Role of Chest CT in Diagnosis corona virus.

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1. Abstract

Coronavirus disease 2019 (*COVID-19*) has become a rapid worldwide pandemic. While *COVID-19* primarily manifests as an interstitial pneumonia and severe acute respiratory distress syndrome, severe involvement of other organs has been documented. In this article, will review the role of non-contrast chest computed tomography in the diagnosis, follow-up and prognosis of patients affected by *COVID-19* pneumonia with a detailed description of the cases of isolations

Objective: To identify the role of *High-Resolution Computed Tomography chest* and summarize characteristics of chest *CT* imaging for the diagnosis and evaluation of *COVID-19* patients.

Methodology: This study included the 663 totally patients with a diagnosis

of *COVID-19* infection confirmed by CT scan diagnostic divided to three isolation centers **maitiga** Isolation Center, **Aswany** Isolation Center, **Airport Road** Isolation Center in three months ,January, February and march

study tools: A form was prepared to register the cases that were examined, and this form included (number of cases _ age _ gender _ devices used _ degree of infected severity of the cases) The form was filled out with the help of the archives in the radiology department, for a *CT scan* in the isolation centers located in Tripoli

This study conclude the *tomography device* is one of the devices that have already contributed to detecting the *Corona virus*, and it may not be considered the first line for detecting the virus, but its role is important in confirming the severity of the infection and the actual confirmation of infection through early detection. The three months were compared to other centers, as a result of receiving cases for 24 hours and allocating an external room to receive all suspected cases, as well as an increase in cases of infection, the male category compared to the female category.

Key words: Coronavirus, computed tomography, isolation hospital.

2. Introduction.

In December 2019, a novel pathogenic human coronavirus, called 2019 novel coronavirus, was identified in Wuhan, Hubei Province, China (Zhu N, Zhang D, Wang 2019-2020). It can achieve human-to-human transmission between close contacts, and can cause serious coronavirus disease (COVID-19), especially pneumonia (Li Q, Guan, et al 2020). On January 30, 2020 the World Health Organization (WHO) announced that the outbreak of COVID-19 has become a Public Health Emergency of International Concern, and further declared it a pandemic on March 11, 2020. Although the Chinese government has adopted timely and effective measures to prevent and control the spread of COVID-19, the scope and effect of this outbreak is rapidly evolving [Wu Z, McGoogan JM2019]. As of March 20, 2020, there were 81,263 confirmed cases, 3250 deaths and 70,560 recovered cases in China. Thanks to its high-resolution and lack of the overlap of organizational structures, chest computed tomography (CT) is an important noninvasive examination for the diagnosis of lung disease. The aim of this article is to review the chest CT features and analyze its value in this COVID-19 pandemic . Chest computed tomography plays significant role in the detection, evaluation and management of coronavirus infection (M. Li, P. Lei, B. Zeng(2020)). Computed tomography has superiority over plain chest imaging because it is very easy to miss GGO by using plain radiography. So, it is recommended to use computed tomography for the early detection of coronavirus infection (H.-W. Zhang, J (2020)). The important characteristic of the scanning is to focus the GGO along with or without solid masses near the borders of the inferior and dorsal pulmonary areas. (Salehi, A. Abedi, 2020)). The unusual findings are fluid in the pleural cavity, lymph enlargement, lung cavitation and calcification as well (X. Li, X. Zeng, (2020)). Thin-section chest computed tomography is effectual in the diagnosis of lung infection caused by a coronavirus and assess the progression of the disease (Chan JF-W, S. (2020)). The severity of lung involvement in coronavirus disease 2019 is assessed by the radiologic features of chest CT scan (F. Pan, T. Ye, P. Sun, (2020)).

3. Literatures review:

Role of High Resolution Computed Tomography chest in the diagnosis and evaluation of COVID -19 patients -A systematic review and meta-analysis. (Ahmed Ishfaq a,* et al,) European Journal of Radiology Open 8 (2021).

In this review, 28 studies (total 2655 patients) were included. Classical findings were Ground Glass Opacities (GGO) (71.64 %), GGO with consolidation (35.22 %), vascular enlargement (65.41 %), sub pleural bands (52.54 %), interlobular septal thickening (43.28 %), pleural thickening (38.25 %), and air Broncho grams sign (35.15 %). The common anatomic distribution of infection was bilateral lung infection (71.55 %), peripheral distribution (54.63 %) and multiple lesions (74.67 %). The incidences were higher in in the left lower lobe (75.68 %) and right lower lobe (73.32 %). A significant percentage of patients had over 2 lobes involvement (68.66 %). Conclusion: Chest CT-scan is a helpful modality in the early detection of COVID-19 pneumonia. The GGO in the peripheral areas of lungs with multiple lesions is the characteristic pattern of COVID-19. The correct interpretation of HRCT features makes it easier to detect COVID-19 even in the early phases and the disease progression can also be accessed with the help of the follow-up chest scans.

CT imaging changes of corona virus disease 2019(COVID-19)

study in Southwest China. Li et al. J Transl Med (2020) 18:154

A total of 100 (76%) patients had a history of close contact with people living in Wuhan, Hubei. The clinical manifestations of COVID-19 included cough, fever. Most of the lesions identified in chest CT images were multiple lesions of bilateral lungs, lesions were more localized in the peripheral lung, 109 (83%) patients had more than two lobes involved, 20 (15%) patients presented with patchy ground glass opacities, patchy ground glass opacities and consolidation of lesions co-existing in 61 (47%) cases. Complications such as pleural thickening, hydrothorax, pericardial effusion, and enlarged mediastinal lymph nodes were detected but only in rare cases. For the follow-up chest CT examinations (91 cases), We found 66 (73%) cases changed very quickly, with an average of 3.5 days, 25 cases(27%) presented absorbed lesions, progression was observed in 41 cases (46%), 25 (27%) cases showed no significant changes.

This study concluded to the Chest CT plays an important role in diagnosing COVID-19. The imaging pattern of multifocal peripheral ground glass or mixed consolidation is highly suspicious of COVID-19, that can quickly change over a short period of time.

4. Materials and Methods:

This study included the 663 totally patients with a diagnosis of COVID-19 infection confirmed by *CT* scan diagnostic divided to three isolation centres ***maitiga*** Isolation Centre, swany Isolation Centre***, Airport Road*** Isolation Centre in three months, January, February and march, spss program used in this study.

In January ,242 patients was collected (152 male and 90 female) ; age range, 20–70 years) where infected patients with COVID-19 are 86 moderate and 156 sever infected.

In February, the number of patients infected by covid _19 in three isolations center was 288 pt , (155 male , 73 female); age range, 20–100 years),86 moderate infected and 142 sever infected .

In march ,the number of patients infected coved 19 in three isolations center was 193 pt , (126 male , 67 female); age range, 20–100 years),79 moderate infected and 144 sever infected

The clinical information was reviewed, CT images, and corresponding image reports. compared the image reports of CT and identified CT patterns suggestive of viral infection.

5. CT Technique and Image Interpretation:

All chest patients were scanned using CT scan , multislices 16 and 64 Philips CT scanner were used. Conventional CT was performed with the patient in the supine position during end-inspiration. High-*Resolution Chest technic* was use in this cases. technologists who performed CT for patients with suspected COVID were required to wear protective garments. Because the study is a retrospective analysis, no standard CT protocol was applied. All CT images were reconstructed to 1.25-mm thin slices. Multiplanar images were obtained using the multiplanar reformatting (MPR) technique on a workstation. (table_1) Every chest CT examination was read first by expert one radiologist and was then checked by another expert radiologist for patients with CT findings suggestive of viral pneumonia, the radiologists informed the clinician immediately. The clinician would then order immediate isolation of the patient for clinical monitoring and treatment.

Table (1) illustrated the approved protocol for high-resolution CT chest imaging.

(radclass. files,2016)

Scouts:	**AP and lateral**

Group	**Supine Inspiration**
Scan Type	Helical
Start Location	Just above lung apices
End Location	Just below costophrenic angles
IV Contrast	None
Oral Contrast	None
Breath-Hold	Inspiration
SFOV	Large body
Window Settings	1500 ww/ −700 wl (Lung)
Reconstruction (Slice thickness/interval)	1.25 mm
Pitch	1.375
kVp	140
mA Small:	150
Medium	300
Large:	375

5. Result and Discussion

The number of Male patients have higher infection of covid −19 than female in the three center of isolation on three months(table−4), Quantitative comparison of chest CT findings in three isolation center Number of severity of infection and whose under the mechanical ventilation involved in three isolation centers(table _3) was significantly more than the moderate infections particularly **maitiga** center almost 50%, Total CT score, GGO score , fibrosis score and consolidation score were significantly higher in severity infection while the moderate infection

patients almost The images were analyzed for the following aspects, presence of ground glass opacities, .

The table **2** illustration range of age in each center of isolation in January

maitiga	aswany	Airport Road	Age range
0	0	5	40-20
0	10	14	60-41
15	14	14	70-61
26	19	6	80-71
36	23	13	90-81
15	14	8	100-91
102	80	60	Total

The table **3** illustration severity of infection in each center of isolation in January

maitiga	aswany	Airport Road	Infection severity
29	26	31	Moderate
73	54	29	severity
102	80	60	Total

The table **4** illustration type of gender in each center of isolation in January

maitiga	aswany	Airport Road	Gender
68	53	31	Male
34	27	29	Female
102	80	60	Total

The table **5** illustration range of age in each center of isolation in February

maitiga	aswany	Airport Road	Age range

0	0	5	40–20
9	12	16	60–41
14	8	10	70–61
23	21	9	80–71
40	23	6	90–81
14	11	5	100–91
100	75	53	Total

The table **6** illustration severity of infection in each center of isolation in February

maitiga	aswany	Airport Road	Infection severity
35	28	23	Moderate
65	47	30	Severity
100	75	53	Total

The table **7** illustration type of gender in each center of isolation in February

maitiga	aswany	Airport Road	Gender
68	54	33	Male
32	21	20	Female
100	75	53	Total

The table **8** illustration range of age in each center of isolation in march

maitiga	aswany	Airport Road	Age range
0	1	6	40–20
13	5	10	60–41
16	7	15	70–61
27	8	8	80–71
35	15	6	90–81

14	5	3	100-91
105	40	48	Total

The table **9** illustration severity of infection in each center of isolation in **march**

maitiga	aswany	Airport Road	Infection severity
44	15	20	Moderate
61	25	28	Severity
105	40	48	Total

The table **10** illustration type of gender in each center of isolation in march

maitiga	aswany	Airport Road	Gender
74	25	27	Male
31	15	21	Female
105	40	48	Total

6. Image analysis

The chest CT of each patient was independently reviewed by two expert radiologists in CT diagnostics. In case of any discrepancy, a consensus was reached through discussion. The images were analyzed for the following aspects: (1) presence of groundglass opacities: defined by increase in lung density but without covering the pulmonary blood vessels and bronchial walls; (2) presence of lung consolidation: defined by higher density than ground-glass opacities and blurred margins of pulmonary blood vessels and bronchial tubes; (3) presence of nodular/cord-like shadows; (4) interlobular septal thickening, thickening of vascular, and air Broncho gram signs inside the lesions.

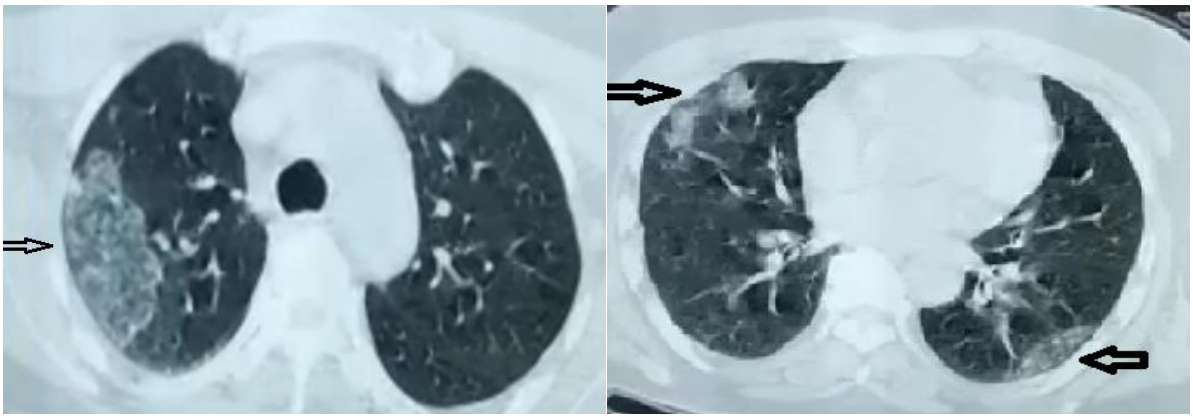


Fig1 Transverse chest HRCT scans series from a 70-years-old man with common COVID-19 pneumonia (a) after symptom onset: multifocal round or patchy ground-glass opacity in bilateral lobes. Multifocal irregular consolidation

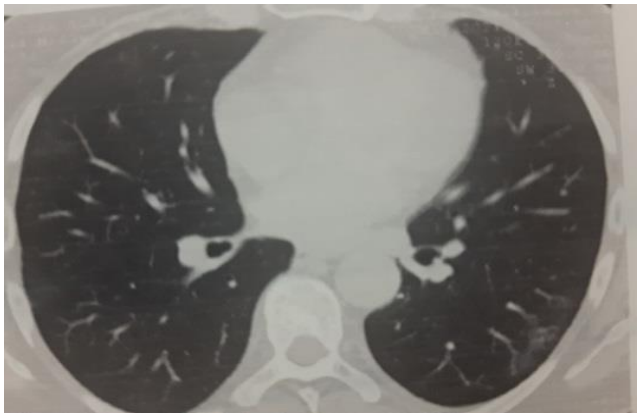
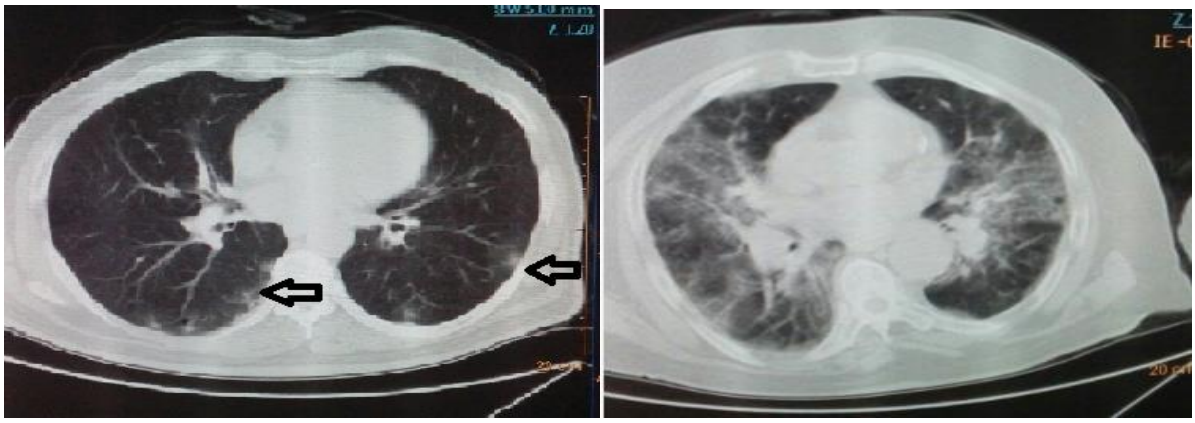


Fig 2 (b) Day25 were followed up by giving antibiotics, vitamins and oxygen supplying this image to same patient who classified under moderate cases.



(a) b

Fig 3 (a) Axial thin sections of CT chest scan show mild GGO involving bilateral peripheral upper lobes (b) Axial sections show diffuse crazy paving pattern with areas of peripheral consolidations indicating severe disease and classified under severity cases .

7. Conclusion

Chest CT played an important role in the diagnosis of COVID-19 pneumonia. Changes in chest CT were difficult to assess quantitatively in the In three months) Chest CT of male patients was more serious than female in the all isolation centers . More consolidation and fibrosis lesions existed in male patients , the Severe cases were classified in the three isolation centers according to their Connected with the mechanical ventilation, while moderate cases were followed up by giving them antibiotics, vitamins and oxygen supplying .

8. References

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