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COVID or not COVID, key role of CT in diagnosis and evolution : Case report.

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Abstract: *Since December 2019, the world had experienced the emergence of an epidemic novel coronavirus disease named COVID-19 leading to a Public Health Emergency of International Concern (PHEIC).The non-enhanced chest computed tomography (CT) is an important imaging modality for the diagnosis and the management of patients with coronavirus disease 2019 (COVID-19).We present two cases of two young adults, the first one with a recent history of travel coming back from an endemic country who presented dry cough, myalgia, weakness and chest tightness all evolving in a context of low grade fever, the chest CT at admission was suggestive of COVID with positive biological confirmation by the real-time polymerase chain reaction(RT-PCR) test. The second patient had one week history of rhinopharyngitisassociated to a dry cough, headache, myalgia, curvature, all evolving in a context of unencrypted fever who was admitted in the emergency department for acute dyspnea, the chest CT was also suggestive of COVID while the RT-PCR test on admission was negative. During their hospitalization, both patients received a series of RT-PCRtests and multiple pulmonary CT scans (3 times) providing reliable data of the dynamic radiological pattern.Both patients were treated initially with hydroxychloroquine in combination with Azithromycin and was interrupted in the second case.A few days later, the second patient showed a significant radiological improvementwith different chronogical evolution of lung abnormalities.*

We present this case to compare the sensitivity of chest CT and viral nucleic acid test at initial presentation and to highlight the important role played by the chest CT and the chronological evolution of the imaging toorient and straighten the diagnosis.

Keywords: *Imaging, CT, epidemic, COVID 19, RT-PCR.*

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I. Introduction

Coronaviruses are non- segmented, enveloped, positive-sense, single-strand ribonucleic acid viruses, belonging to the Coronaviridae family [1]. In December 2019, an outbreak of unexplained pneumonia in Wuhan [2] was caused by a new coronavirus infection named COVID-19 with an accelerated increase in cases and deaths. Novel COVID-19 may causes diseases ranging from a common cold to severe respiratory disease and death. Imaging is critical in assessing severity and disease progression in COVID-19 infection.The non-enhanced chest CT may be considered for early diagnosis of this newly emerging life threatening infection , even if viral nucleic acid detection using (RT-PCR) remains the standard of reference [3]. The predominant CT findings include ground-glass opacification, consolidation, bilateral involvement, and peripheral and diffuse distribution.

First Case Presentation :

The patient was a 33-year-old man, non smoker, with a recent history of travel coming back from an endemic country and 10 days history ofdry cough, myalgia, weakness and chest tightness all evolving in a context of fever. The patientcalled the emergency number for COVID suspicion. The patient was examined by a special team and the examination revealed a low grade fever (Temperature : 37,9 °C) , respiration rate (20 cpm); pulse (94 bpm); blood pressure (120/60 mmHg), blood oxygen saturation (92%). The remaining examination

was inconspicuous. An initial non enhanced chest computed tomography with multi-planar reconstruction was performed and showed bilateral, central and peripheral, diffuse ground glass opacities interesting the inferior and superior lobes associated tointer- and intralobular septal thickening (crazy-paving pattern) . The extent of lung abnormalities was estimated between 20% and 50%.The first RT-PCR was positive. The patient was treated with hydroxychloroquine in combination with Azithromycin for 10 days. During hospitalization, the second and third RT-PCR tests were still positive while the fourth one was negative. The patient presented a gradual clinical improvement. The control CT at day 10 onset hospitalization revealed a regression of lung abnormalities (Figure 1-Figure 3).

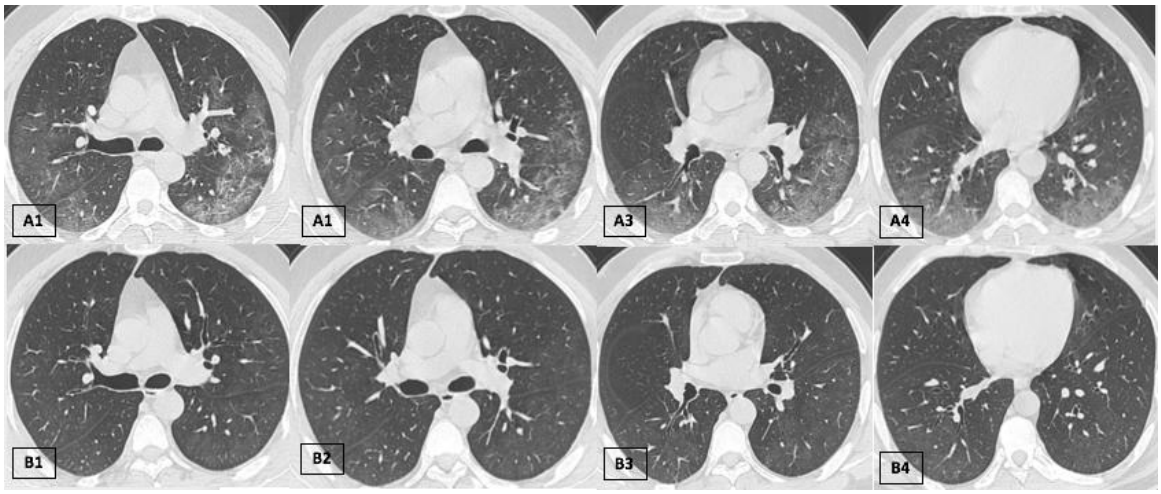

Figure 1 : Axial non-enhanced lung sequences chest computed tomography at presentation in (A1,A2,A3,A4) and control CT respectively at 10 days onset hospitalization in (B1,B2,B3,B4), all images have the same window level and window width : (A1,A2,A3, A4) Bilateral diffuse ground glass opacities interesting the inferior and superior lobes associated to inter- and intralobular septal thickening (crazy-paving pattern). . (B1,B2,B3, B4) : regression of lung abnormalities.

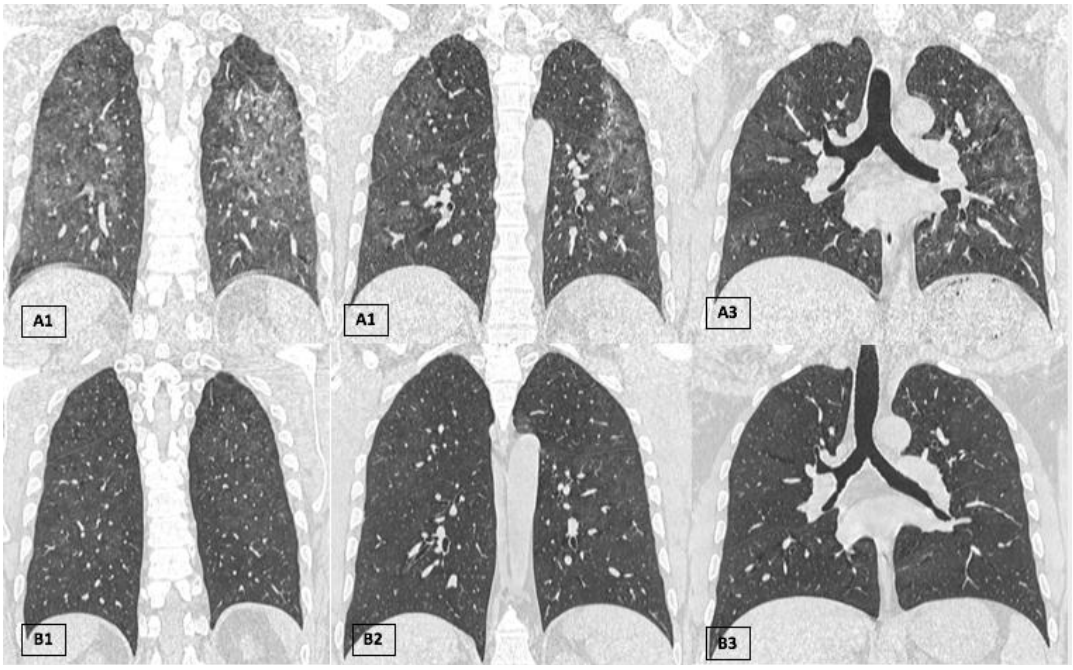

Figure 2 : Coronal non-enhanced lung sequences chest computed tomography at presentation in (A1,A2,A3) and control CT respectively at 10 days onset hospitalization in (B1,B2,B3), all images have the same window level and window width : (A1,A2,A3) Bilateral diffuse ground glass opacities interesting the inferior and superior lobes associated to inter- and intralobular septal thickening (crazy-paving pattern). . (B1,B2,B3) : regression of lung abnormalities.

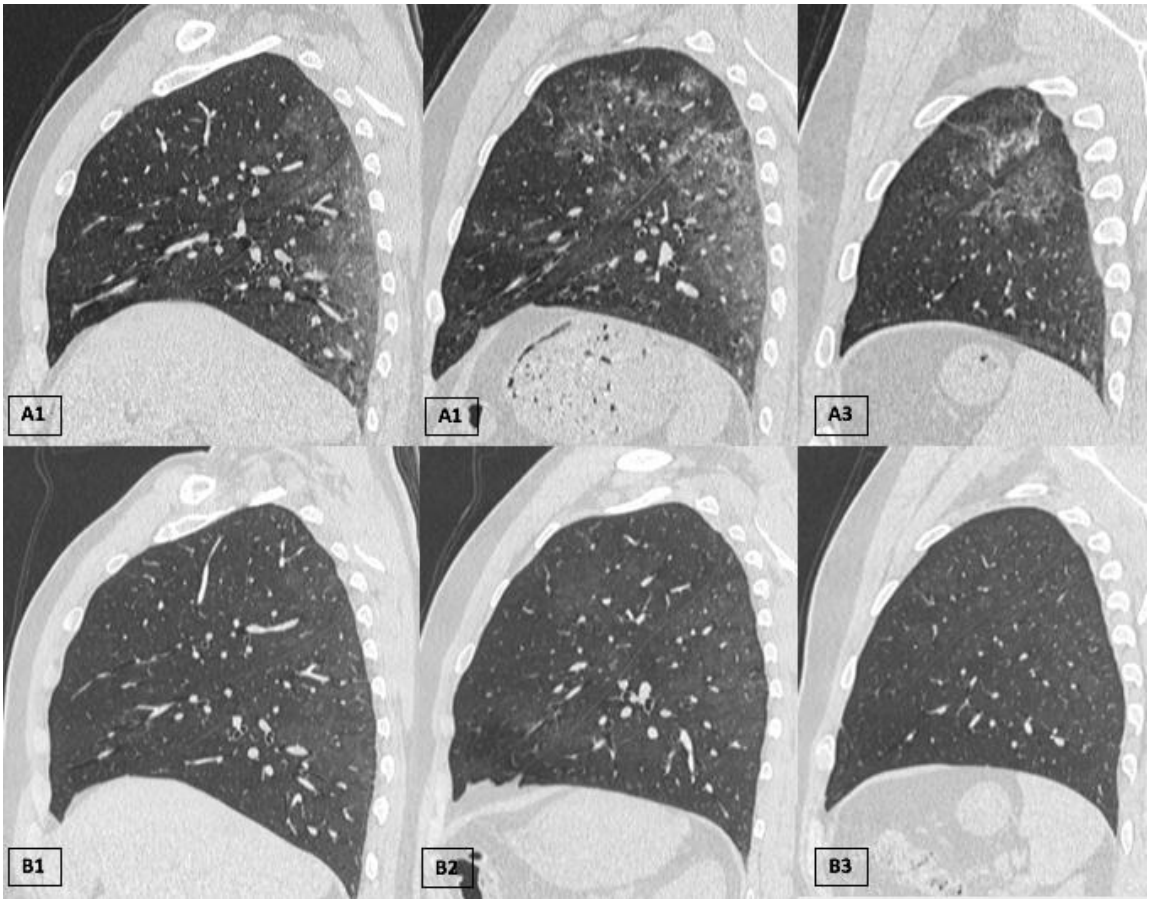

Figure 3 : Sagittal non-enhanced lung sequences chest computed tomography at presentation in (A1,A2,A3) and control CT respectively at 10 days onset hospitalization in (B1,B2,B3), all images have the same window level and window width : (A1,A2,A3) Bilateral diffuse ground glass opacities interesting the inferior and superior lobes associated to inter- and intralobular septal thickening (crazy-paving pattern). (B1,B2,B3) : regression of lung abnormalities.

Second Case Presentation:

The patient was a 40-year-old woman,non smoker,with one week history of rhinopharyngitis associated to a dry cough, headache, myalgia, curvature, all evolving in a context of unencrypted fever. The patient didn't have any recent travel history and had no close contact with an infected individual.She was admitted in the emergency department for acute dyspnea. She presented a low grade fever (Temperature : 37,8 °C) , respiration rate (18 cpm); pulse (96 bpm); blood pressure (110/70 mmHg), blood oxygen saturation (90%). The remaining examination was inconspicuous. Anon enhanced chest computed tomography with multi-planar reconstruction was performed and showed bilateral, central and peripheral, diffuse ground glass opacitiesinteresting the inferior lobes, the right superior and the middle lobes, and small bilateral consolidation areas. The extent of lung abnormalities was estimated between 25% and 50%.The patient was treated initially with hydroxychloroquine in combination with Azithromycin.The first real-time polymerase chain reaction (RT-PCR) was negative. The treatment was interruptedand the patient was underclose monitoring.Three days later,we noticed on the control CTa regression of lung abnormalities and the second RT-PCR test was still negative.She presented a significant clinical improvement including a decrease in dyspnea.Six days onset presentation, the control CT showed almost a complete disappearance of the above mentioned abnormalities (Figure 4 – Figure 7) and the third RT-PCR test was still negative.

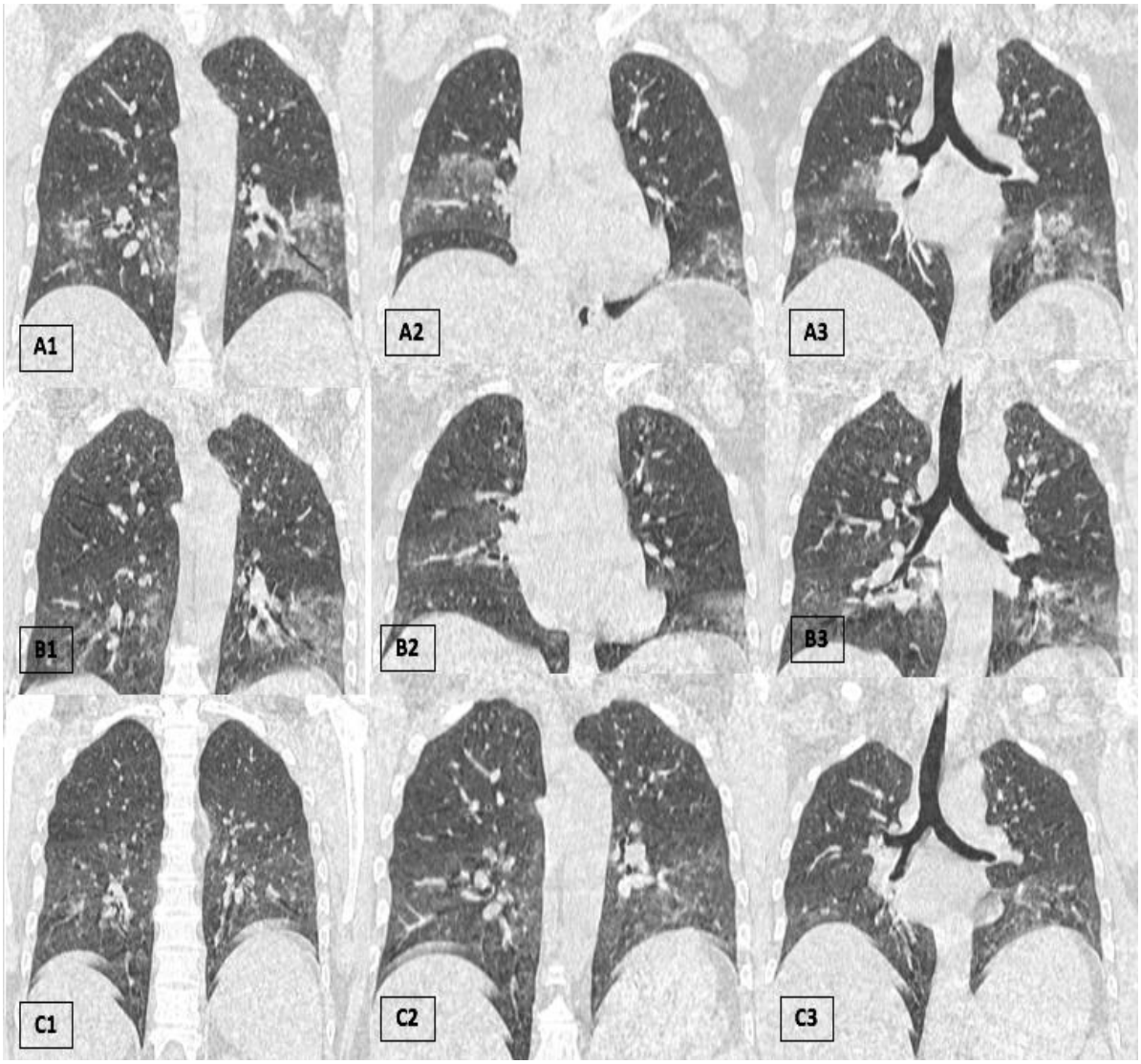

Figure 4 : Coronal non-enhanced lung sequences chest computed tomography at presentation in (A1,A2,A3) and control CT respectively after 4 days in (B1,B2,B3) and after 10 days in (C1,C2,C3) , all images have the same window level and window width : (A1,A2,A3) Bilateral diffuse ground glass opacities interesting the inferior lobes and the superior right lobe associated to a small consolidation areas . (B1,B2,B3 & C1,C2,C3) : progressive disappearance of lung abnormalities.

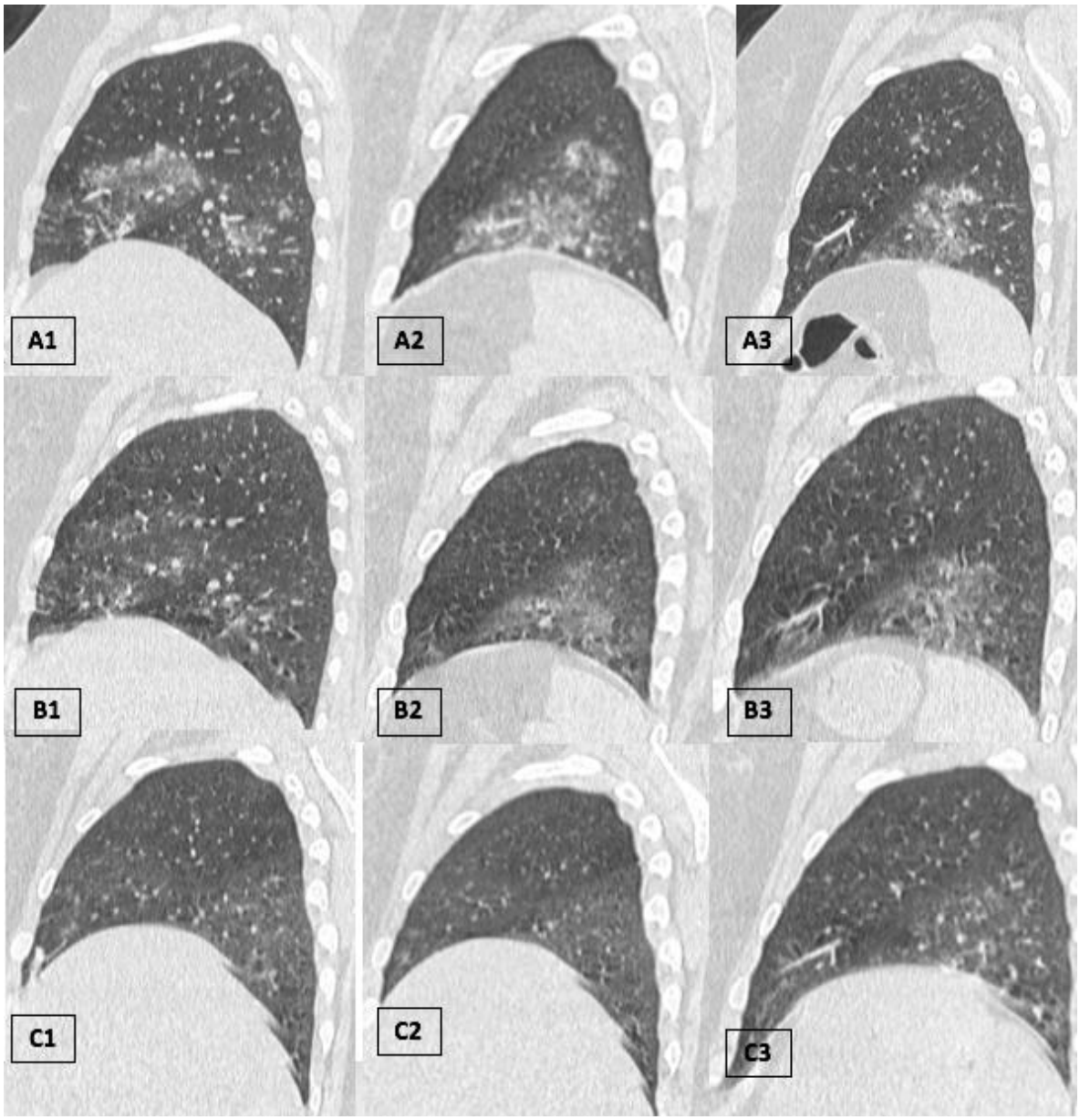

Figure 5 : Sagittal non-enhanced lung sequences chest computed tomography at presentation in (A1,A2,A3) and control CT respectively after 4 days in (B1,B2,B3) and after 10 days in (C1,C2,C3) , all images have the same window level and window width : (A1,A2,A3) Bilateral diffuse ground glass opacities interesting the inferior lobes and the superior right lobe associated to a small consolidation areas . (B1,B2,B3 & C1,C2,C3) : progressive disappearance of lung abnormalities.

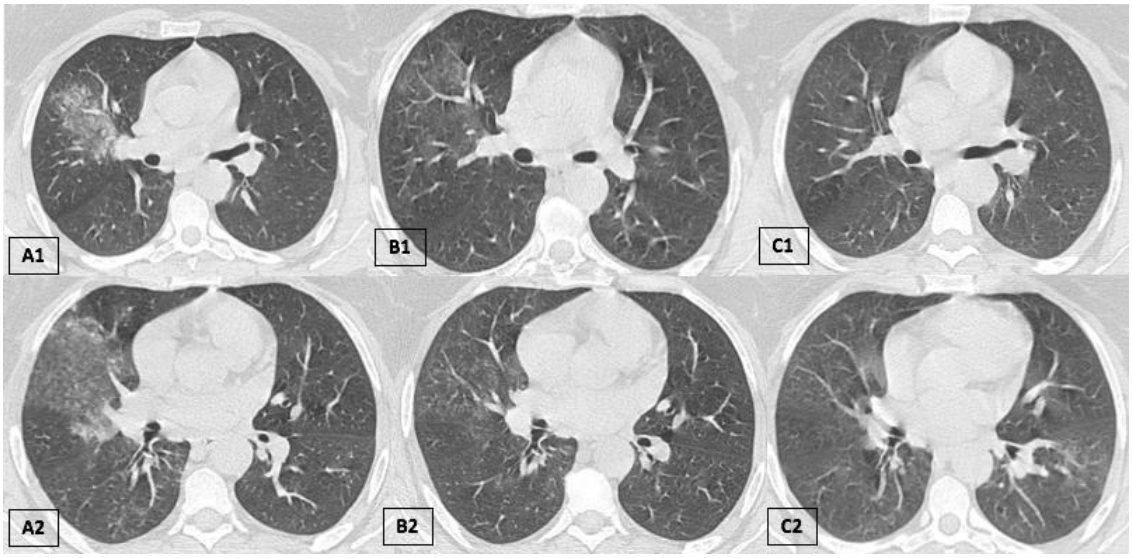

Figure 6 : Axial non-enhanced lung sequences chest computed tomography at presentation in (A1,A2) and control CT respectively after 4 days in (B1,B2) and after 10 days in (C1,C2) , all images have the same window level and window width : (A1,A2) diffuse peripheral and central ground glass opacities interesting the superior right lobe progressively disappearingon control CT (B1,B2 & C1,C2).

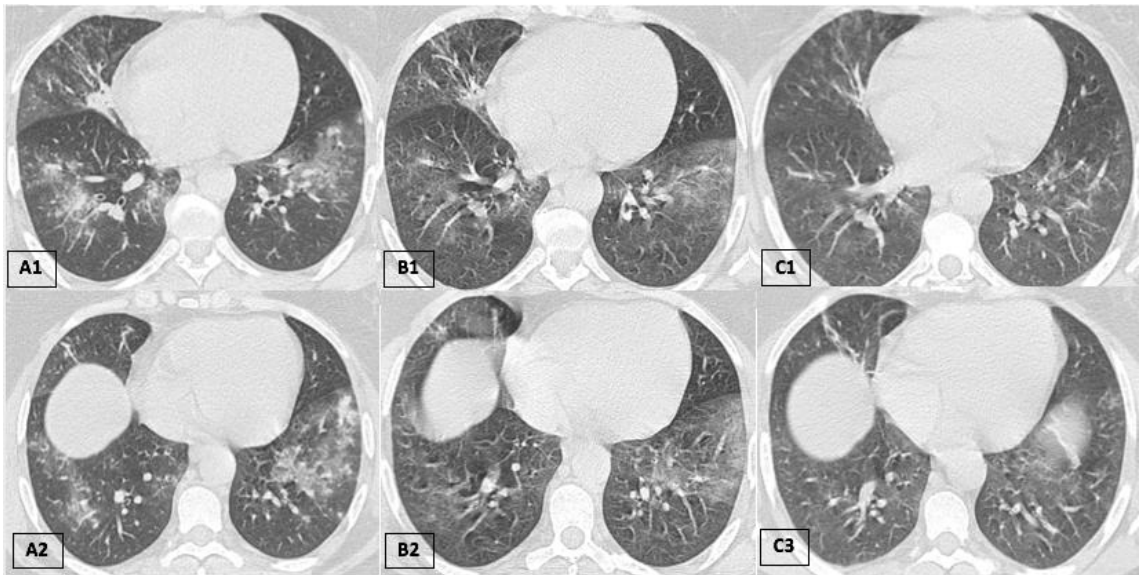

Figure 7 : Axial non-enhanced lung sequences chest computed tomography at presentation in (A1,A2) and control CT respectively after 4 days in (B1,B2) and after 10 days in (C1,C2) , all images have the same window level and window width : (A1,A2) Bilateral diffuse peripheral and central ground glass opacities interesting the inferior lobes and the middle lobe associated to small bilateral consolidation areas progressively diseappearing on control CT (B1,B2 & C1,C2).

II. Discussion :

Thoracic imaging based on chest radiography and computed tomography (CT) are key tools for pulmonary disease diagnosis and management, however performing radiological examinations including CT for a large number of patients suspected or confirmed to have COVID-19 is challenging during an outbreak because of the multiple constraints of adherence to infection control protocols to minimize the risk of transmission and also to protect healthcare personnel**[4].**

To this intent, the Fleischner society has worked on a multinational consensus to guide and optimize the use of imaging in patient management during the COVID-19 pandemic and has developed different scenarios based on the severity features consistent with COVID 19, pre-test probability and resource constraints**[5].**

Among the scenarios proposed is that of patients with moderate to severe characteristics compatible with COVID-19 infection, any pre-test probability of COVID-19 infection, and no significant critical resource

constraints and in whom it was recommended to perform the chest CT.This applies in our second case who presented moderate features consistent with COVID-19 infection worsening the respiratory status, with negative pre-test probability of COVID-19 infection and in which it was deemed necessary to perform the chest CT .

Since the advent of COVID 2019, several studies have described a large variety of CT abnormalities for this disease that have been grouped together in the Salehi study **[6]**The main radiological patterns and the distribution characteristics on CT are : ground glass opacification (GGO) (88.0%), bilateral involvement (87.5%), multilobe involvement (78.8%), peripheral distribution (76.0%). The association of isolated GGO and consolidative opacities were frequent. Other CT findings included interlobular septal thickening, bronchiectasis, pleural thickening, and subpleural involvement, with various rates across the studies **[7,8].**In both cases, the ground glass opacities presented the main pattern with multilobar and bilateral involvement, the distribution was peripheral and central.In the first case, there was inter- and intralobular septal thickening (crazy-paving pattern)while in the second case there was partial consolidation areas.

Feng Pan and colleagues **[9]** discuss the CT findings and temporal changes and evolution of COVID-19 pneumonia with reference to the time of onset of initial symptomand four lung involvement were defined on CT :

1-Early stage (0-4 days) : negative findings (normal) or subpleural distribution of GGO in the lower lobe unilaterally or bilaterally.

2-Progressive stage (5-8 days): rapid propagationof infection with bilateral and multi-lobe distribution, diffuse GGO, crazy-paving pattern and consolidation.

3-Peak stage (9-13) : The affected area of the lungs slowly increased to the peak involvement and dense consolidation became more prevalent. Findings included diffuse GGO, crazy-paving pattern, consolidation, and residual parenchymal bands.

4-Absorption stage (≥14 days): Gradual absorption of pulmonary consolidation is observed with absence of crazy-paving.Pulmonary abnormalities may persist beyond 26 days after onset of symptoms.

In the first case, the patient presented three positive RT-PCR tests and Chest CT abnormalities suggesting novel COIVD 19 disease at admission. The radiological evolution of the pulmonary abnormalities on the CT follows the usual pattern of the evolution of the radiological abnormalities of the disease. The positive value of PCR three times and which became negative after completion of treatmentalso confirmed the diagnosis.

In the second case, the patient had evidence of initial abnormal CT compatible with viral pneumonia at baseline while the RT-PCR was negative three times. The CT is sensitive for the detection of anomalies but is not specific, however the evolution of lung abnormalities was shorter and different from the usual radiological evolution pattern of COVID.

The CT helps toorient the diagnosis. The abnormalities must be analyzed with caution and it is necessary to follow the radiological evolution of the abnormalities.

III. Conclusion:

Even if viral nucleic acid detection using (RT-PCR) remains the standard of referencefor diagnosis of this newly emerging life threatening infection, the CT has a key role for diagnosis at admission and the chronological evolution of imaging abnormalities helps to orient and straighten the diagnosis.

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References :

[1]. Weiss SR, Leibowitz JL. Coronavirus pathogenesis. Adv Virus Res 2011;81:85-164.
[2]. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet, 2020 Jan 30. Doi:10.1016/S0140-6736(20)30211-7.
[3]. Fang Y, Zhang H, Xie J, Lin M, Ying L, Pang P, Ji W. Sensitivity of Chest CT for COVID-19: Comparison to RT-PCR. Radiology. 2020 Feb 19:200432. Doi: 10.1148/radiol.2020200432.
[4]. Mossa-Basha M, Meltzer CC, Kim DC, Tuite MJ, Kolli KP, Tan BS. Radiology Department Preparedness for COVID-19: Radiology Scientific Expert Panel. Radiology 2020:200988. doi: 10.1148/radiol.2020200988
[5]. Geoffrey D. Rubin , Christopher J. Ryerson, Linda B. Haramati, Nicola Sverzellati, Jeffrey P. Kanne, Suhail Raoof, Neil W. Schluger, Annalisa Volpi, Jae-Joon Yim, Ian B. K. Martin, Deverick J. Anderson, Christina Kong, Talissa Altes, Andrew Bush, Sujal R. Desai, Jonathan Goldin, Jin Mo Goo, Marc Humbert, Yoshikazu Inoue, Hans-Ulrich Kauczor, Fengming Luo, Peter J. Mazzone, Mathias Prokop, Martine Remy-Jardin, Luca Richeldi, Cornelia M. Schaefer-Prokop, Noriyuki Tomiyama, Athol U. Wells, Ann N. Leung.The Role of Chest Imaging in Patient Management during the COVID-19 Pandemic: A Multinational Consensus Statement from the Fleischner Society. Radiology. https://doi.org/10.1148/radiol.2020201365
[6]. Sana Salehi, Aidin Abedi, Sudheer Balakrishnan and Ali Gholamrezanezhad. Coronavirus Disease 2019 (COVID-19): A Systematic Review of Imaging Findings in 919 Patients. American Journal of Roentgenology: 1-7. Doi : 10.2214/AJR.20.23034
[7]. Kim JY, Choe PG, Oh Y, et al. The first case of 2019 novel coronavirus pneumonia imported into Korea from Wuhan, China: implication for infection prevention and control measures. J Korean Med Sci 2020; 35:e61

[8]. FangY,ZhangH,XuY,XieJ,PangP,JiW.CT manifestations of two cases of 2019 novel corona- virus (2019-nCoV) pneumonia. Radiology 2020 Feb 7 DOI:10.1148/radiol.2020200280

[9]. Feng Pan, Tianhe Ye, Peng Sun, Shan Gui, Bo Liang, Lingli Li, Dandan Zheng, Jiazheng Wang, Richard L. Hesketh, Lian Yang , Chuansheng Zheng. Time Course of Lung Changes On Chest CT During Recovery From 2019 Novel Coronavirus (COVID-19) Pneumonia.Radiology. DOI :10.1148/radiol.202020037

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