



Lung and Diaphragm Ultrasonography During Weaning from Mechanical Ventilation in a Patient with COVID-19 Pneumonia

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Introduction

Mechanical ventilation is the main therapy used as the support live therapy performed in Intensive Care Units (ICU) for the patient with COVID-19 [1]. The failure in weaning the patient from mechanical Ventilation (MV) can result in such air way manipulations as deep tracheal aspiration and tracheostomy, where there are the high risks of rein tubation and aerosol generation. It is the most important point to decide to weaning the mechanically-ventilated patients from the device at the right time. On the other hand, we realized that published reports investigating the weaning time in COVID-19 patients were insufficient. Here, we aimed to present the weaning process of a case with COVID-

19 pneumonia, supported by lung (LUS) and diaphragmatic ultrasonography (DUS). A written informed consent was obtained from the case due to the procedure and data publication. The 47-year-old patient under went MV for 14 days due to COVID-19 pneumonia and respiratory failure. During the ventilation period, the patient was turned to prone position twice. Musclar elaxantagents were administered in prone position. Due to the fact that the ratio of PaO₂/FiO₂ was 262 [PaO₂=92 mmHg, positive end-expiratory pressure (PEEP)=7 cm H₂O and FiO₂=35%], and the case met the clinically weaning criteria on 12th day of hospital admission, the weaning procedure was decided. The



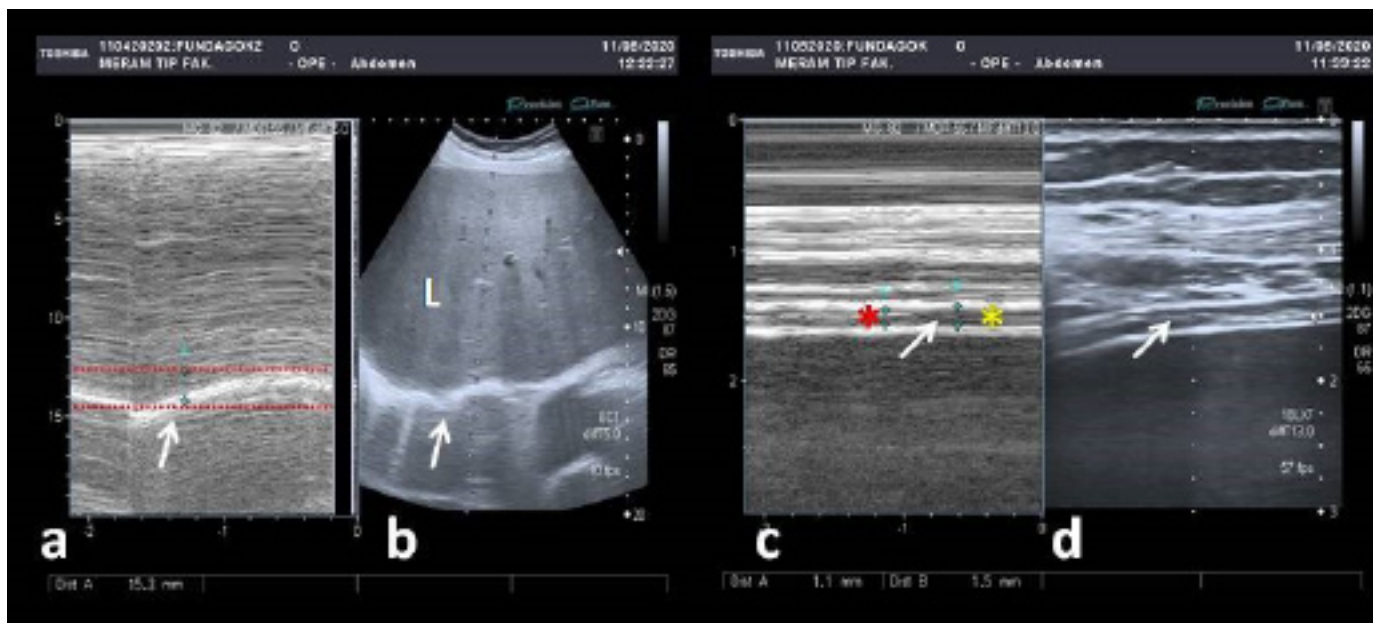
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patient was taken to the pressure-assisted mode [pressure support(PS)=5 cm H₂O, PEEP=5 cm H₂O and FiO₂=30%]. During the first measurements, the patient had the values of rapid shallow breathing index (RSBI)=75, negative inspiratory force(NIF)=-26, minute ventilation volume (MVV)=13.2 L min⁻¹ and respiratory rate (RR)=30 min⁻¹. Among the sonographic parameters, the right diaphragmatic excursion(DE), the diaphragm thickness index (tDi) and LUS (antero-lateral LUS) scores were found as 1.53, 34% and 8, respectively [2,3] (Figure 1) (supplementary video 1).

While slight changes were observed in the pleura in the anterior thorax region, white lung appearances were dominant in the later allower region. The patient was followed for 24 hours, and the measurements were repeated. The followings cores were found: RSBI=80, NIF=-21, MV=16,9 L min⁻¹, RR=37 min⁻¹, DE=0.98, tDi=%22 and LUS score as 9. The patient had the limit values according to the traditional parameters to weaning patients. However, diaphragmatic functions were not compatible with weaning procedure. Extubation was decided because the scores of DE, tDi and LUS were measured as 1.67, 32% and 7 after 24 hours, respectively. No complications developed after the extubation, and oxygen (4L min⁻¹) was administered through an or nasal mask for 4 days. The patient was transferred to the

ward 18 days after the admission to ICU. Unlike the traditional weaning process, the T-piece method is not recommended in COVID-19 patients due to aerosol formation. The weaning process is evaluated through traditionally used objective criteria, such as RSBI, NIF, MVV and RR [4]. Diaphragmatic function may be impaired after the prolonged use of high PEEP and muscler relaxants. Even in this case, such parameters can be with in the normal limits by the help of accessory muscles. The sonographic evaluation of diaphragmatic function is a noninvasive and rapid method performed at point of care to yield a comprehensive evaluation of the critically ill patients, but can lead to spontaneous Weaning-Induced Pulmonary odema (WIPO) during the weaning process [5]. As one of the reasons leading to the failures in weaning process, the condition be detected through LUS.

As a result, performing the weaning process at optimum time will prevent complications and reduce airway-related procedures during the current period, when the patient population is increased due to novel COVID-19 disease. Therefore, we consider that the sonographic evaluation of lung and diaphragm can be added into traditional parameters during the weaning stage in COVID-19 patients.



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