THE ROLE OF CT THORAX AS A SCREENING TOOL IN COVID-19 BEFORE ELECTIVE UROLOGICAL SURGERIES: A TERTIARY CARE CENTRE EXPERIENCE

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ABSTRACT Background: CT thorax has been advocated and widely applied in Covid-19 clinical management. **Aims and objectives:** We evaluated the diagnostic value of CT thorax as a screening tool for Covid-19 in asymptomatic patients posted for elective urological surgeries & compared it with RT-PCR findings. **Material & Methods:** The present retrospective, observational study was conducted among those who were planned for urological surgeries in the department of Urology from April 2019 to March 2021 in a tertiary care centre institute. For each patient, a nasopharyngeal and/or oropharyngeal swab was taken and tested for the presence of SARS-CoV-2. If the first RT-PCR was negative, a second RT-PCR was performed within 48 hours after the first test in patients who were still admitted to the hospital. The detection rate of COVID-19 infection based on initial CT thorax & RT-PCR (as reference standard) was compared. **Results:** There were 24 true positives, 243 true negatives, 7 false positives, and 8 false negative patients. Sensitivity was 75% (95% CI: 56.60% – 88.54%), specificity: 97.20% (95% CI: 94.32 – 98.87%, positive predictive value: 61.65% (95% CI: 61.65 – 87.97%), negative predictive value: 96.81% (95% CI: 94.34 – 98.23%) and accuracy: 94.68% (95% CI: 91.38 – 96.99%). **Conclusions:** High diagnostic accuracy of CT with typical & relatively atypical CT findings of COVID-19 leads to a low rate of missed diagnosis. Normal CT can be found in RT-PCR +ve COVID-19 cases & typical CT manifestations can be seen in RT-PCR -ve cases. Thus, combining both CT & RT-PCR may help improve the diagnostic accuracy of Covid-19.

KEYWORDS CT, Thorax, COVID-19, RT-PCR

Introduction

CT thorax has been widely used to manage Covid-19 during this Covid pandemic. Typical chest imaging manifestations include multiple, patchy, sub-segmental, or segmental ground glass density shadows in both lungs, though atypical findings are increasingly common [1]. However, hereby we reiterate that while CT radiation is associated with nonnegligible oncogenic risk, till now, the role of CT in Covid-19 patient care remains poorly defined. Currently, there are no well-proven effective anti-viral treatments or vaccines for 2019-nCoV [2]. This is very much different from that of pulmonary tuberculosis. After a clinical judgment along with imaging for tuberculosis, once the diagnosis is made, anti-tuberculosis treatment can be initiated even without a positive pathogenic diagnosis of Mycobacterium tuberculosis smear or culture [3]. For cases of Covid-19, CT may show signs typical of viral pneumonia and thus help the clinical diagnosis. However, a shift from a suspected case designation to a clinically diagnosed Covid-19 case designation may not impact clinical management [4].

Covid-19 suspected cases should be isolated, and supportive treatment should be offered. The supportive treatments are primarily based on the severity of clinical symptoms/signs [5].

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The chest x-ray can be used for severity monitoring of Covid-19 pulmonary lesion. CT thorax has been shown to have better diagnostic accuracy than CXR [6].

RT-PCR is a standard gold method for confirming the diagnosis of Covid-19. However, it has low sensitivity (60-89%), time-consuming, & may not be able to detect mutated SARS-CoV-2. On the other hand, CT thorax is a routine imaging tool, relatively easy to perform & produces a fast diagnosis. Furthermore, it reveals pulmonary changes consistent with Covid-19 in patients with initial negative RT-PCR [7]. Thus, we evaluated the diagnostic value of CT thorax & compared it with RT-PCR findings.

Materials & Methods

The present retrospective, observational study was conducted among those who were planned for urological surgeries in the department of Urology from April 2019 to March 2021 in a tertiary center institute. Data such as name, age, gender, RT-PCR, and CT thorax findings were recorded. Patients were also asked regarding Covid-19 symptoms like fever, chills, myalgia, cold & cough, dyspnea, sore throat, gastrointestinal symptoms like diarrhoea, abdominal pain ad history of travel to endemic areas or exposure to high-risk contact. A CT scan unit scanned patients with or without respiratory symptoms (dyspnea, coughing, sore throat, and fever). Simultaneously, for each patient, a nasopharyngeal and/or oropharyngeal swab was taken and tested for SARS-CoV-2. If the first RT-PCR was negative, a second RT-PCR was performed within 48 hours after the first test in patients who were still admitted to the hospital. The detection rate of COVID-19 infection based on initial CT thorax & RT-PCR (as reference standard) was compared.

CT thorax showed typical features like multiple, bilateral and peripheral ground glass opacities(GGOs), including consolidation, linear opacities, or findings of organizing pneumonia or total lung involvement (Fig.1). Thorax can also be normal in some patients of early disease. Therefore, a normal study was defined as one without any features to suggest pneumonia.

Figure 1 Unenhanced CT in a 55-year-old man with COVID-19 pneumonia. Peripheral GGO in the upper portion of both lungs (A, B) is associated with linear consolidations in the lower lobes (C). Results of 1st & 2nd RT-PCRs were -ve, with only 3rd test, repeated in view of CT findings, becoming +ve.

Positivity or suspected COVID-19: A positive screening test was defined as a positive RT-PCR or a high suspicion of COVID-19 on the CT scan. Suspected cases were defined by a high suspicion of COVID-19 on the CT scan with a negative RT-PCR. CT scans of patients with negative RT-PCR were retrospectively blinded and proofread by specialized radiologists. The COVID-19+ group included patients with positive RT-PCR, and suspected cases were confirmed by the medical history and repetition of the biological tests. When a patient was deemed positive or suspected of being infected by COVID-19, the surgical procedure was postponed with a delay of up to 14 days after a second negative RT-PCR test, unless the procedure was considered a vital or oncologic emergency by the referent physician.

Statistical Analysis

Data thus obtained were subjected to statistical analysis using SPSS software version 24. P-value < 0.05 was considered significant. Diagnostic efficacy of CT outcome (RT-PCR as reference standard) was analyzed by calculating sensitivity, specificity, positive predictive value, negative predictive value, and accuracy.

Results

We assessed 307 patients for eligibility. Out of 307 patients, 282 were included in the study (Fig.2).

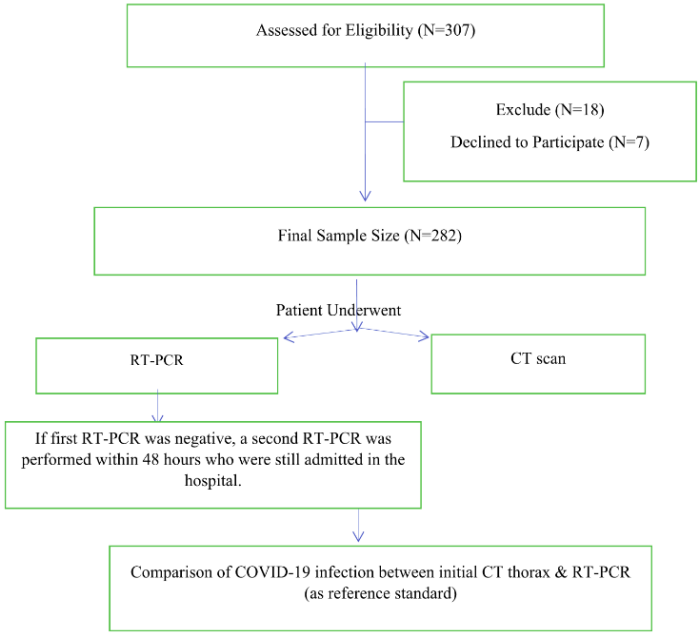

Figure 2 Study procedure.

67.38% of patients were male. The mean age among the study subjects was 58.27±7.48 years. Hypertension and diabetes were revealed in 36.81% and 28.57% of the subjects, respectively (Table 1).

There were 24 true positives, 243 true negatives, 7 false positives and 8 false negative patients (Table 2).

We found that sensitivity was 75% (95% CI: 56.60% – 88.54%), specificity: 97.20% (95% CI: 94.32 – 98.87%, positive predictive value: 61.65% (95% CI: 61.65 – 87.97%), negative predictive value: 96.81% (95% CI: 94.34 – 98.23%) and accuracy: 94.68% (95% CI: 91.38 – 96.99%)(Table 3/Fig.3).

Discussion

The CT characteristics of COVID-19 infection and the role of CT chest in severe infection and emergent surgery are well known [8]. However, there is little evidence that CT chest may be used to screen for COVID-19 infection in asymptomatic people or before elective surgery [9,10]. Positive CT findings were found in as much as 54 percent (41/76) of asymptomatic contacts of proven carriers, according to data from the Diamond Princess cruise ship [11].

Table 1 Demographic profile among the study subjects.

Variables	Value
Male, N (%)	190 (67.38)
Female, N (%)	92 (32.62)
Age in years, Mean±SD	58.27±7.48
BMI (kg/m2), Mean±SD	24.62±4.53
Hypertension, N (%)	103 (36.81)
Diabetes, N (%)	80 (28.57)
Smoking, N (%)	35 (12.64)

Table 2 Patient distribution based on CT outcome (RT-PCR as reference standard)

Parameters	True Positive	True Negative	False Positive	False Negative
Number	24	243	7	8

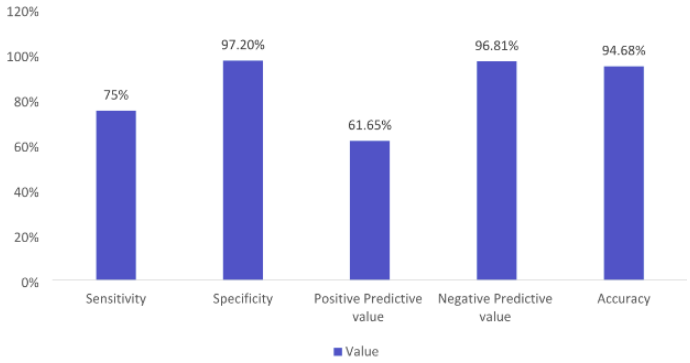

Figure 3 Diagnostic efficacy of CT outcome (RT-PCR as reference standard)

Our study's CT investigation revealed 24 true positives, 243 true negatives, 7 false positives, and 8 false negative patients considering RT-PCR as the reference standard. In a study by Dafydd et al [12], screening included CT chest for major thoracic and abdominal surgery. In the screened population, 0.7 percent (5/681) had COVID-19 infection verified by RT-PCR. They performed 240 preoperative CTs. 3.8 percent (9/240) of CTs were reported as abnormal, out of which only one patient was RT-PCR positive. Surgery was postponed in 2% (5/240) of instances due to CT results. All nine patients who had abnormal CT scans underwent surgery without complications. In the tested population, the frequency of asymptomatic COVID-19 infection was low. As a result, CT chest pre-test probability in asymptomatic, self-isolating individuals is low. In this situation, CT can produce false positives, causing unnecessary surgery delays in a tiny percentage of instances. On the contrary, Shi et al. found that 15 out of 15 asymptomatic RT-PCR-positive Covid-19 patients in Wuhan displayed GGOs on CT thorax [13]. Similarly in a study by Ikehara et al, 54% of asymptomatic patients may have pulmonary changes in the CT thorax[14]. Our study also supports that CT may add to the diagnostic value in screening asymptomatic patients before elective surgeries.

In the present study, CT thorax have sensitivity of 75% (95% CI: 56.60% – 88.54%), specificity: 97.20% (95% CI: 94.32 – 98.87%, positive predictive value: 61.65% (95% CI: 61.65 – 87.97%), negative predictive value: 96.81% (95% CI: 94.34 – 98.23%) and accuracy: 94.68% (95% CI: 91.38 – 96.99%). Several recent studies have looked into the efficacy of chest CT in the diagnosis of COVID-19 pneumonia. The presence of bilateral peripheral GGOs with a lower-lung predominance has been demonstrated in multiple studies as one of the typical features of RT-PCR diagnosed COVID-19 pneumonia; however, "typical" chest CT findings for COVID-19 can also be seen in infectious processes, organizing pneumonia, and connective-tissue diseases [15,16]. Chest CT can distinguish pulmonary abnormalities in patients with microbiologically identified COVID-19 pneumonia with a sensitivity of up to 90% and specificity of up to 96 percent, according to recent research [17,18].

Several studies have suggested that chest CT can be a more reliable alternative to RT-PCR [19]. In contrast to our suspected patients, these studies were conducted on mostly symptomatic groups of patients in places with a high population frequency of SARS-CoV-2 [16-20]. A recent meta-analysis comparing the performance of CT and RT-PCR in the diagnosis of COVID-19 found that chest CT had an overall pooled sensitivity of 94 percent and specificity of 37 percent. In comparison, RT-PCR had an overall pooled sensitivity of 89 percent. It concluded that in regions with low disease prevalence, the positive predictive value of RT-PCR was ten times that of CT [21]. Thus CT thorax may not add to diagnosis and have questionable value in low prevalence settings. While the CT chest remains relevant as a preoperative screening and diagnostic tool in emergency settings where the result of RT-PCR may not be readily available in symptomatic patients with negative or awaited RT-PCR reports. However, it can be done for symptomatic COVID-19 patients, having an RT-PCR report for better management electively.

In Heinze et al [22] study, 107 delegates from different centres in 22 countries completed the survey. Clinical activities were disrupted in 54.2 percent of the centres, and 85.0 percent of elective surgeries were canceled. However, 64.5 percent of urology departments still performed minimally invasive surgery for malignant illness. There were no specialized and properly equipped operating theatres for COVID-19–positive patients in 33.6 percent of the hospitals. COVID-19 had a significant negative influence on academic activities, according to 72.9 percent of participants, and 82.3 percent thought that the pandemic had a negative impact on their quality of life. Finally, 92.5 percent of those polled thought the pandemic would have a moderate to severe impact on their country's health systems.

Table 3 Diagnostic efficacy of CT outcome (RT-PCR as reference standard)

Parameters	Value	95% CI
Sensitivity	75%	56.60% – 88.54%
Specificity	97.20%	94.32% – 98.87%)
Positive Predictive value	61.65%	61.65% – 87.97%
Negative Predictive value	96.81%	94.34% – 98.23%)
Accuracy	94.68%	91.38% – 96.99%)

The information gathered in this survey sheds light on the changes that have occurred in clinical and academic settings due to COVID-19. It underlines detrimental repercussions on academic and scientific activities and urologists' personal and social lives, in addition to shortages such as bed occupancy and personal protective equipment.

In the field of urology, it is vital to improving medical personnel safety training. Medical personnel must be effectively protected from virus transmission because they are exposed to patients and bodily fluids. As social distance requirements are reduced, and more surgical procedures are reinstated, future directions will be dictated by outcomes and patient infection rates. As more data becomes available, the shortage of testing and PPE is overcome, and a vaccine and treatments for COVID-19 are produced, recommendations should be tailored to the local setting.

The safe resumption of surgical and interventional operations is vital for patient care and health care, both of which have been severely damaged by the COVID-19 epidemic. Intending to restart semi-urgent and urgent procedural treatment at our facility, we used questionnaires and RT-PCR in combination with screening chest CT to take a cautious approach to reduce the risks to both patients and physicians. In our experience, chest CT scanning provided useful information for detecting asymptomatic COVID-19 patients in our suspected group.

Limitations

We acknowledge certain limitations in this study. First, it was a retrospective study design. Other limitations were the single-centric nature, small sample size, and limited abnormal test events on statistical analysis.

Conclusion

High diagnostic accuracy of CT with typical & relatively atypical CT findings of COVID-19 may lead to a low rate of missed diagnosis. Normal CT can be found in RT-PCR +ve COVID-19 cases & typical CT manifestations can be seen in RT-PCR -ve cases. Thus, combining both CT & RT-PCR may help improve the diagnostic accuracy of Covid-19.

Abbreviations

CXR : Chest Xray
GGOs : Ground Glass Opacities

Declarations

Ethics approval and consent to participate

All consents have been taken.

Consent for publication

Informed consent has been taken.

Availability of data and materials

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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