



RESEARCH ARTICLE

LUNG ULTRASOUND AS AN EMERGENCY TRIAGE TOOL IN PATIENTS DIAGNOSED WITH COVID-19

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Abstract

COVID-19 is a widespread disease in 2020. The goal of this study is to determine the sonographic characteristics of 105 individuals brought to the ER with COVID-19. Lung Ultrasound was performed by two doctors on each patient then compared to CT Scan Findings. Our study found that Lung ultrasound is a good tool for identifying patients at higher risk of clinical deterioration, ICU admission, mechanical ventilation and mortality. Lung ultrasound can be used in settings where CT Scan is not available.

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Introduction:-

In the first months of 2020, the world witnessed a rapid spread of the severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2). COVID-19 became the most threatening global health crisis of our time. Lung Ultra Sound can be performed at the patient's bedside quickly without exposing the patient to radiation, limiting patient mobility and cross-contamination of both patients and nursing personnel. The goal of this study is to determine the sonographic characteristics of individuals brought to the ER with COVID-19.

Methods:-

All patients (n=105) enrolled in this study were aged 18 years and older and admitted to the University Hospital Emergencies, between March 15th and June 15th, 2020. Patients with confirmation of a SARS-Cov-2 infection were eligible for the study, and were tested using a Reverse Transcriptase - polymerase chain reaction (RT-PCR) from a nasopharyngeal swab.

The patients were divided into mild and severe groups following the criteria listed below:

1. Mild COVID-19 group: Fever, respiratory symptoms;
2. Severe COVID-19 group: Patients have one of the following: Respiratory distress (Rate ≥ 30 min; oxygen saturation $\leq 90\%$); Respiratory failure and required mechanical ventilation; ICU admission.

The demographic data, clinical symptoms, laboratory findings, and outcome of the patients were collected from electronic medical records.

Lung ultrasound was evaluated by two experienced intensive care doctors, before performing CT Scan.

Lung ultra sound was performed by both of the doctors following the BLUE-protocol¹. According to visual assessment of the lungs, the results of lung ultrasound were divided into 4 categories: Normal,

patchy confluent B-lines, sub-pleural consolidations and bilateral pulmonary insults. Radiologists performing CT Scan were blind to RT-PCR test results, and were therefore unable to use the CO-RADS VI category. Results were noted for each patient, then compared with the findings of the CT Scan.

The ethics committee of the University Hospital approved this study and granted a waiver of informed consent from study participants.

Results:-

A total of 105 patients were included in this study. 60 of whom belonged to the mild group and 45 severe. The condition of 37 of patients (35.2%) from both groups deteriorated during hospitalization, requiring mechanical ventilation, and among these, 33 died (31.4%). The time between onset of illness and hospital admission varied from 1 to 17 days with a median of 10 days.

Of all our patients, 61 (58%) were known positive prior to admission, 44 (42%) were tested positive at the admission.

Mean age for all patients included in the study was 45.14 years. With respect to sex of the study population, 63.8% (67/105) of all study subjects were of male sex. At admission, the most common clinical symptoms were flu-like syndrome (47.6% (50/105)) and dyspnea (34.2% (36/105)). Chest CT results were standardized using the CO-RADS classification and came back as follows: Co-RADS I-III (54.3% (57/105)) and CO-RADS IV-V (45.7% (48/105)).

The most common LUS findings were patchy confluent B-lines, found in nearly half of all study population (48.5% (51/105)), and sub-pleural consolidations in 26.6% (28/105), findings were bilateral in 36.1% (38/105). LUS was normal in 22.7% (25/105). All patients who required immediate intensive care hospitalization from the severe group, 13.63% (12/88) had positive LUS findings, all having CO-RADS IV-V findings in CT Scan.

Discussion:-

Lung ultrasound (LUS) is an important aspect of the critical care evaluation of a variety of lung diseases, including pneumothorax, ARDS, pulmonary oedema, interstitial lung disease, and pneumonia². Furthermore, Poggiali et al. discovered that ultrasonic anomalies have a strong connection with CT chest results³ and might be used instead of ionizing radiation imaging⁴.

The most common ultrasonography presentations in COVID 19, according to Nouvenne et al.⁵, were focal areas of the interstitial syndrome (either non confluent or confluent B lines) with the presence of small, numerous subpleural consolidations and pleural line indentation, but no pleural effusion. It is noteworthy that B-line count, consolidations and thickened pleural lines are associated with positive RT-PCR tests and clinical severity^{6,7}.

Recently, it has been suggested that point-of-care LUS can be useful for both diagnosing and monitoring COVID-19 patients^{8,9}. Lung involvement may be limited to dorsal/basal areas in milder COVID-19 pneumonia¹⁰. LUS shows good agreement with CT in recognizing lung pathology and its severity^{5,11} thus, identifying patients at higher risk of clinical deterioration, ICU admission, mechanical ventilation and mortality¹². A score named COVILUS was even suggested for the prediction of positivity of SARS-COV 2¹³.

Therefore, this paper suggests that lung ultrasound could be used early as a marker of severity and to predict a pulmonary lesion prior to CT scans, especially with the overflow of in-hospital patients in developing countries.

Considering CT scans are scarce during an outbreak, lung ultrasound presents itself as a rapid useful clinical tool for establishing rapid triage and prompt isolation in settings where resources may already be stretched, determining ventilation strategies and post procedures in mechanically ventilated patients, as well as indicating a false negative swab result and allowing a firm diagnosis to be made.

We acknowledge that this study has some limitations. The first is that it is a single center investigation, first of its kind in Morocco. The second is the relatively small sample size. Further investigation is needed to elucidate the involvement of pulmonary ultrasound in severity and mortality of COVID-19 patients.

Conclusion:-

LUS has been utilized in patients with COVID-19 who have been diagnosed during the outbreak. The use of LUS has enabled for the identification of individuals with lung involvement and the severity of their condition with great correlation to CT Scan findings. In addition, serial studies help us follow for progression or regression of disease. With the application of LUS we have noted the need to implement the standardization for its use in emergency departments and ICU's where Covid-19's outbreaks lead to a lack of staff and resources.

Figures:

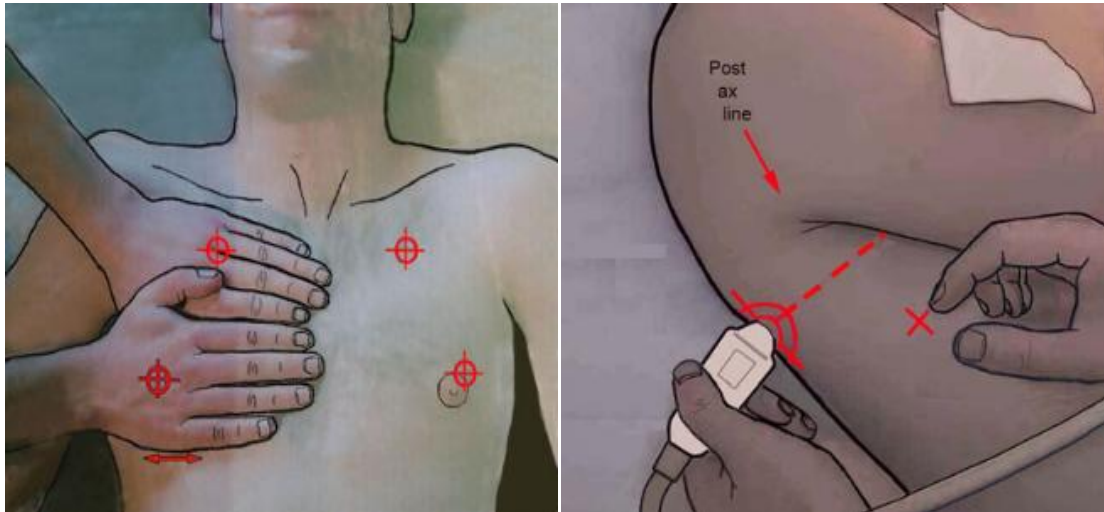


Figure 1:- Left : Upper and Lower Blue point at the middle of the left and right hand (thumbs not included). Right : Posterolateral alveolar and/or pleural syndrome (PLAPS) point, in the horizontal continuation of the lower blue point. (From Whole body ultrasonography in the critically ill, Springer)¹⁴

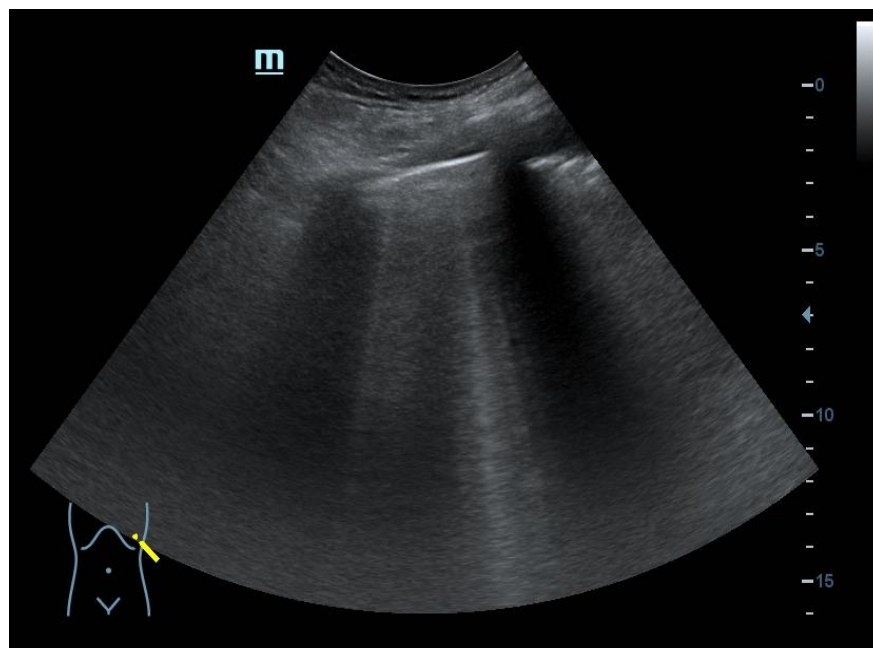


Figure 2:- B Lines, Probe on the lower blue point, Case courtesy of Dr Balint Botz, Radiopaedia.org, rID: 65567¹⁵

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