Lung Ultrasound Score in Critically Ill COVID-19 Patients: A Waste of Time or a Time-Saving Tool?

From:

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To the Editor,

The lung ultrasound score (LUS) can be used to evaluate the loss of aeration by dividing the thorax into 12 specific regions and assigning a number from 0 (normal lung) to 3 (lung consolidation) to each region. These ratings can range from a minimum of 0 to a maximum of 36 [1]. LUS is easy-to-learn and takes little time. Rouby et al. demonstrated that after 25 supervised exams, physicians could acquire the skills in a median time of 8 minutes (IQR 3-14) for experts and 10 minutes (4-17) for trainees [2].

Lung ultrasound (LU) is a well-established diagnostic tool in acute respiratory failure, and it is particularly suited for identification, grading, and follow-up of lung involvement severity [3,4,5]. In critically ill COVID-19 patients, LU is an alternative to chest radiography, chest CT or electric imped-ance tomography to quantify pulmonary impairment, follow lung involvement changes, or predict an intensive care unit (ICU) stay of more than 30 days or death [6,7,8]. Since medi-cal personal involved in COVID-19 patients' treatment wear special protective equipment that increases the workload dra-matically through temperature imbalance, touch impairment, communication problems, and visual difficulties. In this spe-cific work scenario, LU may be seen as an extra task that can be a loss of time.

Is LU a useful clinical exam, or does it worsen physicians' burden to the clinical practice? To answer this question, we calculated the time necessary to perform the LUS in critically ill COVID-19 patients. We used an Affiniti 70 G ultrasound machine (Philips, Amsterdam, Netherlands) with a convex probe. We calculated the LUS in 25 patients admitted to the COVID-19 ICU and the time needed to perform the exam. For scanning 25 different patients, the median time was 4.2 minutes (IQR 3.6-4.5). It is rather surprising that our group, despite the personal protective equipment limiting mobility, achieved a median time roughly half that of Rouby et al. However, our group is quite experienced in using LU. Fur-thermore, in the setting of COVID-19 pneumonia, the ultra-sound patterns highlighted are rather homogeneous: a picture of an alveolar-interstitial syndrome consisting of scattered and fused B-lines, associated with irregularities of the pleural line, up to subpleural consolidation.

The use of LU has allowed us to monitor the progress of our COVID-19 patients with considerable time savings com-pared to traditional radiology. To quantify the saved time, we measured the time necessary to prepare, transport, perform and return from a chest CT scan with all the protective equipment. We calculated a median time required for 25 chest CT scans of 85 minutes (IQR 78.5- 97.5). The time saved for each patient using LU would have been about 80.8 minutes (Mann-Whitney *p*-value (Mann-Whitney *p*-value and the time saved for 25 patients is approximately 33.75 hours. Therefore, using LU instead of CT to monitor critically ill patients with COVID-19, can free staff to per-form other duties.

While repeat CT scans may be impractical and unsafe for patients and operators, LU may be the default imaging modality for monitoring patients' conditions throughout their hospital stay and after discharge. However, the use of LU does not replace the CT scan, which is necessary to exclude pulmonary or cardiovascular complications in case of the clin-ical worsening of the patient. Ultimately, we performed a daily topographic ultrasound evaluation of the lung without moving the patient, reducing the number of chest x-rays and CT scans and saving considerable time.

AUTHORS' CONTRIBUTIONS

Francesco Meroi and Daniele Orso contributed equally to this work, analyzed results and wrote the manuscript. Luigi Vetrugno and Tiziana Bove share the senior authorship. Luigi Vetrugno and Tiziana Bove analyzed the results, discussed the findings and wrote the manuscript. All authors read and approved the final manuscript.

COMPETING INTERESTS

All authors declare no conflict of interests.

REFERENCES

1. Bouhemad B, Mongodi S, Via G, et al. Ultrasound for "lung monitoring" of ventilated patients. Anesthesiology 2015; 122(2):437–447.
2. Rouby JJ, Arbelot C, Gao Y, et al. Training for lung ultrasound score mea-surement in critically ill patients. Am J Respir Crit Care Med 2018; 198 (3):398–401. doi:10.1164/rccm.201802-0227LE. PMID: 29557671; PMCID: PMC7205011.
3. Volpicelli G, Gargani L, Perlini S, et al. Lung ultrasound for the early diag-nosis of COVID-19 pneumonia: an international multicenter study. Inten-sive Care Med 2021; 47(4):444–454. doi:10.1007/s00134-021-06373-7. Epub 2021 Mar 20. PMID: 33743018; PMCID: PMC7980130.
4. Volpicelli G, Gargani L. A simple, reproducible and accurate lung ultra-sound technique for COVID-19: when less is more. Intensive Care Med 2021; 1–2. doi:10.1007/s00134-021-06415-0. Epub ahead of print. PMID: 33938958; PMCID: PMC8090509.
5. Vetrugno L, Bove T, Orso D. Our Italian experience using lung ultrasound for identification, grading and serial follow-up of severity of lung involve-ment for management of patients with COVID-19. Echocardiography

2020; 37(4):625–627. doi:10.1111/echo.14664. Epub 2020 Apr 15. PMID: 32239532; PMCID: PMC7228311.

6. Heldeweg MLA, Lopez Matta JE, Haaksma ME, et al. Lung ultrasound and computed tomography to monitor COVID-19 pneumonia in critically ill patients: a two-center prospective cohort study. Intensive Care Med Exp 2021; 9(1):1. doi:10.1186/s40635-020-00367-3. PMID: 33491147; PMCID: PMC7829056.

7. Vetrugno L, Orso D, Deana C. COVID-19 diagnostic Imaging: caution need before the end of the game. Acad Radiol 2020; 27(9):1331. doi:10.1016/j.acra.2020.06.009. Epub 2020 Jun 20. PMID: 32593539; PMCID: PMC7305904.

8. Tomasino S, Sassanelli R, Marescalco C. Electrical Impedance Tomography and prone position during ventilation in covid-19 pneumonia: case reports and a brief literature review. Semin Cardiothorac Vasc Anesth 2020; 24(4):287–292. doi:10.1177/1089253220958912. Epub 2020 Sep 13. PMID: 32924792.