



The Value of Spiral Chest Computed Tomography Scan in the Diagnosis of Asymptomatic Coronavirus Carriers among Paranasal Sinus and Pharynx Surgery Candidates

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Abstract

Introduction The nasopharynx and oropharynx are the main colonization sites of coronavirus. Therefore, patients with paranasal sinuses and pharyngeal problems (ear, nose, and throat [ENT] patients) predispose coronavirus infection.

Ear, nose, and throat patients with concomitant asymptomatic coronavirus infection may develop severe pneumonia following surgical procedures. As a result, presurgical screening for coronavirus infection is a substantial concern.

Objective We evaluated the usefulness of a spiral chest computed tomography (CT) scan in the diagnosis of asymptomatic coronavirus infection in the presurgical assessment of ENT patients

Methods In this study, candidates of paranasal sinus or pharyngeal surgery were evaluated for coronavirus infection. Patients with neither history of coronavirus disease 2019 (COVID-19) nor compatible symptoms and signs were screened for *asymptomatic* coronavirus infection. These patients composed two groups: the first group underwent a reverse transcription polymerase chain reaction (RT-PCR) test of nasopharyngeal sample and spiral chest CT scan, but for the second one, only the latter was performed.

Results In the first group, which consisted of 106 patients, 11 (10.4%) cases had positive RT-PCR test results, and 17 (16%) patients showed positive findings in favor of coronavirus infection in the spiral chest CT scan. In the second group, which consisted of 173 patients, 34 (19.7%) cases had positive chest CT scan results.

Conclusion The chest CT scan has a valuable role in the early diagnosis of asymptomatic coronavirus carriers in patients highly predisposed to infection, especially in low resource areas, where the RT-PCR test is unavailable.

Keywords

- ▶ COVID 19
- ▶ chest CT
- ▶ ENT surgery

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Introduction

According to the previous studies, a considerable number of patients with coronavirus infection are *asymptomatic*, defined as cases with positive coronavirus disease 2019 (COVID-19) tests without any obvious clinical symptoms.¹⁻⁴ As a result, symptom-based screenings may miss a group of patients with coronavirus infection. Asymptomatic patients may become symptomatic over time, precipitated by emotional or physical stressful events, like surgical procedures.^{5,6} These patients are considered as *presymptomatic*.⁷

In the general population, asymptomatic cases are not routinely tested. Moreover, the available diagnostic tests are not accurate enough. Consequently, determining the prevalence of *asymptomatic* and *presymptomatic* cases are not feasible yet.⁸

Nasopharynx and oropharynx are the main colonization sites of coronavirus infection. The patients with paranasal sinus and pharynx diseases may develop inflammation of the mentioned areas with increased sinus and pharynx secretion. These patients often breathe deeply with open mouth and do not have cough etiquette. Moreover, patients with tracheostomy have a higher risk of aerosol production. Therefore, these patients not only have a higher predisposition to coronavirus infection but also have a higher probability of spreading infection.⁹

Presurgical screening for coronavirus infection could reduce the number of hospital transmissions. In this study, we evaluated the value of a spiral chest CT scan in the diagnosis of asymptomatic coronavirus infection in the presurgical assessment of ENT patients.

Methods

This cross-sectional retrospective study was performed on patients with ENT problems referred to one of the main ENT referral centers in Tehran, Iran, from May 1st to July 1st, 2020. Candidates for paranasal sinus or pharynx surgery were screened for coronavirus infection. All the patients underwent a careful history taking and physical examination by an infectious disease specialist. Patients with a positive history of COVID-19 or close contact with COVID-19 patients in the previous 2 weeks were excluded from the study. Patients with neither history nor symptoms and signs of COVID-19 were included in our study. All participants had been screened for coronavirus, in case they were *asymptomatic* carriers.

The study group was composed of two subgroups: The first group underwent a reverse transcription polymerase chain reaction (RT-PCR) test of a nasopharyngeal sample to identify severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) infection as well as a spiral chest computed tomography (CT) scan; for the second group, only a spiral chest CT scan was performed. Two expert radiologists analyzed the spiral chest CT scans.

The demographic data of the subjects were reported. The quantitative data were expressed by the mean \pm standard

Table 1 The polymerase chain reaction test results compared with spiral chest computed tomography scan of patients who were candidates of paranasal sinus or pharynx surgery (Amir-Alam Hospital - May 1st to July 1st, 2020)

Variable	Chest CT (+)	Chest CT (-)
PCR (+)	3(2.8%)	8(7.5%)
PCR (-)	14(13.2%)	81(76.5%)

Abbreviations: CT, computed tomography; PCR, polymerase chain reaction.

deviation (SD). All categorical characteristics were described as numbers and percentages. Statistical analyses were performed using the IBM SPSS Statistics for Windows, version 23.0 (IBM Corp., Armonk, NY, USA) software.

The study was approved by the ethics commission of the Amir-Alam Hospital (approval number: IR.TUMS.IKHC.REC.1399.119). All the participants signed the written informed consent.

Results

The first group consisted of 106 patients, including 68 males (64.1%) and 38 females (35.8%) with the mean age of 60.1 ± 11.9 years (range from 12–86 years old). Among the 106 cases, 11 (10.4%) patients had positive RT-PCR test results. Moreover, the spiral chest CT scan showed positive findings in favor of coronavirus infection in 17 patients (16.0%). The frequency of positive PCR test results and spiral chest CT scan are shown in ► **Table 1**.

In the second group, there were 173 cases, including 115 (66%) males and 58 (34%) females with a mean age of 65.1 ± 13.5 years (range from 20–89 years old), who underwent spiral chest CT scan. Thirty-four participants (19.65%), including 27 males and 7 females, had chest CT scan results positive for coronavirus infection. The radiologic findings included patchy or segmental peripheral ground-glass opacities (GGOs) and consolidations compatible with coronavirus infection. The infiltration was single in 19 cases (55.9%) and multiple in 15 patients (44.1%). Furthermore, lung infiltrations were unilateral in 23 cases (67.6%) and bilateral in 11 cases (32.4%).

The frequency of spiral chest CT scan results in different age groups is shown in ► **Table 2**.

Table 2 The spiral chest computed tomography scan results among different age groups of patients who were candidates of paranasal sinus or pharynx surgery (Amir-Alam Hospital - May 1st to July 1st, 2020)

Variable	Chest CT (+)	Chest CT (-)
20–40 years	5 (2.9%)	35
40–60 years	12 (6.9%)	54
60–80 years and more	17(9.9%)	50

Abbreviation: CT, computed tomography.

Discussion

In the present study, a chest CT scan has recognized ~ 20% (10% in the age over 60 years) of asymptomatic cases referred for presurgical evaluation. However, the RT-PCR test detected coronavirus infection in only 10% of patients. Although a chest CT scan is not routinely recommended for the diagnosis of asymptomatic cases in the normal population, it might have a great value in screening and early diagnosis of asymptomatic carriers in high-risk populations, like those with concomitant ENT problems.

Asymptomatic carriers of coronavirus infection could spread the virus with a non-estimated transmission rate. Ear, nose, and throat surgery on asymptomatic coronavirus carriers could facilitate disease transmission to others. According to various studies, between 5 and 80% of patients with positive SARS-CoV-2 results were asymptomatic. Additionally, a group of asymptomatic cases might have received false negative RT-PCR test results.^{1,7}

The RT-PCR test is considered the most accurate and specific diagnostic test for detecting coronavirus infection. However, the ability of the RT-PCR test is largely influenced by the quantity, type, and timing of the clinical specimen collection.¹⁰ The detection of SARS-CoV-2 viral RNA is better in nasopharyngeal samples compared with the oropharynx. In one study, among 205 symptomatic patients, the sensitivity of the RT-PCR test was 63% for nasal swabs, and only 32% for throat swabs.¹¹ The RT-PCR test sensitivity is dependent on the gene targets, and whether multiple gene tests are used in combination. The accuracy of RT-PCR also varies depending on the timing of disease and degree of viral multiplication or clearance. The positive test result starts to decline until the third week and subsequently becomes undetectable. However, in severely ill hospitalized patients, PCR positivity may persist beyond 3 weeks of disease onset.¹² The presence of amplification inhibitors due to inappropriate sample collection, transportation, or handling could cause false-negative RT-PCR results. A patient with one PCR negative test has a 74% chance of having COVID-19. With 2 negative tests, the risk is still around 47%.¹³

A chest CT scan is a sensitive modality in detecting COVID-19 lung lesions and has a substantial role in monitoring treatment. It might be considered as a primary diagnostic test in the epidemic areas. A chest CT scan has the advantage of easy availability and rapid turnaround time. However, according to some literature, a chest CT scan has relatively low specificity in detecting COVID-19 pneumonia. Common chest CT scan findings of COVID-19 infection consists of bilateral, subpleural, peripheral GGOs, and consolidations. The mediastinal lymphadenopathy, pleural effusions, multiple small pulmonary nodules, pneumothorax, cavitation are uncommon atypical chest CT scan findings.¹⁴

In a study on 51 patients with a diagnosis of COVID-19 infection confirmed by RT-PCR test, 49 (96%) patients had typical chest CT scan findings. According to this study, a chest CT scan had a low rate of missing diagnosis of COVID-19 (3.9%) and could be used as a reliable test in the rapid diagnosis of COVID-19.¹⁵

In another study in China, 1,014 symptomatic patients who underwent both chest CT scans and RT-PCR tests were investigated. Out of 1,014 patients, 59% had positive RT-PCR results, and 88% had positive chest CT scans.¹⁶ Kings College Hospital guidelines reported that chest CT scan has a higher sensitivity in the early stage of COVID-19 disease than the RT-PCR test, and chest CT scan abnormalities may appear even before PCR positivity. Moreover, it could be a fundamental diagnostic tool, especially when initial RT-PCR is negative in the current pandemic.¹⁶⁻¹⁹

A retrospective study on 112 subjects found that 54% of asymptomatic patients had pneumonic changes in their chest CT scans. Asymptomatic cases showed more GGOs over consolidation (83%), while symptomatic cases more frequently demonstrated consolidation over GGO (41%).²⁰

Conclusion

As patients with concomitant paranasal sinus and pharynx disease have a higher probability of coronavirus infection and transmission, it is highly recommended to screen these patients before any surgical procedures. Although a chest CT scan is not routinely used as a screening method for coronavirus carriers, it might be considered in this group of patients due to its availability, high sensitivity, and rapid turnaround time, especially in low resource areas where RT-PCR test is unavailable or time-consuming.

Conflict of Interests

The authors have no conflict of interests to declare.

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