar ground glass opacification (GGO) with patchy consolidations bilaterally, a peripheral/subpleural or posterior distribution (or both), mainly in the lower lobes.[6–8,10,11] Since peripheral areas of ground glass are a hallmark of early COVID-19, which can easily be missed at chest X-rays. Therefore, chest CT had a low rate of missed diagnosis of COVID-19.[8]

CONCLUSION

The diagnostic accuracy of CT chest in symptomatic emergency patients is good, but not good enough to safely diagnose or rule out COVID-19 as clinical

presentations may differ. However, CT chest can be used as a quick tool to categorize patients into "probably positive - suspicious CT" and "probably negative – non-suspicious CT".

In conclusion, chest CT should be considered for the patients with respiratory symptoms or moderate to severe features of COVID-19, regardless of COVID-19 test results.[3,6,9] In such probably positive - suspicious CT cases, repeat swab testing and patient isolation should be advised

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Address for Correspondence:
Dr Shoaib Asghar, Registrar, Department of Medicine - Medical Unit II, Sheikh Zayed Medical College/ Hospital (SZMC/H), Rahim Yar Khan-Pakistan
Cell: +92 347 755 5545
Email: dr.shoaibasghar@hotmail.com