




Clinical Notes

Lung ultrasound in children drowning victims in pediatric emergency department

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Drowning, defined as the process of respiratory difficulty caused by submersion/immersion in liquid, is a leading cause of accidental death among infants and toddlers.¹ The most frequent manifestations observed in drowning victims are pulmonary complications. These include: non-cardiogenic pulmonary edema, acute respiratory distress syndrome and pneumonia. In particular, it is important to maintain a high index of suspicion for pulmonary infections caused by waterborne pathogens, such as *Aeromonas*, *Pseudomonas*, and *Proteus* that may cause complicated pneumonia. In order to diagnose all these conditions a chest x-ray is recommended at baseline. However, this can be negative or underestimate the severity of lung injury and therefore a radiological follow up is necessary.

In the case of children, this implies that the child is exposed to a high dose of ionizing radiation. This aspect should not be underestimated, in fact children are considered to have an increased risk of morbidity and mortality from radiation compared with their adult counterparts, both because of organ sensitivity and longer life expectancy.

Therefore, to reduce the dose of ionizing radiation and speed up diagnostic times, the thoracic ultrasound could represent a reliable diagnostic tool for management and follow up in drowning victims in pediatric emergency department and in the ward.

We present a case report of a 4-year-old girl that was brought to hospital after accidental near-drowning in swimming pool. Informed consent was obtained from the patient's parents.

On admission, the patient was found alert and only mildly distressed. The oxygen saturation was 91% in air; respiratory frequency was 48/min; Blood pressure was 90/65 mmHg and pulse 130/min. The skin was cold, but dry; crackles were present on lung auscultation.

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We performed immediately a lung ultrasound that showed an initial small right basal consolidation and some lines B, hyper echoic comet-tail artifacts, perpendicular to the pleural line, caused by the thickening of interlobular interstitium of secondary lobules (Fig. 1a). Therefore, we started an antibiotic therapy with amoxicillin and low-flow oxygen therapy. After 24 h we repeated lung ultrasound that confirmed the consolidation previously seen and showed another anterior left consolidation (Fig. 1b).

Considering the possibility of unusual organisms as cause of drowning pneumonia, ultrasound findings, the occur of fever and the increase of inflammation indices, we modified the therapy with broad-spectrum antibiotics, with defervescence after 72 h after starting the new therapy. Inflammation indices progressively decreased until normalization on day 10. After 14 days we performed a lung ultrasound that showed almost complete resolution of the inflammatory process.

This case report is a further proof of the usefulness of lung ultrasound as point-of-care in Pediatric emergency department.

Lung ultrasound is rapidly becoming a valuable tool in the hands of the pediatrician² and has multiple fields of application: in traumatic pathology, cardiac diseases and lung diseases.³⁻⁵

Currently, there are no data in literature that describe the use of lung ultrasound in the evaluation of children victim of a near-drowning accident.

In particular, different reports showed the accuracy of Lung Ultrasound in the diagnosis and monitoring of pulmonary edema and especially in defining the degree of severity of the edema. Furthermore, many studies demonstrated high sensitivity and specificity of Lung ultrasound in diagnosis and follow-up of pneumonia compared to chest x-ray and the 2020 consensus established at least the same diagnostic value of lung ultrasound to chest x-ray in detecting pneumonia, suggesting ultrasound as the method of choice in children with suspected pneumonia requiring diagnostic imaging.

Both these conditions are frequent complications in case of drowning and it is necessary their investigation through clinical examination and instrumental investigations.

Given the high frequency of the phenomenon, especially in the United States where drowning represents one of the

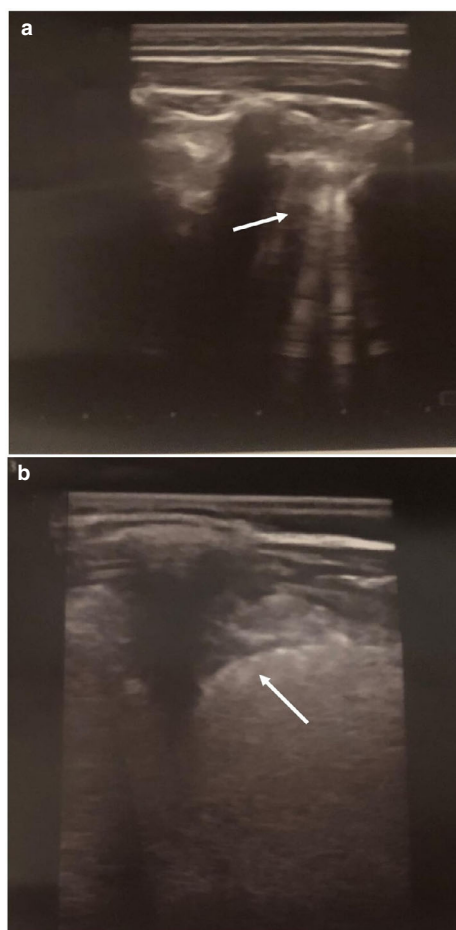


Fig. 1 (a) First lung ultrasound performed on arrival in the emergency department. The probe was placed vertically to the ribs in the right hemithorax and showed initial subpleural consolidation with lines (b) confluent in the right basal area; (b) Second lung ultrasound performed after 24 h of hospitalization. The probe was placed orizontaly to the ribs in the left hemithorax and showed a structure consolidation in the left mid-basal area.

most common injury-related cause of death in children 1–4 years of age, with almost 1,000 child deaths due to drowning in the year 2017, on basis of these considerations an imaging method, simple, easily reproducible and without ionizing radiations as lung ultrasound, could be a valid tool for the initial assessment and follow up of children victim of drowning.

This clinical case highlights the clinical value of lung ultrasound in the evaluation of a near-drowning victim. Lung ultrasound performed by clinicians could be an easy and quick tool to assess early the child with drowning syndrome and for the follow-up, contributing to a better use of the economic resources of the health system and to a more prudent management of children.

However, further studies are needed to assess whether this methodic can be included in the diagnostic pathway of the child drowning victim.

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Disclosure

The authors declare no conflict of interest.

Author contributions

RL designed the study and revised the manuscript. SB, AM, VM, MS enrolled patient and acquired data. SB performed lung ultrasound. SB, AM, VM, MS drafted the manuscript. All authors read and approved the final manuscript.

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