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The Chest CT Scanner in the Diagnosis of COVID 19 Infection, Experience of Radiology Department of University Hospital of Marrakech, Morocco

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Abstract **Original Research Article**

Introduction: To optimize patient management, medical care and pandemic control, it is important to determine the effectiveness of chest CT scan to distinguish COVID-19 from other types of pneumonia. The objective of our work is to present the contribution of the chest CT scan in the diagnosis of Covid-19 viral infection. ***Material and method:*** This is a prospective study carried out from 20 March 2020 to 31 May 2020, of 444 cases identified in the radiology department of university hospital of Marrakech, concerning all patients with a clinical suspicion of coronavirus infection. ***Results:*** The average age of our patients was 52 years, with extremes ranging from 15 to 93 years, a sex H/F ratio of 1.41. Hypertension, diabetes and smoking were the most common co-morbidities. The most common clinical signs were cough, dyspnea and fever. The radiological signs most frequently found were the peripheral ground glass opacification of the posterior regions, followed by consolidations, less frequently the crazy paving, halo sign and reverse halo sign, 2 cases of unilateral form versus 119 cases of bilateral form. The percentage reached was as follows: Minimal (<10%): 37 cases, Moderate (10-25%): 25 cases, Extensive (25-50%): 24 cases, Severe (50-75%): 15 cases, Critical (>75%): 5 cases. The differential diagnosis mainly found were bronchopneumonia, exacerbations of bronchiectasis, cardiac decompensations and tuberculosis. The scanner-PCR correlation was as follows: PCR - / CT -: 106 cases, PCR + / CT +: 72 cases, PCR -/ CT +: 30 cases, PCR + / CT-: 16 cases, CT - / PCR not done: 198 cases, CT + / PCR not done: 19 cases. ***Conclusion:*** The scanner has had a central role in the management of patients with respiratory symptoms in this pandemic. This review also assessed the severity of lung disease, monitored disease progression based on worsening lesions, and participated in the patient referral decision (COVID vs Non-COVID unit) anticipating PCR data.

Keywords: CT imaging findings, COVID-19, ground glass opacities, thin-section chest CT, Radiology.

INTRODUCTION

It was in China precisely in the city of Wuhan in December 2019, that cases of pneumomy of unexplained cause were reported, which led specialists to take samples from the lower respiratory tract to determine the nature of the implicated germ. the results were in favor of a new type of coronavirus. World Health Organization named it coronavirus disease 2019 (COVID-19) [1].

Cronavirus disease has a respiratory affinity, the most frequent clinical signs are cough, fever, fatigue and myalgia [2, 3]. Even in the incubation phase, the patient carrying the virus is a contaminant, hence Radiological examinations are of great help in the diagnosis and follow-up of patients with COVID-19. They have the advantage of providing rapid diagnosis and ease of execution.

The chest x-ray may turn out to be normal, especially at the early stage of the disease, without being able to detect ground glass opacities (GGO), it is where the thin-section thoracic computed tomography intervenes to play a crucial role in assisting diagnosis [4].

MATERIAL AND METHOD

This is a prospective study carried out from 20 March 2020 to 31 May 2020, of 444 cases identified in the radiology department of university hospital of Marrakech; concerning all patients with a clinical suspicion of coronavirus infection.

RESULTS

444 patients were enrolled sexe ratio H/F of 1.41. The average age of patients was 52 years old, (15-93years old). Almost all patients had a clear exposure to

COVID-19. Major comorbidities were represented by high blood pressure with 22%, diabetes 19%, smoking 15%, tuberculosis 10%, kidney failure 8.6%, obstructive pulmonary disease 4% and heart disease 4%. 333 patients had clinical signs, 113 were asymptomatic. Among these symptomatic patients, 20% had fever, 30% shortness of breath, 36 % cough, 2 % vomiting and diarrhea and only 0.6% presented anosmia. CT findings at admission showed abnormalities in all patients. 323 scanners did not object to any abnormalities while 121 scanners were anomalous. More than half of the patients (119, 98%) presented bilateral lesions; 2 (1.6%) patients showed unilateral lung distribution. The most common pattern of CT findings was GGO (116,95%), including patchy ground-glass opacities in 106 cases (91%) (Figure 1A) nodular GGO in 10 cases (8.6%) (Figure1B), peripheral distribution of GGO in 98 cases (84%), central distribution in 10 cases (8,6%) mixt in 50 cases. The second CT feature was consolidation (93,76%), including patchy consolidations in 85 cases (81%) (Figure 2B) band consolidation in 15 cases (17%) (Figure 2A), peripheral distribution of consolidation in 71 cases (76%), basal in 78 cases (83%). Other signs are also found, crazy paving in 56 cases (46%), halo sing in 8 cases (6.6%), reversed halo sign in 2 cases (1.6%) and vascular Thickening in 11 cases (9%). (Figure 3 A-B) The extent of the invasion was minimal in 37 cases (30%), moderate in 25 cases (20%), extended in 24 cases (19%), sever in 15 cases (12%) and critical in 5 (4%) (Figure-4). We had some lesion association with other pathology, like pneumothorax, obstructive bronchopneumopathy, histiocytosis X, lymphoma and bronchial carcinoma (Figure-5). The scanner-PCR correlation was as follows; PCR- / CT-:106 cases, PCR+ / CT+:72 cases, PCR- / CT+:30 cases, PCR+ / CT-:16 cases, CT- / PCR not done: 198 cases, CT+ / PCR not done: 19 cases (Board-1). The scanner demonstrated a sensitivity of 82 % and specificity of 78%

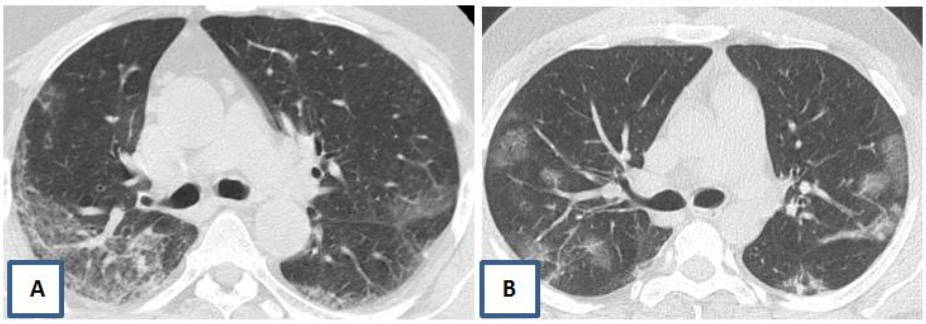

Fig-1: Chest CT with axial plane showing: A - Patchy ground-glass opacities in the bilateral lower lung lobes. B - Minimal nodular ground-glass opacities in the bilateral lower lung lobes

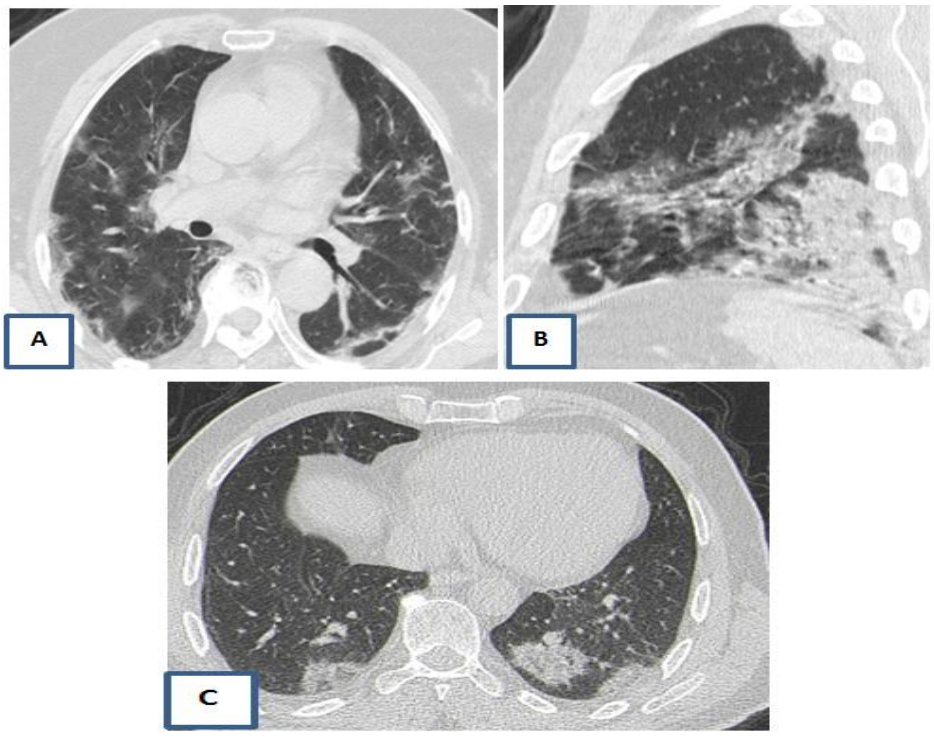

Fig-2: A-Chest CT with axial plane showing bilateral subpleural multifocal patchy consolidations, with lower lobe dominance typical of SARS-CoV2 pneumonia. B-Chest CT with sagittal plane showing band subpleural consolidations. C -Chest CT with axial plane showing minimal nodular consolidations

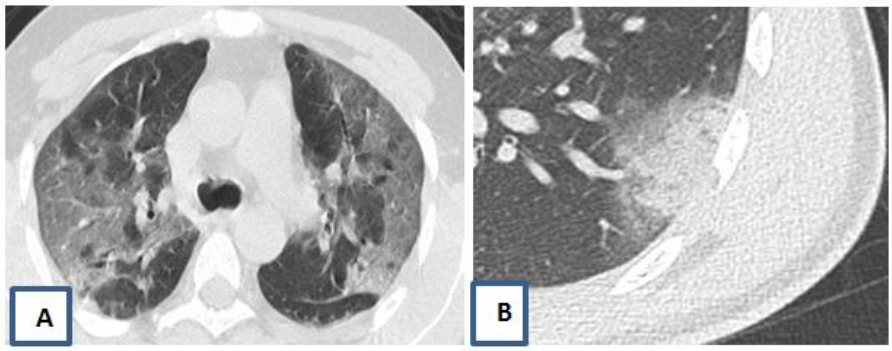

Fig-3: Chest CT with axial plane showing other signs: A- Ground-glass opacity with superimposed interlobular septal thickening and intralobular septal thickening « crazy paving » B- Nodule with ground-glass halo in the left lower lobe « halo sing »

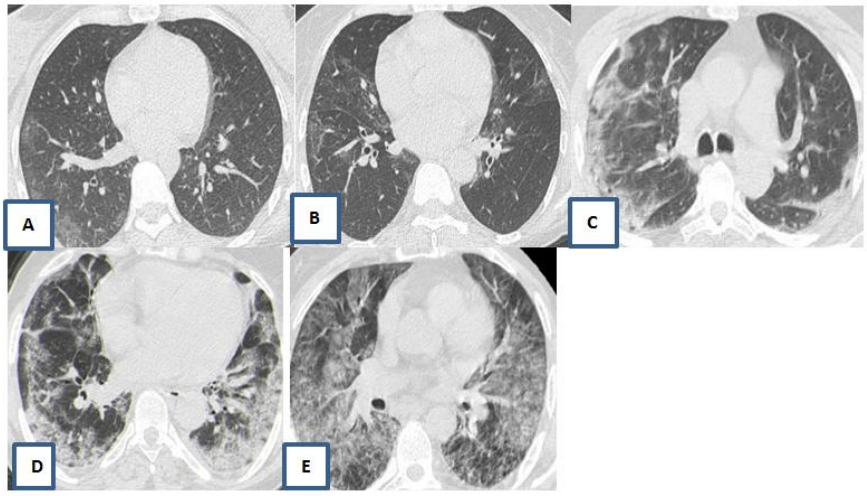

Fig-4: Chest CT with axial plane showing the extent of the invasion: minimal (A), moderate (B), extended (C) sever cases (D) and critical (E)

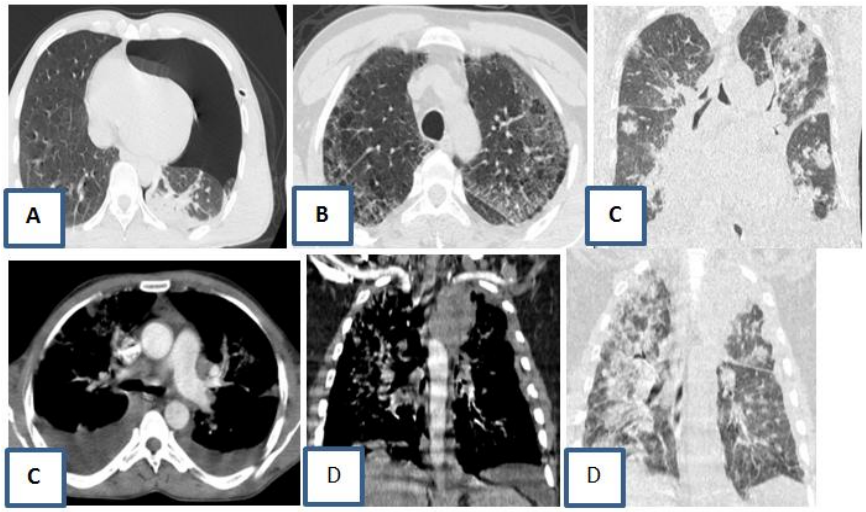

Fig-5: Chest CT with axial and coronal planes shows some association lésionnel with other pathology; A: Pneumothorax with covid 19; B: Histiocytosis X with covid 19; C: Lymphoma and pulmonary embolism with covid 19; D: Bronchial carcinoma with covid 19

Board-1: Showing the scanner-PCR correlation

	PCR +	**PCR-**
Scanner +	VP: 72 case	FP :30 case
Scanner -	FN: 16 case	VN:106 case

DISCUSSION

From the onset of the disease until May, there have been over 156,000 cases of cronavirus disease on different continents [5-9].

This new disease threatens the biosecurity of the planet [10]. This requires a preparation on different levels involving the preventive, diagnostic, therapeutic and epidemiological [11].

In the literature [12] the most frequent comorbidities were similar to those in our studies with first hypertension, diabetes, followed by cardiovascular disease and respiratory disease.

Our study joined the literature with clinical signs mainly represented by fever and cough, followed by myalgia and dyspnea, the involvement in adults far exceeding the involvement in children [4, 5, 11].

The pulmonary involvement is bilateral more marked on the peripheral subpleural area, all the lobes are affected with a predominance of the lower lobes, the most frequent semiological sign was typically the GGO, the consoldation with the air bronchogram , the interlobular septal thickening and adjacent pleural thickening [16-18].

Our results were consistent with the literature, we found that the most frequent radiological sign was GGO with bilateral peripheral subpleural distribution [19]. All the lobes were affected especially the lower lobes. The other signs were represented by consolisations with the air bronchogram, septal thickening and more rarely pleural effusion, the sign of the inverted halo and lymphadenopathy.

Computed tomography has a very high sensitivity in the diagnosis of COVID-19 but a low specificity that cannot rule out other types of viral pneumonia [20].

Although the gold standard in the diagnosis of coronavirus disease is the detection of viral nucleic acid using RT-PCR, there are some studies [21, 22] which have shown radio-bilogical discordance, with negative RT-PCR results and abnormal CT imaging, which supports the sensitivity of computed tomography by several studies [23, 24] with a rate of 97% in a case series of 1,014 patients. The results of our study also showed that the sensitivity of the thoracic computed tomography was 82%, this shows the crucial role of the computed tomography in the detection of early lung lesions especially in epidemic areas.

In a review of 356 patients with COVID-19 [25], 11.5% had positive RT-PCR results and normal CT imaging. The low specificity of the tomodensitometry; does not exclude the diagnosis of Covid-19 on only radiological arguments.

CONCLUSION

Imaging and more specifically computed tomography play an important role in the diagnosis and follow-up of patients with COVID-19 but the diagnostic confirmation is always radio-bilogical.

REFERENCES

1. She J, Jiang J, Ye L, Hu L, Bai C, Song Y. 2019 novel coronavirus of pneumonia in Wuhan, China: emerging attack and management strategies. Clin Transl Med. 2020;9(1):19.
2. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The lancet. 2020 Feb 15;395(10223):497-506.
3. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Yu T. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. The lancet. 2020 Feb 15;395(10223):507-13.
4. Bao C, Liu X, Zhang H, Li Y, Liu J. Coronavirus disease 2019 (COVID-19) CT findings: a systematic review and meta-analysis. Journal of the American college of radiology. 2020 Jun 1;17(6):701-9.
5. World Health Organization. Novel coronavirus (2019-nCoV) - situation report - 10 - 30 January 2020. https://www.who.int/docs/default-source/coronaviruse/ situation-reports/20200130-sitrep-10-ncov.pdf?sfvrsn=d0b2e480_2.2020.
6. World Health Organization. Pneumonia of unknown cause – China. https://www. who.int/csr/don/05-january-2020-pneumonia-of-unkown-cause-china/en/.2020.
7. Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time. Lancet Infect Dis. 2020. https://doi.org/10.1016/S1473-3099(20) 30120-1.
8. World Health Organization. Statement on the meeting of the international health regulations (2005) emergency committee regarding the outbreak of novel coronavirus (2019-nCoV). https://www.who.int/news-room/detail/23-01-2020- statement-on-the-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov; 2020.
9. World Health Organization. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel Rodriguez-Morales AJ. Travel Medicine and Infectious Disease 34 (2020) 101623 12 coronavirus (2019-nCoV). https://www.who.int/news-room/detail/30-01-2020- statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov; 2020.
10. Wu F, Zhao S, Yu B, Chen YM, Wang W, Song ZG, Hu Y, Tao ZW, Tian JH, Pei YY, Yuan ML. A new coronavirus associated with human

respiratory disease in China. Nature. 2020 Mar;579(7798):265-9.
11. Paules CI, Marston HD, Fauci AS. Coronavirus infections-more than just the common cold. J Am Med Assoc. 2020.
12. Sun P, Qie S, Liu Z, Ren J, Li K, Xi J. Clinical characteristics of 50466 hospitalized patients with 2019-nCoV infection. J Med Virol. 2020. https://doi.org/10.1002/ jmv.25735.
13. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Yu T. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. The lancet. 2020 Feb 15;395(10223):507-13.
14. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The lancet. 2020 Feb 15;395(10223):497-506.
15. Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, Ren R, Leung KS, Lau EH, Wong JY, Xing X. Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. New England journal of medicine. 2020 Jan 29.
16. Chong S, Kim TS, Cho EY. Herpes simplex virus pneumonia: highresolution CT findings. Br J Radiol. 2010;83:585-9.
17. Wong KT, Antonio GE, Hui DS, Lee N, Yuen EH, Wu A, Leung CB, Rainer TH, Cameron P, Chung SS, Sung JJ. Thin-section CT of severe acute respiratory syndrome: evaluation of 73 patients exposed to or with the disease. Radiology. 2003 Aug;228(2):395-400.
18. Das KM, Lee EY, Jawder SE, Enani MA, Singh R, Skakni L, Al-Nakshabandi N, AlDossari K, Larsson SG. Acute Middle East respiratory syndrome coronavirus: temporal lung changes observed on the chest radiographs of 55 patients. American Journal of Roentgenology. 2015 Sep;205(3):W267-S274.
19. Hou K, Zhang N, Li T, Zhou M, Shi X, Zhao G. CT features of corona virus disease 2019 (COVID-19) in different stages and its correlation with neutrophil-lymphocyte (NLR) and T lymphocyte subsets. Radiol Pract. 2020;35:272-6.
20. Li Q, Peng XH, Sun ZY, Shao JB. Clinical and imaging characteristics of children with coronavirus disease 2019 (COVID- 19). Radiol Practice. 2020;35:277-80.
21. Zhan Y, Liu H, Li K. Preliminary Finding of SARS-CoV-2 Infection: Clinical and Chest CT Features. Chinese Computed Medical Imaging. 2020. doi: 10.19627/j.cnki.cn31-1700/th.20200316.001.
22. Meng C, Chen Y, Liu K. CT features of COVID-2019: a study of 20. Gongdong Medicine Journal, 2020. doi: 10.13820/j.cnki.gdyx.20200697.
23. Han R, Huang L, Jiang H, Dong J, Peng H, Zhang D. Early Clinical and CT Manifestations of Coronavirus Disease 2019 (COVID-19) Pneumonia. AJR Am J Roentgenol. 2020:1-6.
24. Yueying PA, Yujin WA, Tingting ZH. CT features of 938 senile patients with corona virus disease 2019 pneumonia. Radiologic Practice. 2020;35(3):269-71.
25. Hou K, Zhang N, Li T, Zhou M, Shi X, Zhao G. CT features of corona virus disease 2019 (COVID-19) in different stages and its correlation with neutrophil-lymphocyte (NLR) and T lymphocyte subsets. Radiol Pract. 2020;35:272-6.