

Integrative weaning index: New kid on the block!

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Weaning covers the entire process of liberating the patient from mechanical ventilation and endotracheal tube.^[1] Till date, no weaning index has been shown to accurately predict weaning success. The decision to wean a patient by clinical judgment of the physician is not always correct and is met with a high incidence of weaning failure.

The challenge for critical care physicians is to balance the act of successfully weaning the patient from ventilator against the dreadful need of re-intubation. The need for accurate prediction applies to all phases of weaning, beginning with reductions in mechanical support, as patients are increasingly able to support their own breathing, followed by trials of unassisted breathing, which often precede extubation and ending with extubation.^[2]

An ideal weaning index should be able to discriminate between those patients who can be successfully weaned from mechanical ventilation and those who are unable to be weaned. Many factors can influence the weaning outcome: The functional parameters used as indexes of weaning, the criteria used to define failure or success, the moment at which the patients are studied, different clinical practice from unit to unit, and the different populations.^[3]

Esteban *et al.*^[4] along with other Spanish Lung Failure Collaborative Group researchers introduced weaning by attempting a 2-h spontaneous breathing trial (SBT) and concluded that two-thirds of ventilated patients can be successfully discontinued from ventilator after a 2-h SBT. Based on these findings, the critical care physicians have been practicing SBT and if the patient fulfills the objective and subjective readiness criteria, the trachea is extubated. Nevertheless, around 12–25% of the patients

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experience respiratory insufficiency postextubation and require re-intubation.^[5] Hence, this method does not have accurate predictive value.

Yang and Tobin^[6] in 1991 developed a new weaning index and named it rapid shallow breathing index (RSBI) and had concluded that RSBI is the single most accurate predictor of weaning success and has a predictive value of 89%. Since then, this index has been evaluated in almost 22 studies published. Lee *et al.*^[7] suggested that RSBI could be employed more usefully as a trend monitor rather than as a spot check. Various studies have found that RSBI <105 breaths/min/L has a sensitivity, 65–96%; specificity, 0–73%; and hence only modestly predicts extubation success.

Nemer *et al.*^[8] in 2009 defined the integrative weaning index (IWI) and its predictiveness for successful weaning. The principle of IWI is to integrate three important components of breathing in a single equation: The respiratory mechanics, oxygenation, and breathing pattern. The principle that static compliance and SaO₂ are directly proportional to weaning success and RSBI

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values are inversely proportional to weaning success have been incorporated in the equation.

The authors of the present study^[9] have based their study on the above-mentioned article and compared IWI with routine weaning criteria. They have shown IWI can accurately predict weaning failure even in patients who tolerate SBTs.

To incorporate IWI in routine weaning prediction model, we have to understand certain important points.

First, there are very limited studies on IWI and most of the studies have majority of chronic obstructive pulmonary disease patients as their study subjects. Hence, the question whether this weaning index accurately predict successful weaning in other conditions of acute respiratory failure needs a larger extrapulmonary database as the respiratory mechanics may change with the disease. Second, when the patients are in the weaning phase, calculation of static respiratory compliance with patients' breathing spontaneously can give erroneous readings. So, to get an accurate reading, the patient's respiratory effort either has to be abolished or the patient has to voluntarily become apneic. To calculate IWI, static compliance plays a very important role and one has to be sure about the method of obtaining the correct compliance value.

In the present study, the authors have done justice to the first point by enrolling patients with varied etiologies of respiratory failure although the total number of patients is less. They also have taken into account the second point by taking the digital display value of static

respiratory compliance by selectively deleting the values where patient had taken respiratory effort. The positive predictive value of IWI in the study is 97%, which is almost the same as the original article which had 99%. In this present study, the authors have been able to predict statistically significant weaning success.

Even with limited literature on IWI, the concept looks appealing with such high sensitivity and specificity. To make IWI as a routine predictor of weaning success could be an excellent advancement in the respiratory management, but require more studies.

References

1. Boles JM, Bion J, Connors A, Herridge M, Marsh B, Melot C, *et al.* Weaning from mechanical ventilation. *Eur Respir J* 2007;29:1033-56.
2. Meade M, Guyatt G, Cook D, Griffith L, Sinuff T, Kergl C, *et al.* Predicting success in weaning from mechanical ventilation. *Chest* 2001;120 6 Suppl:400S-24S.
3. Conti G, Montini L, Pennisi MA, Cavaliere F, Areangeli A, Bocci MG, *et al.* A prospective, blinded evaluation of indexes proposed to predict weaning from mechanical ventilation. *Intensive Care Med* 2004;30:830-6.
4. Esteban A, Alía I, Gordo F, Fernández R, Solsona JF, Vallverdú I, *et al.* Extubation outcome after spontaneous breathing trials with T-tube or pressure support ventilation. The Spanish Lung Failure Collaborative Group. *Am J Respir Crit Care Med* 1997;156(2 Pt 1):459-65.
5. Solsona JF, Díaz Y, Vázquez A, Pilar Gracia M, Zapatero A, Marrugat J. A pilot study of a new test to predict extubation failure. *Crit Care* 2009;13:R56.
6. Yang KL, Tobin MJ. A prospective study of indexes predicting the outcome of trials of weaning from mechanical ventilation. *N Engl J Med* 1991;324:1445-50.
7. Lee KH, Hui KP, Chan TB, Tan WC, Lim TK. Rapid shallow breathing (frequency-tidal volume ratio) did not predict extubation outcome. *Chest* 1994;105:540-3.
8. Nemer SN, Barbas CS, Caldeira JB, Cárrias TC, Santos RG, Almeida LC, *et al.* A new integrative weaning index of discontinuation from mechanical ventilation. *Crit Care* 2009;13:R152.
9. El-Baradei GF, El-Shmaa NS, Gama SA. Can integrative weaning index be a routine predictor for weaning success? *Ind J Crit Care Med*;19:703-707