Key words

Chest ultrasound and weaning process: heart, lung and diaphragm assessment

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Purpose:

Failure of weaning from mechanical ventilation(MV) is a common problem that face the intensivist. The causes are often multifactorial and involve a complex interplay between cardiac and pulmonary dysfunction. Application of chest ultrasonography(US) may help in weaning and prediction of its outcome.

Methods:
50 invasively MV patients fulfilling criteria of weaning&shifted to SBT(using PSV 8 cmH2O) for 1 hour. Weaning failure was defined as: Failed SBT, Reintubation&/or reventilation or death within 48 hours. Echocardiography was used to get Ejection fraction, E/A ratio, TAPSE, Doppler tissue imaging (DTI)&E`(MV lateral),E`(MV septal),E/E`lateral, E/E` septal, E`(Tricuspid valve)and E/ E`(Tricuspid valve),lung ultrasound(LUS)was used to assess LUS score, diaphragm ultrasound was used to assess diaphragmatic thickening fraction(DTF).

Results: Mean age 57.1±14.5, 62% were males. Weaning was successful in 80% of patients. E/A ratio, E/E`(MV lateral),E/ E`(MV Septal),E/ E`(Tricuspid valve),and(LUS) score  were significantly higher in the failed weaning group: :(1.5±0.5)versus(1.1±0.4),(p:0.004),(11.5±3.3)versus(7.3±1.6)(p:0.003),(13±3.1)versus(8.0± 1.9),(p:0.001),(9.4±1.4)cm  vs  (6.9±1.3cm),(*p*:0.001),and(10.8±4.2) vs(16.5±4.2cm),(*p*:0.001)  respectively. E`(MV lateral).E`(MV septal),and (DTF) were significantly higher in the successful weaning group:(10.6±2.4versus(8.4±2.5)(p:0.013), (9.4±2.4)versus(7.0±2.4)(p:0.007)and(43.0±10.7)vs(28.9±2.8cm),(*p*:0.001)respectively.TAP SE,DTF,E`(MV) lateral and E`(MV)septal can predict successful weaning using Receiver operating characteristic(ROC)curves with the following cutoff values respectively:≥16.5,with sensitivity 90.0% and specificity 80.0% with a *p value*<0.001,≥29.5 with sensitivity 95.0% and specificity 80.0% with a *p value* <0.001, ≥9 with sensitivity 77.5% and specificity 77.8% with a *p value* :0.001, ≥7.7 with sensitivity 77.5% and specificity 88.9% with a *p value*:0.001.E/E`(MV) lateral, E/E`(MV)septal, E/E`(TV),E/A ratio and LUS score can predict weaning failure by using ROC curve with following cutoff values respectively:(≥ 9 with sensitivity 66.7% and specificity 87.0% with a *p value*<0.001,≥9.7 with sensitivity 90.0% and specificity 85.0% with a *p value* < 0.001, ≥ 8.2 with sensitivity 90.0% and specificity 87.5 % with a p *value* 0.001,≥ 1.4 with sensitivity 90.0% and specificity 87.0% with a *p value* 0.036,≥15.5 with sensitivity 70.0% and specificity 82.5 % with a p *value*<0.001. when adding LUS,E/E`MV septal and E/E`tricuspid cutoff values together to predict weaning failure, it shows sensitivity 100.0% and specificity 96.7%.Regression analysis showed significant impact on weaning prediction (p 0.010).***Conclusion****:* the integrated use of bedside chest US(to assess the heart, lung and diaphragm) may be of great benefit throughout the weaning process .