Lung ultrasound score to monitor non-invasive respiratory support in hypoxemic patients

Dott.ssa GIULIA SALVE (1), Dott.ssa SILVIA MONGODI (1), Dott. SANDRO PREGNOLATO (1), Dott. ERMINIO SANTANGELO (2), Dott.ssa SILVIA BONAITI (1), Dott. ANDREA STELLA (1), Dott. ANDREA COLOMBO (1), Dott. COSTANZO ROMBOLÀ (1), Dott. LUCA FONTANELLI (1), Dott. ANITA ORLANDO (1), Prof.ssa ROSANNA VASCHETTO (2), Prof. BELAID BOUHEMAD (3), Prof. GIORGIO ANTONIO IOTTI (1), Prof. FRANCESCO MOJOLI (1)

(1) Intensive Care Unit, Fondazione IRCCS Policlinico S. Matteo, University of Pavia, VIale Golgi 19, Pavia, Italia.
(2) Intensive Care Unit, Ospedale Maggiore della Carità, University of Piemonte Orientale, Novara, Italia.
(3) CHU Dijon and Université Bourgogne Franche-Comté, Dijon, Francia.

Argomento: Insufficienza respiratoria acuta e ventilazione meccanica

Background: lung ultrasound (LUS) score allows reliable quantification of loss of aeration[1] and has been applied to monitor ARDS, weaning from mechanical ventilation, PEEP-induced recruitment and VAP recovery[2].

Aims and objectives: To determine if LUS score early identifies responders to non-invasive respiratory support.

Methods: prospective observational multicenter international study. Hypoxemic patients (PaO_2/FiO_2<300) with clinical indication to non-invasive support (high-flow nasal cannula – HFNC, continuous positive airways pressure – CPAP, non-invasive ventilation – NIV). LUS score computation before and after 2 hours of non-invasive support, examining 6 regions per hemithorax, each scored from 0 (normal) to 3 (complete consolidation). Global LUS score is obtained by the sum of regional scores and ranges from 0 to 36 scores. Non-responders required intubation within 48 hours.

Results: we enrolled 25 supports in 23 patients (males 10, age 71.0 [57.0-74.0] year-old, BMI 25.8 [23.5-31.1] kg/m^2, SAPS2 35.0 [27.0-47.0]), admitted to ICU from emergency department (14), operating room (6), medical/surgical ward (3) for acute respiratory failure (12), complicated abdominal surgery (5), vascular surgery (2), neurological diseases (3) and HELLP syndrome (1). They required non-invasive respiratory support for community-acquired pneumonia/ARDS (9), weaning failure (8), cardiogenic pulmonary edema (3) and aspiration pneumonia (3).

The support was delivered by helmet CPAP (84.0%), HFNC (12.0%) and mask NIV (5.0%); 7 were non-responders (29.2%). LUS score, LUS score variations, PaO_2/FiO_2 and respiratory rate before and after 2 hours of respiratory support are displayed in Tab.1. PaO_2/FiO_2, LUS score and LUS score variations after 2 hours predicted respiratory support failure with AUC 0.7857, 0.7937 and 0.8532 respectively.

Conclusions: LUS score and LUS score variations after 2 hours of treatment may early identify responders to non-invasive respiratory support.

References:

- Chiumello D. et al. Crit Care Med 2018: 46(11):1761-1768
- Mojoli F. et al, Am J Resp Crit Care Med 2018, [Epub ahead of print]

	Non failing (18)	Failing (7)	P value
T0: LUS score	16.0 [12.0-20.0]	17.0 [15.0-23.0]	0.4114
T0: PaO_2/FiO_2	131.3 [101.8-180.0]	145.0 [102.7-160.3]	1.0000
T0: pH	7.46 [7.39-7.47]	7.44 [7.43-7.46]	0.7834
T0: RR	21.5 [20.0-30.0]	25.0 [21.0-32.0]	0.3616
T1: LUS score	12.0 [9.0-16.0]	17.0 [16.0-21.0]	**0.0246**
T1: Delta LUS (T0-T1)	4.0 [2.0-6.0]	-1.0 [-1.0-2.0]	**0.0068**
T1: PaO_2 /FiO_2	203.7 [172.3-216.7]	130.4 [82.8-190.4]	**0.0293**
T1: pH	7.43 [7.38-7.46]	7.43 [7.42-7.45]	0.8724
T1: RR	21.0 [18.0-26.0]	28.0 [21.0-32.0]	0.1080

Tab.1: Lung ultrasound score, PaO_2/FiO_2 and respiratory rate before (T0) and after 2 hours (T1) of non-invasive respiratory support. LUS: lung ultrasound; RR: respiratory rate.