

Abstract

Background: Ventilator induced diaphragmatic dysfunction (VIDD), as a loss of diaphragmatic force generating capacity due to the use of mechanical ventilation. Difficulties in discontinuing ventilatory support are encountered in 20–25% of mechanically ventilated patients, with a staggering 40% of time spent in the intensive care unit being devoted to weaning. M-mode ultrasonography is now an accepted qualitative method of assessing diaphragmatic motion in normal and pathological conditions. In this study, we evaluated whether diaphragmatic excursion (DE) as measured by M-mode Sonography can be a predictor of weaning and diagnosis of VIDD.

Methods: Fifty consecutive patients who required mechanical ventilation ≥ 72 hrs. who fulfilled the spontaneous breath trial (SBT) criteria, at the start of a 1-hr SBT, each hemidiaphragm was evaluated M-mode Sonography with the patient in the supine position. Rapid shallow Breathing index (RSBI) was simultaneously calculated at the bedside. Ultrasonographic Diaphragmatic Dysfunction (**DD**) was diagnosed if an Diaphragmatic Excursion (**DE**) was < 10 mm or negative, the latter indicating paradoxical diaphragmatic movement.

Results: Diaphragmatic Dysfunction **DD** among the eligible 50 patients was 48% ($n = 24$). **DD group** had longer weaning time [43 (192–10) hrs. vs. 29 (72–11) hrs. $p = 0.02$) in **DD** vs. **NDD group** respectively and total ventilation time [144 (480–72) hrs. vs. 139 (336–72) hrs. $p > 0.05$) in **DD** vs. **NDD group** respectively. Weaning failure was (45.8% vs. 30.8%, $p=0.01$) in **DD** vs. **NDD group** respectively. In **NDD group** Rt. DE, mean 24.7 ± 8.7 mm, IQR 17.25 mm and median 23.4mm (40-11.5). While Lt. side was 23.2 ± 7.7 mm, 11.25mm and 22mm (45-15) respectively. In **DD group** Rt. DE, mean 7.6 ± 2.02 mm, IQR 2.4 mm and median 8.2mm (10-1.9). While Lt. side was 9.2 ± 0.8 mm, 4.3mm and 8.9mm (9.8-5.7) respectively. The area under ROC of ultrasonographic criteria in predicting weaning failure was near similar to that of rapid shallow breathing index.

Conclusions: DD is present in a significant percentage 48% nearly half of our medical ICU patients on MV \geq 72hrs. DE as a morphometric index is as good as traditional volumetric respiratory indices in predicting weaning outcome. PaCO₂ was higher in NDD, suggesting the protective role of hypercapnia against DD.

Keywords: Diaphragm; Ultrasonography; Weaning.

**Ventilator induced Diaphragmatic Dysfunction assessed
by Ultrasonography and its impact on Weaning
outcome**

Thesis

Submitted for partial fulfillment of the **M.Sc. degree in Critical
care**

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2015

