

Evaluation of the Radiological Characteristics of Patients with COVID-19 in a General Hospital of Tabasco

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Abstract

According to various studies, it has been found that due to the lack of reagents for the RT-PCR test for the accurate diagnosis of SARS-CoV-2 infection, tomography began to be used as a criterion to achieve diagnostic support in patients with lack of a definitive diagnosis. The objective of this work is to describe the tomographic findings in patients with COVID-19 and their relationship with the clinical presentation in each of the radiological patterns. According to the Feinstein Criteria, the analytical type of study, with quantifiable, non-experimental data, was cross-sectional from October 2020 to June 2021, obtaining a sample of 227 patients hospitalized in the UAER of the CMJPP. Statistical analysis was performed using Microsoft Excel (2021) and SPSS. According to the radiological classifications, 6.17% (14) presented in the Initial (early) phase of the disease, 46.7% (106) were in progression and 47.14% (107) in the advanced phase of the latter with a higher percentage in the CORADS classification at level 3 with 74.5% in both; Similarly, in advanced onset, the extension with the greatest presentation was severe with 86.96% (93). Tomographic studies played an important role during the COVID-19 pandemic, together with the application of international classifications such as CO-RADS and the classification issued by INER, being considered diagnostic support tools for COVID-19 and patient evolution.

Keywords

COVID-19, TAC, CO-RADS, Appearance/Attenuation, Extension

1. Introduction

In 1965, the human coronavirus (CoV) was first described by Tyrrell, who gave it that name because of the projections that occur on the surface of the particle like a crown [1] [2]. There are multiple agents that cause pneumonia in humans, such as seasonal influenza, adenovirus, other coronaviruses, human bocavirus, parainfluenza 1/2/3 virus, and respiratory syncytial virus; The knowledge about their evolution through molecular techniques has allowed us to have the possibility of diagnosing them in a timely manner and being able to offer a timely treatment for the patient.

In 2002-2004 there was a SARS pandemic, which shares 79% identity with the nucleotide sequence belonging to SARS-CoV-2; This in turn, depends on an exclusive obligate receptor that allows it to enter the cell to start its replication, which is the Angiotensin 2 Converting Enzyme (ACE2) [3]. In December 2019, a new virus was discovered that produced Acute Respiratory Distress Syndrome, which evolved unfavorably until death; SARS-CoV-2 was identified as the causative agent, which is a positive-sense, enveloped, single-strand ribonucleic acid (RNA) virus, which belongs to the Betacoronavirus and the Sarbecovirus subgenus [4]. On March 11, 2020, the WHO (World Health Organization) declared COVID-19 a Pandemic [5].

The first case in Mexico of COVID-19 was announced on February 27 in Mexico City; it was a Mexican resident woman who had traveled to Italy and had mild clinical manifestations; on March 28 two more cases were reported, both were imported and there were still no local ones [5]. The Health Secretary begins phase 3 in Mexico on April 21, in which non-essential activities of the public, private and social sectors are suspended, and the day of healthy distance is extended until May 30, 2020; By this time, there was already evidence of active outbreaks and the spread in national territory with more than a thousand cases [5] [6].

Among the risk factors for severe disease and death, it has been shown that longevity is the most determining risk factor. In the same way, factors that are related to greater severity have been associated and due to this, a greater risk of death is implied. These other factors are cardiovascular diseases, cancer, diabetes mellitus [7]. Metabolic syndrome has been defined as a comorbidity that represents a risk factor, motivating more epidemiological studies to reveal its true impact on severity and mortality rates from COVID-19 and thus determine strategies specific therapeutics for these patients [8].

A method for the classification of information presented on lung images has been developed by the Radiological Society of the Netherlands. "CO-RADS" helps to study the suspicion of lung damage caused by infection due to SARS-CoV-2 on a scale from 0 to 6, denoting a category of either very low or very high suspicion which is has been used in patients with infection in moderate or severe stages [9].

The Dutch Radiological Society created a COVID-19 Reporting and Data Sys-

tem (CO-RADS) that standardizes the assessment scheme and simplifies reporting with a five-point scale of suspicion for COVID-19 pneumonia in chest CT images [10]. The diagnostic performance of CO-RADS for COVID-19 through the interpretation of chest CT images was shown to be excellent, and the interobserver agreement was moderate to substantial [10].

It is known that the incidence, severity, and mortality of COVID-19 pneumonia vary between races and countries [11]; therefore, it is necessary to verify whether the CO-RADS findings from Europe can be applied to Japan. Therefore, we investigated the usefulness of CO-RADS using Japanese chest CT data.

2. Objective

Describe the tomographic findings in patients with COVID-19 and their relationship with the clinical presentation in each of the radiological patterns.

3. Material and Method

3.1. Methodological Design

The research design is observational and analytical, with quantifiable data, not experimental, with inductive interference with a transversal development time.

3.2. Universe and Sample

The universe of the study consisted of 753 patients who were hospitalized with a positive diagnosis of COVID-19 in the period of time from October 2020 to February 2022 in the Respiratory Disease Care Unit (UAER) of the “Dr. Juan Puig Palacios” (CMDJPP) of the Social Security Institute of the State of Tabasco (ISSET), the total number of samples was obtained with the formula for finite samples with a confidence level of 99% and a margin of error of 7.18%, the having a sample of 227 patients carried out by means of probabilistic sampling.

4. Results

The realization of this study included the capture of tomographic interpretations through the use of the ISSET Comprehensive Medical Benefits System (SIPEM) of 227 patients who were hospitalized in the Respiratory Disease Care Unit UAER with a confirmed diagnosis of COVID-19; the distribution was made by gender in a manner heterogeneous with a total of 122 women corresponding to 53.74% and 105 men corresponding to 46.36% (**Figure 1**); According to the data, the oxygen saturation (SaO_2) on admission of the patients was an average of 85.47%, data that according to the pathophysiology of the disease and the critical data for hospital admission indicated supplemental oxygen support reaching ventilation invasive mechanics (IVM).

In relation to radiological classifications, the distribution of the evolution of the disease by assessing the appearance of the lesions is divided into the initial (early) phase, the progression phase, and the advanced phase with 6.16% [12], and 46.70%. (106) and 47.14% (107) respectively (**Figure 2(a)** and **Figure 2(b)**);

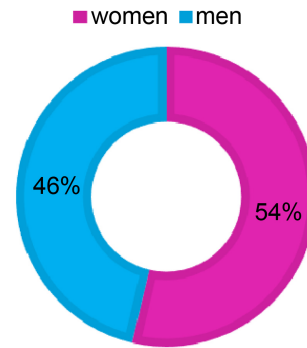


Figure 1. Gender distribution.

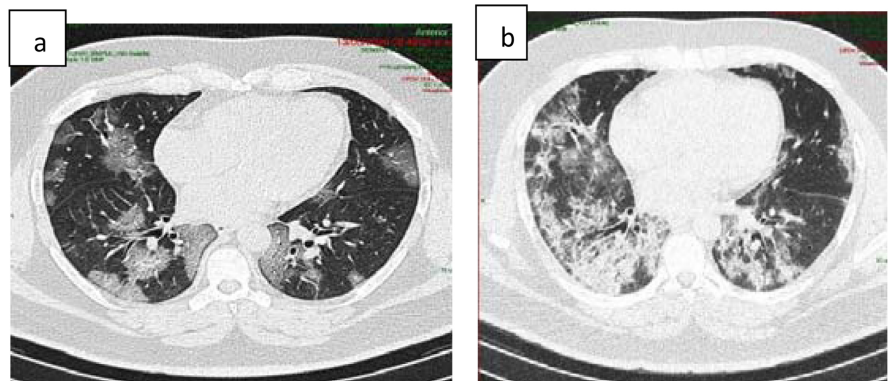


Figure 2. Evolution of the disease by the appearance of the lesions (a) Axial CT in the COVID-positive pulmonary window with ground-glass areas with subpleural distribution associated with septal and peribronchovascular thickening that give a cobblestone appearance characteristic of disease in progression phase. (b) Axial CT in COVID-positive lung window with areas of increased attenuation with air bronchogram and cottony appearance in both bases typical of advanced-stage.

Similarly, gender distribution was found, with 51 men in the progression phase corresponding to 22.47% and 62 women in the advanced phase corresponding to 27.31%.

In accordance with the proposal of the National Institute of Respiratory Diseases (INER), where a semiquantitative evaluation of the extension by lobes was made and an evaluation of the appearance and attenuation of the lesions, it was found that in the progression phase and in the advanced phase they reached with severe extension in 37.01% (84) and 40.97% (93) respectively (**Figure 3** and **Figure 4**).

Finally, a comparison of the classification proposed by INER and the CO-RADS classification was made to assess the suspicion of SARS-CoV-2 infection and the severity of lung lesions according to the phase of admission in which found that of the 227 admitted patients, 4.40% (10) arrived in the initial phase, 34.80% (79) arrived in the progression phase and advanced phase, all three had a CO-RADS 3 classification, which made us suspect diagnosis for COVID-19 but in the same way there was a probability of a diagnosis by negative rt-PCR, 11.89% (27) arrived in an advanced phase with CO-RADS 4, which

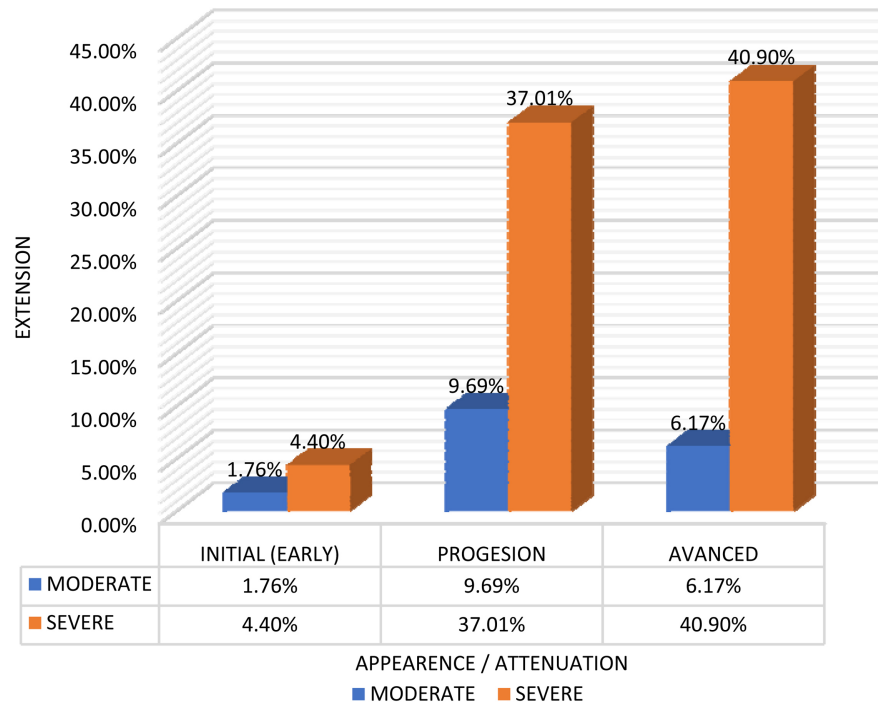


Figure 3. Relationship of the classification proposed by the INER in the sample.



Figure 4. INER classification for severe disease - Axial chest CT in COVID-positive lung window with more than 15 days of evolution, shows septal and peribronchovascular thickening associated with ground-glass areas and bilateral subpleural consolidations affecting more than 75% of lung volume.

meant suspicious findings for COVID-19 and only 0.88% (2) arrived in the progression phase with a CO-RADS 5, which meant typical findings for COVID-19, these patients arrived clinically complicated and had a high risk of IMV with a high probability of death (**Figure 5**). A ROC curve was performed to evaluate the sensitivity and specificity of the diagnostic use of CT for COVID, obtaining 86.8% sensitivity and a specificity of 65.4%.

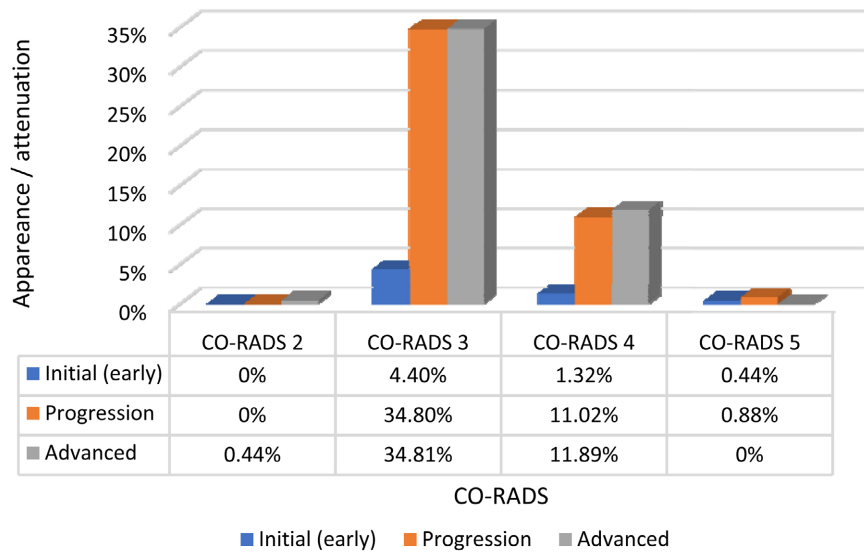


Figure 5. Proposed relationship between INER versus CORADS classification.

5. Discussion

It is important to point out that one of the limitations of the study was that not all patients underwent tomography during their stay, which limited the sample, as well as it was not possible to classify the sample studied by days of evolution and that altered the radiographic patterns.

Radiological studies, especially the use of computed tomography (CT) of the chest, have been of main help for diagnostic support and evolution of the disease by COVID-19 and likewise as a differential of other pathologies that have the same radiological pattern; Pumapillo Garcia & Quispe Castillo [12] emphasizes early management of the disease in its early stages to greatly reduce complications and death, despite the fact that at that time the therapeutic options were not fully defined compared to our study in which it was found that patients arrived in advanced stages where complications were imminent and were at high risk of advanced management of the airway by IMV and even death despite the pharmacological therapies that were administered to improve their health condition.

Soriano Aguadero *et al.* [13] carried out a retrospective study of the chest CTs of 182 patients who had a positive RT-PCR test, in order to have a classification according to the stage and days of disease evolution, where they reported that 60.4% (110) had ground glass opacities, which meant an initial or early phase of the disease (0 - 14 days) where they found uni- or bilateral affection; Compared with our population, which arrived with a cobblestone pattern with 37.01% (84) representing a progression phase (5 - 8 days) and consolidations with 40.97% (93) which was already an advanced phase (9 - 13 days), this shows that the population studied arrived in advanced stages of the disease.

Martinez Chamorro *et al.* [14] describe the importance of using imaging techniques for diagnosis, assessing evolution, guiding treatment and evaluating com-

plications that occur in patients who have a positive diagnosis by rt-PCR where it coincides with chest CT, it has greater sensitivity compared to chest X-ray since it also provides us with alternative diagnoses because other pathologies have the same radiological pattern as COVID-19 disease; The same situation that arose in the population studied at the UAER where chest CT was the diagnostic support that allowed us to differentiate patients admitted for probable COVID-19 from other pathological entities, correlating their symptoms and their underlying pathological history.

6. Conclusions

Tomographic studies played an important role during the COVID-19 pandemic, together with the application of international classifications such as CO-RADS and the classification issued by the INER, considering support tools for the diagnosis of COVID-19 and patient evolution.

In the present project, the main findings were the cobblestone patterns and consolidations with a CO-RADS 3 classification, which demonstrated great affection and prolonged times of the disease, but necessary confirmation of the diagnosis by means of rt-PCR tests. Due to the similarity of radiological patterns in other diseases.

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Conflicts of Interest

There is no conflict of interest in carrying out this study.

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