Critical remarks to ‘Pediatric lung ultrasound — pros and potentials’

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Jovan Lovrenski states [1] that “Aside from subpleural consolidations, lung US is very much based on artifacts, such as A- and B-lines,” but this aspect is poorly discussed in his article. The author, for example, says that pneumonia can be seen on lung ultrasound (US) as “focal confluent B-lines” without consolidation. I am perplexed and doubt such a pattern on lung US (without consolidations) allows the diagnosis of pneumonia without using traditional imaging.

According to Lovrenski, lung US is strongly based on artifacts. They should be a “form of a fingerprint at the crime scene.” But that it is just a pragmatic use of what we do not know yet:

- Structural changes in subpleural airspaces cause B-lines. Typically, the pleura reflects ultrasounds. According to Soldati et al. [2], the pleural surface of the lungs affected by interstitial pathologies, or where the terminal airspaces are heterogeneously collapsed, presents transonic channels essential for the genesis of B-lines. They are acoustic traps across which ultrasound waves can propagate [3].
- B-lines appear different at different levels depending on (a) the subpleural pathology (pneumogenic or cardiogenic conditions), (b) the pulse frequency and bandwidth and (c) the footprint of the probe.
- Ultrasound scanners are designed to explore organs that are anatomically different from the lung, providing anatomical information not adequate to the combined presence of air and soft tissues. To properly evaluate artifacts, it is crucial to develop processing techniques to obtain objective quantitative information [4]. For example: strong changes in impedance from tissue and air in the alveoli cause multiple scattering in the lung parenchyma. During lung imaging, the backscattered echos are

distorted, leading to artifacts and introducing errors in image interpretation. Multiple scattering is becoming a widely studied phenomenon and has proven utility in characterizing disordered media. Exploiting US multiple scattering should be possible to characterize the micro-architectural properties of the lung parenchyma [5].

Lovrenski states: “One of the most valuable aspects of lung US use is the ability to follow up the course of pneumonia, without unnecessary exposure to radiation. It can help clinicians make proper therapeutic adjustments if needed.” We recently described a study focusing on early changes of lung US that enabled us to predict outcome and thereby reduce the number of patients who require follow-up [6].

Finally, Lovrenski states that “Interpretation of lung US findings is inseparable from the clinical context” and “the future of lung US probably belongs to neonatologists, whether radiologists like it or not.” In fact, any radiologic diagnosis must be linked to the clinical context. In the case of lung US, the clinical component prevails because of the physical limitations of the technique and the difficulty of standardization. After all, the interpretation of the chest radiograph has well-known limitations. Nevertheless, the chest radiograph always contains all the data even if sometimes hidden or subject to interpretation.

Compliance with ethical standards

Conflicts of interest None

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