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Daniel Lichtenstein

Hospital Ambroise Paré (Paris Saclay university), Paris, France

Lung ultrasound in acute respiratory failure - the basis

Lung ultrasonography is only one part of critical ultrasound, but its integration into critical ultrasound provides a new definition of the priorities. This application requires a simple machine, the knowledge of basic techniques, and the mastery of no more than ten signs. The best machine to our opinion is the simplest. We use a 1992 technology, a simple gray-scale unit without Doppler and a microconvex probe.

Shortly, the ten signs (the basis) are the bat sign (indicating pleural line), lung sliding (generating the seashore sign), the A-line (horizontal artifact), the quad sign and the sinusoid sign (indicating pleural effusion regardless its echogenicity), the fractal sign and the lung sign (indicating lung consolidation), the B-line and the lung rockets (particular vertical comet-tail artifacts indicating interstitial syndrome), abolished lung sliding with the stratosphere sign (suggesting pneumothorax), and the lung point (indicating pneumothorax). All these disorders can be assessed using CT as a gold standard with sensitivity and specificity ranging from 90 to 100%, allowing to consider ultrasound as a reasonable bedside gold standard in the critically ill.

Major applications of lung ultrasound are the possibility to postpone referral to CT in critically ill patients. The immediate diagnosis of cause of an acute respiratory failure : the BLUE-protocol. A direct parameter of clinical volemia, of interest in the management of an acute circulatory failure : the FALLS-protocol. Lung ultrasound can be performed in the baby (the signs being the same as in the adult), in trauma, in the ICU as well as in austere or remote areas. All in all, lung ultrasound results in a visual medicine, associated to a major decrease in irradiation.

Keywords: lung ultrasound, pneumonia, acute respiratory failure, BLUE-protocol

Biography

Daniel Lichtenstein, medical intensivist, Ambroise-Paré hospital (Paris), defined critical holistic ultrasound in 1985 (Intensive Care Med 1991;19:353-355) describing diagnoses, immediate therapies, procedures (venous cannulation, thoracentesis...). Simple equipment, one universal probe for whole body, emphasis on lung, holistic cardiac sonography (and others), extrapolable to multiple disciplines (pediatrics, pulmonology...), settings (ICU, austere areas...). Seven hundred conferences. Six textbooks since 1992 (latest "Lung ultrasound in the critically ill" - Springer 2016). Two dozens of original articles including: BLUE-protocol (acute respiratory failure), FALLS-protocol (lung ultrasound in circulatory failure), SESAME-protocol (cardiac arrest), lung ultrasound in babies. President of CEURF (training center at bedside in I.C.U.).