

Diaphragm Evaluation and Lung Ultrasound Score during Weaning

Jacobo Bacariza Blanco¹, Antonio Esquinas²

Keywords: Critically ill adults, Diaphragm excursion, Weaning from mechanical ventilation.

Indian Journal of Critical Care Medicine (2022): 10.5005/jp-journals-10071-24312

We have read, with great interest, the study from Amara et al.¹ On this single-center, prospective observational study, the authors try to assess the relation between the abdominal expiratory muscles and weaning. The study suggests a new and different approach to evaluate not only the classical assessed inspiratory muscles, the diaphragm, but also the expiratory muscles, specifically, rectus abdominis (RA), internal oblique (IO), external oblique (EO), and transversus abdominis (TA). Doing so, the study of Amara et al. expands significantly with the scope of the analysis. To hit their marks, the authors focused on the expiratory abdominal muscle thickness pattern and order, the diaphragmatic excursion (DE), diaphragmatic thickening fraction (DTF), and lung ultrasound score (LUS) in critically ill patients undergoing the weaning process. The study also tries to estimate the cut-off values for the expiratory muscle thickness (EMT) and the DE, as successful weaning predictors. The primary outcome was to identify the weaning patterns—simple, difficult, or prolonged weaning patterns. The secondary outcome was the survival of intensive care unit (ICU).

First of all, we completely agree, whether with the relevance nor the overlooked function of the expiratory muscles. Actually, paying attention to them, in association with the inspiratory muscles, will give the chance to evaluate the severity of dyspnea deeper, better, and more accurately. However, some considerations need to be cared.

The ultrasound analysis for the inspiratory muscles is based on the DE, while the assessment for the expiratory muscles is based on the thickness pattern. However, the measurements are different from each other, thickness vs excursion. This fact limits considerably the possibility to compare both of them as weaning failure predictors, or even to estimate the comparative cut-off values. Also, the recent expert panel recommendations by the European Society of Intensive Care² do not recommend the use of DTF, as soon as considered more technically challenging than the DE. This also seems to be the reason why the cut-off values for the DTF are so heterogeneous on the studies. However, DTF seems to be more sensitive and specific than the DE.³ Also, DE is more related to the inspired volume, regardless of whether it is delivered by the muscle effort or the ventilatory support. This means that it is less accurate on patients receiving mechanical ventilation and, therefore, it should be used on the patients with no mechanical support. On the contrary, the DTF is more related with the inspiratory muscle contraction; so, considered to be more accurate on ventilated patients. Similarly, TA thickness was correlated with muscle pressure delivered during the expiratory

¹Department of Intensive Care Medicine Unit, Hospital Garcia de Orta, Almada, Setubal, Portugal

²Department of Intensive Care Unit, Hospital General Universitario Morales Meseguer, Murcia, Spain

Corresponding Author: Jacobo Bacariza Blanco, Department of Intensive Care Medicine Unit, Hospital Garcia de Orta, Almada, Setubal, Portugal, Phone: +351 00351916593806, e-mail: jacobobacariza@hotmail.com

How to cite this article: Blanco JB, Esquinas A. Diaphragm Evaluation and Lung Ultrasound Score during Weaning. *Indian J Crit Care Med* 2022;26(9):1054–1055.

Source of support: Nil

Conflict of interest: None

effort;⁴ therefore, it remains suitable for ventilated patients. Also, as the authors highlighted, the diaphragm thickness and EO thickness concurrences have been proven in the previous studies. The cut-off values for the RA, IO, EO, and TA thicknesses are not able to contrast due to current data lack; the same is applicable for the expiratory muscles order.⁵

The LUS of $5,75 \pm 3.32$ in simple weaning, and $9,71 \pm 5,198$ in difficult/prolonged weaning, matches with the previous study, which reported a relation between LUS <11 and successful weaning, and LUS >15 with failed weaning.

ORCID

Jacobo Bacariza Blanco  <https://orcid.org/0000-0003-2898-1050>

Antonio Esquinas  <https://orcid.org/0000-0003-0571-2050>

REFERENCES

1. Amara V, Vishwas P, Maddani SS, Natarajan S, Chaudhuri S. Evaluation of abdominal expiratory muscle thickness pattern, diaphragmatic excursion, and lung ultrasound score in critically ill patients and their association with weaning patterns: A prospective observational study. *Indian J Crit Care Med* 2022;26(3):307–313. DOI: 10.5005/jp-journals-10071-24125.
2. Robba C, Wong A, Poole D, Al Tayar A, Arntfield RT, Chew MS. Basic ultrasound head-to-toe skills for intensivists in the general and neuro intensive care unit population: Consensus and expert recommendations of the European Society of Intensive Care Medicine. *Intensive Care Med* 2021;47(12):1347–1367. DOI: 10.1007/s00134-021-06486-z.

3. Li C, Li X, Han H, Cui H, Wang G, Wang Z. Diaphragmatic ultrasonography for predicting ventilator weaning. A meta-analysis. *Medicine (Baltimore)* 2018;97(22):e10968. DOI: 10.1097/MD.00000000000010968.
4. Misuri G, Colagrande S, Gorini M, Iandelli I, Mancini M, Duranti R, et al. *In vivo* ultrasound assessment of respiratory function of abdominal muscles in normal subjects. *Eur Respir J* 1997;10(12):2861–2867. DOI: 10.1183/09031936.97.10122861.
5. Li S, Chen Z, Yan W. Application of bedside ultrasound in predicting the outcome of weaning from mechanical ventilation in elderly patients. *BMC Pulm Med* (2021);21:217. DOI: 10.1186/s12890-021-01605-4.