Lung Ultrasound in Children With COVID-19

Marco Denina, MD, Carlo Scolfaro, MD, Erika Silvestro, MD, Giulia Pruccoli, MD, Federica Mignone, MD, Marisa Zoppo, MD, Ugo Ramenghi, MD, Silvia Garazzino, MD, PhD

The novel coronavirus disease 2019 (COVID-19) is rapidly spreading all around the world, affecting both adults and children. Recently, the clinical and radiographic characteristics of children infected have been described. Although lung ultrasound (LUS) is recognized as a valid imaging technique for the diagnosis and follow-up of pneumonia in pediatric age, no data are currently available about LUS use in children with COVID-19. Considering the well-known advantages of point-of-care ultrasound, including the possibility of reducing the patient’s movement across the hospital department, we investigated LUS findings in children infected with severe acute respiratory syndrome-coronavirus 2.

METHODS
We performed an observational study at Regina Margherita Children’s Hospital (Turin, Italy). Children and adolescents (0–17 years) admitted to the pediatric infectious diseases department for documented COVID-19 were analyzed. Epidemiological, clinical, and laboratory data were collected, and we categorized patients according to the clinical definitions recently provided by Qiu et al. LUS was performed during the routine medical examination with a linear array transducer at 7.5 to 13 MHz (MyLab Seven; Esaote, Genoa, Italy), applying the Copetti protocol.

RESULTS
Between March 18 and March 26, 2020, 8 children affected by COVID-19 were admitted to our department. Epidemiological and clinical features are provided in Table 1. Two cases (25%) were classified as severe clinical types, 2 (25%) as moderate, and 4 (50%) as mild. Two (25%) children needed noninvasive oxygen administration for 2 and 4 days, respectively. None of them required mechanical ventilation. We performed LUS in all 8 patients, paying particular attention to signs of viral pneumonia as small subpleural consolidations and/or individual B-lines or confluent B-lines (echogenic vertical lines arising from the pleural line and moving in concert with a sliding lung, expression of an interstitial syndrome). LUS revealed subpleural consolidations in 2 children and confluent B-lines in 5 children. In 7 of 8 patients, we found a concordance with the radiologic findings (Fig 1), whereas in the remaining patient, an interstitial B-lines pattern was observed despite a normal chest radiography. One patient with severe clinical type was repeatedly examined with LUS on alternate days, and we noted a B-lines bilateral pattern reduction a day in advance before clinical and radiographic improvement.

In the 7 children with pathologic ultrasound imaging at baseline, LUS was repeated before discharge and revealed improvement or resolution of consolidations (2 of 2) and interstitial patterns (5 of 5), which was consistent with the concomitant radiologic findings.

CONCLUSIONS
Investigators have shown that in adults with COVID-19 pneumonia, bedside ultrasound imaging at baseline, LUS was performed during the routine medical examination with a linear array transducer at 7.5 to 13 MHz (MyLab Seven; Esaote, Genoa, Italy), applying the Copetti protocol.

ultrasound correlates with computed tomography findings. Our study represents a preliminary report of LUS characteristics in children affected by COVID-19. Although the number of patients analyzed is small, the high concordance between radiologic and LUS findings suggests that ultrasound may be a reasonable method to detect lung abnormalities in children with COVID-19. LUS may be useful in the management of children with COVID-19 for several reasons. First, it may reduce the number of radiologic examinations, lowering the radiation exposure of the patients. Secondly, when performed at the bedside, LUS allows for the reduction of the patient’s movement within the hospital; thus, it lowers the number of health care workers and medical devices exposed to severe acute respiratory syndrome–coronavirus 2. Moreover, the recent evolution in the ultrasound field allows for the use of wireless devices, which, when available, are probably the most appropriate ultrasound equipment in patients with confirmed or suspected COVID-19. Both the wireless probe and the tablets are easily wrapped in disposable plastic covers, allowing for simple sterilization procedures and reducing the risk of contamination, as recently suggested by Buonsenso et al.

In conclusion, although additional studies are needed to better...
understand and characterize LUS findings in this novel disease in children, we propose routine LUS protocol examinations as a useful tool in the diagnostic and clinical management of mild or severe COVID-19 in children.

ACKNOWLEDGMENTS

We thank Drs A.G. Delmonaco and E. Garrone for their constant ultrasound teaching activity at pediatrics resident.

ABBREVIATIONS

COVID-19: coronavirus disease 2019
LUS: lung ultrasound

REFERENCES


Lung Ultrasound in Children With COVID-19
Marco Denina, Carlo Scolfaro, Erika Silvestro, Giulia Pruccoli, Federica Mignone, Marisa Zoppo, Ugo Ramenghi and Silvia Garazzino
Pediatrics 2020;146;
DOI: 10.1542/peds.2020-1157 originally published online April 21, 2020;

Updated Information & Services
including high resolution figures, can be found at:
http://pediatrics.aappublications.org/content/146/1/e20201157

References
This article cites 6 articles, 1 of which you can access for free at:
http://pediatrics.aappublications.org/content/146/1/e20201157#BIBL

Subspecialty Collections
This article, along with others on similar topics, appears in the following collection(s):
Infectious Disease
http://www.aappublications.org/cgi/collection/infectious_diseases_sub
Radiology
http://www.aappublications.org/cgi/collection/radiology_sub

Permissions & Licensing
Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
http://www.aappublications.org/site/misc/Permissions.xhtml

Reprints
Information about ordering reprints can be found online:
http://www.aappublications.org/site/misc/reprints.xhtml
Lung Ultrasound in Children With COVID-19
Marco Denina, Carlo Scolfaro, Erika Silvestro, Giulia Pruccoli, Federica Mignone,
Marisa Zoppo, Ugo Ramenghi and Silvia Garazzino
Pediatrics 2020;146;
DOI: 10.1542/peds.2020-1157 originally published online April 21, 2020;

The online version of this article, along with updated information and services, is
located on the World Wide Web at:
http://pediatrics.aappublications.org/content/146/1/e20201157