The importance of utilizing CT images at early stages for COVID-19 diagnosis – a Scoping Review

A importância da utilização das imagens de Tomografia Computadorizada no diagnóstico precoce da COVID-19

La importancia del uso de imágenes de tomografía computarizada en el diagnóstico precoz de la COVID-19

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ABSTRACT
Overcoming the challenges posed by the severe acute respiratory syndrome caused by COVID-19 (SARS-CoV-2) has been one of the most recurrent themes when it comes to public health in a global context. Since March 2020, when it reached the stage of a pandemic by the World Health Organization, the world has been unfolding itself to overcome the challenges posed by
this disease. As time goes by, new variants are demanding an even greater effort from health services to overcome the impacts caused by the disease. Several diagnostic methods have been developed with the aim of detecting the main signs of the disease as early as possible. The accelerated deterioration of the health status of patients affected by this disease reinforces the need for a conscious and timely action, in order to allow a rapid therapeutic intervention to propitiate a more favorable clinical outcome for the patient. However, each of the different methods developed over the past two years has advantages and disadvantages. Thus, the objective of this article is to present a scoping review of the literature currently available based on the criteria established by Amog et al (2) and published in the “Journal of Clinical Epidemiology” – volume 147, aiming to systematically summarize the existing knowledge and, based on the literature, discuss the importance as well as the advantages and disadvantages of adopting computed tomography images in the diagnosis of patients infected by COVID-19.

**Keywords:** early diagnosis, COVID-19, computed tomography.

**RESUMO**
A superação dos desafios decorrentes da síndrome respiratória aguda grave causada pela COVID-19 (SARS-CoV-2) tem sido um dos temas mais recorrentes quando se trata de saúde pública em um contexto global. Desde março de 2020, quando chegou ao estágio de pandemia pela Organização Mundial da Saúde, o mundo vem se desdobrando para superar os desafios impostos por essa doença. Com o passar do tempo, novas variantes estão exigindo um esforço ainda maior dos serviços de saúde para superar os impactos causados pela doença. Vários métodos diagnósticos têm sido desenvolvidos com o objetivo de detectar os principais sinais da doença o mais precocemente possível. A deterioração acelerada do estado de saúde dos pacientes acometidos por essa doença reforça a necessidade de uma ação consciente e oportuna, a fim de permitir uma intervenção terapêutica rápida que propicie um desfecho clínico mais favorável para o paciente. No entanto, cada um dos diferentes métodos desenvolvidos nos últimos dois anos tem vantagens e desvantagens. Assim, o objetivo deste artigo é apresentar uma revisão de escopo da literatura atualmente disponível com base nos critérios estabelecidos por Amog et al (2) e publicada no "Journal of Clinical Epidemiology" – volume 147, com o objetivo de resumir sistematicamente o conhecimento existente e, com base na literatura, discutir a importância, as vantagens e desvantagens da adoção de imagens tomográficas computadorizadas no diagnóstico de pacientes infectados pela COVID-19.

**Palavras-chave:** diagnóstico precoce, COVID-19, tomografia computadorizada.

**RESUMEN**
La superación de los retos derivados del síndrome respiratorio agudo severo causado por la COVID-19 (SARS-CoV-2) ha sido uno de los temas más recurrentes en lo que a salud pública se refiere a un contexto global. Desde marzo de 2020, cuando llegó a la etapa de pandemia por parte de la Organización Mundial de la Salud, el mundo ha estado trabajando arduamente para superar los desafíos que plantea esta enfermedad. A medida que pasa el tiempo, las nuevas variantes exigen un esfuerzo aún mayor por parte de los servicios de salud para superar los impactos causados por la enfermedad. Se han desarrollado varios métodos diagnósticos con el objetivo de detectar los principales signos de la enfermedad lo antes posible. El deterioro acelerado del estado de salud de los pacientes afectados por esta enfermedad refuerza la necesidad de una acción consciente y oportuna para permitir una intervención terapéutica rápida que proporcione un resultado clínico más favorable para el paciente. Sin embargo, cada uno de los diferentes métodos desarrollados en los últimos dos años tiene ventajas y desventajas. Así, el objetivo de este artículo es presentar una revisión exploratoria de la literatura actualmente
disponible, basada en los criterios establecidos por Amog et al(2) y publicada en el "Journal of Clinical Epidemiology" – volumen 147, con el objetivo de resumir sistemáticamente el conocimiento existente y, con base en la literatura, discutir la importancia, ventajas y desventajas de la adopción de imágenes de tomografía computarizada en el diagnóstico de pacientes infectados con COVID-19.

**Palabras clave:** diagnóstico precoz, COVID-19, tomografía computarizada.

1 INTRODUCTION

Overcoming the challenges posed by severe acute respiratory syndrome caused by COVID-19 (SARS-CoV-2) has been one of the most recurrent topics when it comes to public health in a global context. Since March 2020, when it reached the pandemic stage by the World Health Organization, the world has been unfolding to overcome the challenges posed by such an illness. As time goes by, new variants have demanded an even greater effort from health services to overcome the impacts caused by the disease.

Several diagnostic methods have been developed with the objective of detecting the main signs of the disease as early as possible. The accelerated degradation of the health status of patients affected by this disease reinforces the need for conscious and timely action, in order to allow a rapid therapeutic intervention to allow a more favorable clinical outcome to the patient. However, each of the various methods developed over the last two years has advantages and disadvantages.

For example, Chen et all(1) in their publication mention that nucleic acid assays based on RT-qPCR or NGS99 were the most important techniques for the diagnosis of COVID-19 at the beginning of the outbreak and for some time the molecular and antibody detection methods were the most commonly used. In addition to the great demand at the beginning of the pandemic, the world faced a critical issue regarding the availability of this type of examination to the population. On the other hand, imaging diagnoses such as X-rays and computed tomography of the chest (especially high-resolution scans), has been widely used for the early detection of changes in the lungs and such examinations, when combined with the clinical history of patients and other analytical tools allow physicians to develop more accurate diagnoses enabling the adoption of therapeutic measures earlier.

Thus, the aim of this article is to present a review of the scope of the literature available. This review is based on the criteria established by Amog et all(2) and published in the Journal of Clinical Epidemiology – volume 147", and its main objective is to systematically sum up the
existing knowledge until then, and, based on the publications available so far, discuss the importance as well as the advantages and disadvantages of the adoption of Computed Tomography images in the diagnosis of patients infected with COVID-19.

2 THEORETICAL FRAMEWORK

Several diagnostic methods have been developed with the objective of detecting the main signs of COVID-19 as early as possible. The accelerated degradation of the health status of patients affected by this disease reinforces the need for timely action in order to allow a rapid therapeutic intervention to enable a more favorable clinical outcome for the patient. However, each of the various methods developed has advantages and disadvantages and the idea of this review is to consolidate and present to the reader a synthesis of the main studies developed and their respective conclusions.

For example, Chen et all(1) in their publication present a brief description of the analytical and rapid detection methods for COVID-19 and describe their advantages and disadvantages in relation to sensitivity, specificity and easiness of operation. Nucleic acid assays based on RT-qPCR or NGS99 were the most important techniques for the diagnosis of COVID-19 at the beginning of the outbreak and currently molecular and antibody detection methods were the most commonly used for a long time. For example, RT-qPCR has high sensitivity and low detection cost and, due to this, has become the gold standard for detection of SARS-CoV-2. However due to the high demand at the beginning of the pandemic, the world faced a major problem regarding the availability of this type of examination to the population. On the other hand, imaging diagnoses such as X-rays and computed tomography of the chest (especially high-resolution scans), have been widely used for the detection of early changes in the lungs. Such tests, once combined with the clinical history of patients and other analytical tools allow physicians to develop more accurate diagnoses and enable the adoption of therapeutic measures earlier.

Several articles were published describing the main imaging findings of pneumonia caused by SARS-Cov2 and the utilization of tomography images proved fundamental to increase patient safety mainly by allowing that even with very low doses of ionizing radiation, the quality of acquired images was sufficiently adequate to allow an accurate diagnosis, as described by Bertolazzi ((3). Farias (4) in his publication reports that the generation of chest images could eventually be indicated as a method for medical screening of patients with moderate to severe clinical characteristics and act in this case as an element of fundamental
importance to support clinical decision." The authors also mention the need for a more assertive interpretation of tomographic findings related to COVID-19 and that the preparation of structured reports offers advantages by enabling radiologists to make quick decisions in the face of the high demand for exams.

Despite the importance of identifying as soon as possible a positive case of COVID-19 pneumonia, the mere mention of the term "COVID-19" in a radiological report already triggered a cascade of events, including infection and anxiety control measures for both the physician and the patient, potentially generating hasty interpretations. For this reason, several societies have established a standardized language of notification of COVID-19 (5) with the objective of improving communication between the participants of the care chain, increasing the efficiency and management of patients during this pandemic.

The aim of this article is to present a literature scope review based on the criteria established by Amog et all(2) and published in the Journal of Clinical Epidemiology – volume 147 in order to systematically sum up existing knowledge around the importance of the adoption of Computed Tomography images in the diagnosis of patients infected with COVID-19 as well as the advantages and disadvantages of this method.

3 METHODOLOGY

The research was implemented on Feb, 2024 and consisted of terms considered as relevant by the authors to review the literature on the relevance of early diagnosis in coping with the pandemic. All research was based on PubMed of the National Center for Biotechnology Information (NCBI) which belongs to the National Library of Medicine (NLM) – https://pubmed.ncbi.nlm.nih.gov/advanced/. The search period comprised articles published from 2020 to the 4th quarter of 2023.

First Search: The search for publications on early diagnosis (without considering additional filters) resulted in 1,146 articles from the base of PubMed with the following syntax: "early diagnosis" Filters: Systematic Review, in the last 5 years (a)

Second Search: The objective of refining the search spectrum by adding the keyword "COVID-19" allowed to extract only the articles related to the pandemic from the database previously obtained. The syntax adopted was: ("early diagnosis" Covid Filters: Systematic Review, in the last 5 years) (b). This second research resulted in 95 articles that, like the previous research, are presented in the graphs presented in the chapter "Results"
To contextualize the volume of published articles focusing more specifically on Computed Tomography, further restricting the focus of the search, we insert one more parameter in the research using the word "Computed Tomography" in order to extract from the reference base, the bibliographic references object of this article. The syntax mentioned below resulted in 10 articles that were analyzed and used as the basis of this work. Its syntax was: "early diagnosis" Covid "COMPUTED TOMOGRAPHY" Filters: Systematic Review, in the last 5 years (c)

4 RESULTS AND DISCUSSIONS

4.1 RESULTS

The results of the three search syntaxes described in the item "Method" are described below. The number of articles using the term "Early Diagnosis" is quite broad and has been growing constantly since 2020. When refining the search by inserting the term "COVID-19" it is natural to note that results present a higher number of publications during the hype of the pandemic and such number has presented a noticeable decline.

It is important to highlight that when analyzing Figure 2, it is observed that despite the discrepancy between the absolute numbers of the research described in (b) and (c), the behavior of both curves regarding the number of articles related to the term "COVID-19" and those related to the term "Computed Tomography" are equivalent and considering that the last syntax has shown a very small number of publications, this finding was the main motivator for the authors to decide to develop this work.
4.2 DISCUSSIONS

The pandemic caused by SARS-CoV-2 (also called 2019-nCoV by the World Health Organization -WHO) began in late 2019 and spread rapidly around the world with the main form of contamination being the transmission of the disease from patients who developed pneumonia after infection by this virus. As a result, a healthy individual may become infected either by prolonged exposure to high concentrations of aerosols or even by direct contact of his/her mucous membranes with hands that previously touched a surface contaminated with SARS-CoV-2. In addition, the existence of asymptomatic people infected with SARS-CoV-2 adds complexity, uncertainty, and challenges inherent to the prevention and control of the epidemic due to its invisibility and absence of clinical symptoms. For this reason, monitoring, screening, isolation, and treatment of infected people, although asymptomatic, are crucial and early diagnosis of the disease plays a key role in the early isolation of positive cases and in preventing dissemination in the community.

Quoting Mathew RP et al. (6) there are two broad categories of SARS-CoV-2 tests: those that detect the virus itself and those that detect the host's response to the virus. The most
widely used and accepted test to detect SARS-CoV-2 is through the identification of viral RNA that occurs through nucleic acid amplification, using the RT-PCR assay. The samples are taken by swabs of the nasopharynx and/or oropharynx, the latter being considered less sensitive than the first. For patients with pneumonia, in addition to the samples mentioned above, secretions from the lower respiratory tract (e.g., scar and alveolar broncho washes) are also collected and tested. Detection rates in each type of sample vary from patient to patient and may change over the period in which the disease is present, however, a negative RT-PCR does not exclude SARS-CoV-2 infection, because although such tests have a high specificity, studies have shown that its sensitivity may vary from 30%-70% at initial presentation. Thus, a negative RT-PCR does not allow the patient's infection to be ruled out, making it necessary to repeat the test.

The second available test is serology, i.e., identifying IgM, IgA, IgG or total antibodies (typically in the blood). However, factors such as host immunity and time may influence the development of antibodies, and studies have shown that patients with SARS-CoV-2 only present positive indices between the 7th and 11th day after exposure to the virus, thus making this type of assay unhelpful in an acute disease scenario. For this reason, RT-PCR remains the standard reference for the diagnosis of COVID-19.

However, it is necessary to bear in mind that the test results can be influenced by the procedure adopted during sample collection, the patient's viral load, transportation and intrinsic variation in kit performance from different manufacturers. In addition, the availability of kits has also become a problem in some centers especially during the most critical moments of the pandemic when the demand for such kits has reached very high levels.

Considering that the lung region is the main area affected by the virus, the modalities of medical images such as X-rays and computed tomography (CT) are generally considered in the evaluation of patients and the corresponding definition as to the severity of the infection. X-ray imaging techniques are often used in the diagnosis of COVID-19 due to the wide availability of this type of equipment, fast processing time and low cost, but CT imaging techniques are preferred because they carry a larger volume of detailed information about the infected region.

According to R. Mathew(6), despite their high specificity, chest x-rays (Chest – Xrays or CXRs) are less sensitive than computed tomography (COMPUTED Tomography or CT) to detect opacities related to COVID-19 infection. Choi et al(7) evaluated 20 studies of both CT and CXRs of 17 patients diagnosed with COVID-19 (performed on the same day), having as one of their objectives, to evaluate the visibility of COVID-19 lesions on radiographs. They found that CXRs had sensitivity and specificity of 25% and 90%, respectively. In another study involving 64 patients with COVID-19 confirmed by RT-PCR, CXRs had a sensitivity of 69%
compared to 91% for initial RT-PCR. Due to these results, experts suggest that, despite the advantages mainly in relation to access to technology, chest X-rays should not be recommended as the first imaging modality to evaluate COVID-19.

On the other hand, Computed Tomography can be considered the reference imaging modality for the identification of highly suspected cases of COVID-19 pneumonia. Tomographic images demonstrated their ability even by identifying patients with COVID-19 who had negative RT-PCR. In addition, the diagnostic method using this technology proved useful in monitoring patients during treatment.

Considering the large number of studies around the world seeking to prove the degree of assertiveness of computed tomography in the diagnosis of COVID-19, the authors selected 4 studies that determine and even recommend the adoption of this technique in the diagnosis of the disease. All studies report the main tomographic findings of the affected areas of the lung as typical lesions of pneumonia caused by SARS-COV-2. The extent of such lesions when identified on the images has been used as a determining factor of the severity with which the disease affected the patient.

4.2.1 Brazil

According to the Brazilian Society of Pulmonology and Tisiology, the first tomographic findings illustrate the Brazilian Consensus illustrated on the terminology of descriptors and fundamental patterns of chest CT is described in table 1.
Table 1: Terminology of descriptors and fundamental patterns of chest CT

<table>
<thead>
<tr>
<th>Key imaging findings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matte glass opacity</td>
<td>increased density of the pulmonary parenchyma in which the contours of the bronchi and vessels within the area affected by a pathological process remain visible</td>
</tr>
<tr>
<td>Consolidation</td>
<td>corresponds to the complete completion of the small airways. Thus, the vessels are not identified inside the affected lung area (main difference for matte glass opacity).</td>
</tr>
<tr>
<td>Mosaic paving</td>
<td>superposition of opacities in frosted glass, intralobular lines and thickening of interlobular septa.</td>
</tr>
<tr>
<td>Halo sign</td>
<td>matte glass opacity surrounding the nodule, mass, or a rounded consolidation area.</td>
</tr>
<tr>
<td>Inverted halo sign</td>
<td>focal opacity in frosted glass surrounded by a complete or partial consolidation ring</td>
</tr>
</tbody>
</table>

Source: Silva CIS et al

Considering the worldwide effort of health professionals in the search to diagnose the manifestation of the disease as early as possible and seeking to prove the degree of assertiveness of Computed Tomography in the diagnosis of COVID-19, several medical societies developed their own methodology for defining and classifying patients according to the degree of disease involvement. Razek et.al. (9) in his article summarizes in a very coherent way in which the different radiology societies around the world classify, through computed tomography images of the chest, the severity with which patients were affected by the infection. A summary of this build is described below:

4.2.2 Italy

A group of Italian radiologists from the tomographic findings established the classification of patients into three categories based on their experience with 702 patients. Category 1, in which the patient is considered not to have been affected by the disease and includes cases in which patients do not show signs suggestive of pneumonia or patients that present signs suggestive of other viral pneumonias. Approximately 5% of patients classified as negative for pneumonia had had signs of COVID-19 after one week of the onset of clinical symptoms. Category 2 deals with cases in which it is not possible to safely establish whether the patient is infected by the disease. Patients in this category present signs that demand a deeper analysis of the images with the aim of confirming infection by SARS-CoV-2. Category 3 shows typical signs of COVID-19, such as bilateral frosted glass opacity and consolidation. Categories 2 and 3 are subsequently subdivided according to the severity of the case in mild, moderate, or severe (Table 2).
### Table 2: Tomographic findings and their corresponding radiological classification

<table>
<thead>
<tr>
<th>Severity</th>
<th>Pulmonary parenchyma changes</th>
<th>Radiological classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lightweight</td>
<td>Up to 3 findings of signs suggestive of COVID-19 infection with a maximum diameter of 3 cm</td>
<td>Category 2</td>
</tr>
<tr>
<td></td>
<td>Opacity in frosted glass in up to 3 finds with a maximum diameter of 3 cm</td>
<td>Category 3</td>
</tr>
<tr>
<td>Moderate/Severe</td>
<td>More than 3 findings of signs suggestive of COVID-19 infection with a diameter greater than 3 cm</td>
<td>Category 3</td>
</tr>
<tr>
<td></td>
<td>Opacity in frosted glass in more than 3 finds with a diameter greater than 3 cm</td>
<td>Category 3</td>
</tr>
<tr>
<td></td>
<td>Matte glass opacity and initial consolidation</td>
<td>Category 3</td>
</tr>
<tr>
<td>Severe</td>
<td>Opacity in frosted glass or consolidation</td>
<td>Category 3</td>
</tr>
</tbody>
</table>

Source: Razek et.al.

#### 4.2.3 United Kingdom

The British Society of Thoracic Imaging (BSTI) suggests another way to classify patients affected by COVID-19, dividing them into 4 categories as shown in table 3.

### Table 3: Description of tomographic findings and corresponding diagnosis according to the British Thoracic Imaging Society

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obvious COVID</td>
<td>Opacity in matte glass, bilateral, predominant peripherical in the lower lobe, Mosaic paving, Peripheral consolidation, Bronchogram, Evidence of halo or inverted halo</td>
</tr>
<tr>
<td>COVID Probable</td>
<td>broncho centric or peripheral consolidation in the lower lobe, spot frosted glass opacity</td>
</tr>
<tr>
<td>COVID indeterminate</td>
<td>Evidence that is not present in the previous categories, Manifestations of some evidence but the clinical context suggests alternative diagnosis</td>
</tr>
<tr>
<td>Negative for COVID</td>
<td>Pneumonia lobular, Cavitation infections, Center lobular nodules, Lymphadenopathy, Consolidated pulmonary fibrosis</td>
</tr>
</tbody>
</table>

Source: Razek et.al.

#### 4.2.4 United States

The classification parameter established by the Radiological Society of North America (RSNA) is the most widespread and applied method currently, suggesting 4 categories of classification of patients, conform illustrates table 4:
Table 4: Tomographic findings and their classification according to the Radiological Society of North America

<table>
<thead>
<tr>
<th>Classification</th>
<th>CT findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical</td>
<td>Specific signals for COVID-19, with frosted glass opacity with consolidation</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>Typical signs of COVID pneumonia but not specific enough (randomly distributed frosted glass opacity)</td>
</tr>
<tr>
<td>Atypical</td>
<td>Signs of COVID but suggestive of other pneumonia</td>
</tr>
<tr>
<td>Negative</td>
<td>Evidence cited above</td>
</tr>
</tbody>
</table>

Source: Farias LDPGD et al.

4.2.5 The Nederlands

Schalekamp et al. (11) in its article brings the way in which the Society of Radiology of the Netherlands identifies patients with moderate to severe symptoms of COVID-19. This model, called CO-RADS (COVID-19 Reporting and Data System) seeks to identify and classify patients with pulmonary involvement with scores ranging from 1 (very low) to 5 (very high) depending on the type and number of pulmonary findings related to COVID.

Table 5: Tomographic findings and their classification according to the CO-RADS system

<table>
<thead>
<tr>
<th>Category</th>
<th>Suspected COVID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Inconclusive</td>
<td>Technically inadequate image</td>
</tr>
<tr>
<td>1</td>
<td>Too low</td>
<td>Normal or uninfected</td>
</tr>
<tr>
<td>2</td>
<td>Low</td>
<td>Findings of other infections but not COVID</td>
</tr>
<tr>
<td>3</td>
<td>Probable</td>
<td>Features of COVID present, however, identified findings typical of other infections</td>
</tr>
<tr>
<td>4</td>
<td>Loud</td>
<td>Some COVID characteristics evidenced</td>
</tr>
<tr>
<td>5</td>
<td>Too high</td>
<td>Typical COVID Features Present</td>
</tr>
<tr>
<td>6</td>
<td>Confirmed</td>
<td>RT-PCR positive</td>
</tr>
</tbody>
</table>

Source: Schalekamp S et.al.

In order to prove the degree of assertiveness in supporting the diagnosis that computed tomography images can provide, based on the classification model elaborated by the Netherlands Radiology Society, Schalekamp et al. (12) developed a study involving centers from four universities and two teaching hospitals evaluating patients who had undergone Chest CT scans and who presented symptoms of moderate to severe for COVID-19. Patients presented to the emergency room of these services between March 20 and April 3, 2020 and the symptomatology for COVID for patient segregation comprised (a) cough and important dyspnea requiring hospital admission regardless of the presence of fever, (b) unclarified fever or (c) fever accompanied by anosmia.

Involving a total of 1070 patients, the study in question compared the classification described in Table 5 with the result obtained using the RT-PCR method. The data were consolidated and are presented in table 6.
Table 6: Comparison between the result obtained using the RT-PCR method with the CO-RADS classification

<table>
<thead>
<tr>
<th>Result</th>
<th>CO-RADS 1</th>
<th>CO-RADS 2</th>
<th>CO-RADS 3</th>
<th>CO-RADS 4</th>
<th>CO-RADS 5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>179</td>
<td>102</td>
<td>76</td>
<td>20</td>
<td>20</td>
<td>397</td>
</tr>
<tr>
<td>Possible</td>
<td>21</td>
<td>11</td>
<td>14</td>
<td>8</td>
<td>13</td>
<td>67</td>
</tr>
<tr>
<td>Likely</td>
<td>10</td>
<td>11</td>
<td>9</td>
<td>13</td>
<td>27</td>
<td>70</td>
</tr>
<tr>
<td>RT-PCR positive</td>
<td>25</td>
<td>16</td>
<td>35</td>
<td>79</td>
<td>381</td>
<td>536</td>
</tr>
<tr>
<td>Total</td>
<td>235</td>
<td>140</td>
<td>134</td>
<td>120</td>
<td>441</td>
<td>1070</td>
</tr>
</tbody>
</table>

Source: Schalekamp S et al.

From the table above, it can be evidenced that 86% of the patients classified as CO-RADS 5, that is, very high suspicion of COVID, had their diagnosis confirmed through the RT-PCR method. Although the CO-RADS method still had limitations mainly regarding the training of radiologists at the time of the study, the fact that 381 patients out of a total of 441 have their classification as "very high suspicion" confirmed by the RT-PCR test reinforces the importance that the diagnosis of COVID through computed tomography images of chest may have mainly in the optimization of the segregation of patients regarding the severity of the disease allowing a faster action, either in isolation or in the adoption of appropriate therapeutic measures for each case.

Advances in the processes of acquisition of tomography images have been fundamental to increase patient safety mainly by allowing that even with very low doses of ionizing radiation, the quality of acquired images is adequate enough to allow an accurate diagnosis, as Bertolazzi (3). Farias (4) in his publication mentions that the generation of chest images can be indicated as a method for medical screening of patients with moderate to severe clinical characteristics and can act in this case as an element of fundamental importance to support clinical decision." The authors also mention the need for a more assertive interpretation of the tomographic findings related to COVID-19 and the preparation of structured reports offers advantages by enabling radiologists to make rapid decision-making in the face of the high demand for examinations.

5 CONCLUSIONS

Considering that the lungs are primarily affected by SARS-CoV-2, the use of radiological images such as X-ray and Computed Tomography are fundamental for determining the degree of severity of the infection. X-ray imaging techniques have often been undertaken in the diagnosis of COVID-19 mainly due to its high availability, fast processing speed and low cost. However, these techniques have been shown to be ineffective in cases of mild infections
or in the early stages of infection, but portable X-ray equipment has been shown to be quite adequate in monitoring the clinical evolution of patients mainly because of their cost but also because of the ease with which the disinfection process of these equipment is carried out. These characteristics make chest X-ray a very useful technique to avoid the risk of interruption in the provision of diagnostic imaging services, which, during the most critical outbreak of the pandemic, were very close to its maximum capacity of attention to the patient.

On the other hand, considering the ability of tomographic studies to generate images with a level of detail that is often higher than radiographic images of thorax, such images allow the degree of severity of the manifestation of the disease in patients to be precisely and early. Thus, computed tomography images allow the timely prescription of the therapeutic protocol to be adopted, as well as allows its adoption should also be considered for the follow-up of the patient until its outcome. The evaluation of the assertiveness of the treatment based on how the tomographic findings characteristic of COVID evolve or regress serves as a beacon for medical teams to define or reconsider the protocols adopted.

Considering that the time factor is determinant throughout the patient's journey along the continuous care, the faster and more accurate the diagnosis, the sooner we can start the treatment of the patient, favoring that the clinical outcome is the best possible, thus reducing the demand of patients for health services and consequently reducing the pressure on the health system.
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