Category : **Respiratory: mechanical ventilation**

A158 - *Utility of dead-space-to-tidal-volume ratio in predicting extubation failure: a systematic review and meta-analysis*

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Introduction:

Despite many advances made with weaning protocols, the need for reintubation still arises in 10%-20% of patients extubated after successful weaning[1]. Such extubation failure (EF) is associated with prolonged mechanical ventilation and mortality[2]. Dead-space-to-tidal-volume ratio (Vd/Vt) as an indicator of extubation outcome was investigated in several studies, however, the results were inconsistent. We hypothesize that higher Vd/Vt values are associated with EF. Thus, we aimed to assess the utility of Vd/Vt in predicting EF among mechanically ventilated ICU patients via a systematic review and meta-analysis of observational studies.

Methods:

A systematic search (PubMed, Scopus and ScienceDirect; in March 2021) was performed for published papers that investigated the relationship between Vd/Vt and outcome of extubation following successful spontaneous breathing trial. Pooled Vd/Vt mean difference (MD) between extubation outcomes, and pooled Vd/Vt predictive accuracy measures (sensitivity [Sn], specificity [Sp], diagnostic odds ratio [dOR] and summary area under the curve [AUC]) were determined using a random-effects model. Subgroup analysis based on age (pediatric vs adult) was likewise done.

Results:

Eight studies (684 patients) met the inclusion criteria. Optimal Vd/Vt cutoffs ranged from 0.50 to 0.65. EF patients had higher mean Vd/Vt relative to extubation successes (MD = 0.12; 95% CI 0.06-0.18; $p<0.01$). Pooled Sn, Sp and dOR were 0.79 (95% CI 0.66-0.88), 0.74 (95% CI 0.67-0.81) and 9.72 (95% CI 3.89-24.32), respectively. The summary AUC (Figure 1) is 0.83 (95% CI 0.79-0.86). No significant differences in pooled estimates between the age subgroups were noted.

Conclusion:

Vd/Vt is a potential predictor for EF given its modest Sn and Sp, high dOR and moderate-to-high summary AUC. However, further studies are needed to determine a single optimal Vd/Vt cutoff, above which EF is expected.

References:

[1] Thille AW et al. *Am J Respir Crit Care Med* 187:1294-302, 2013
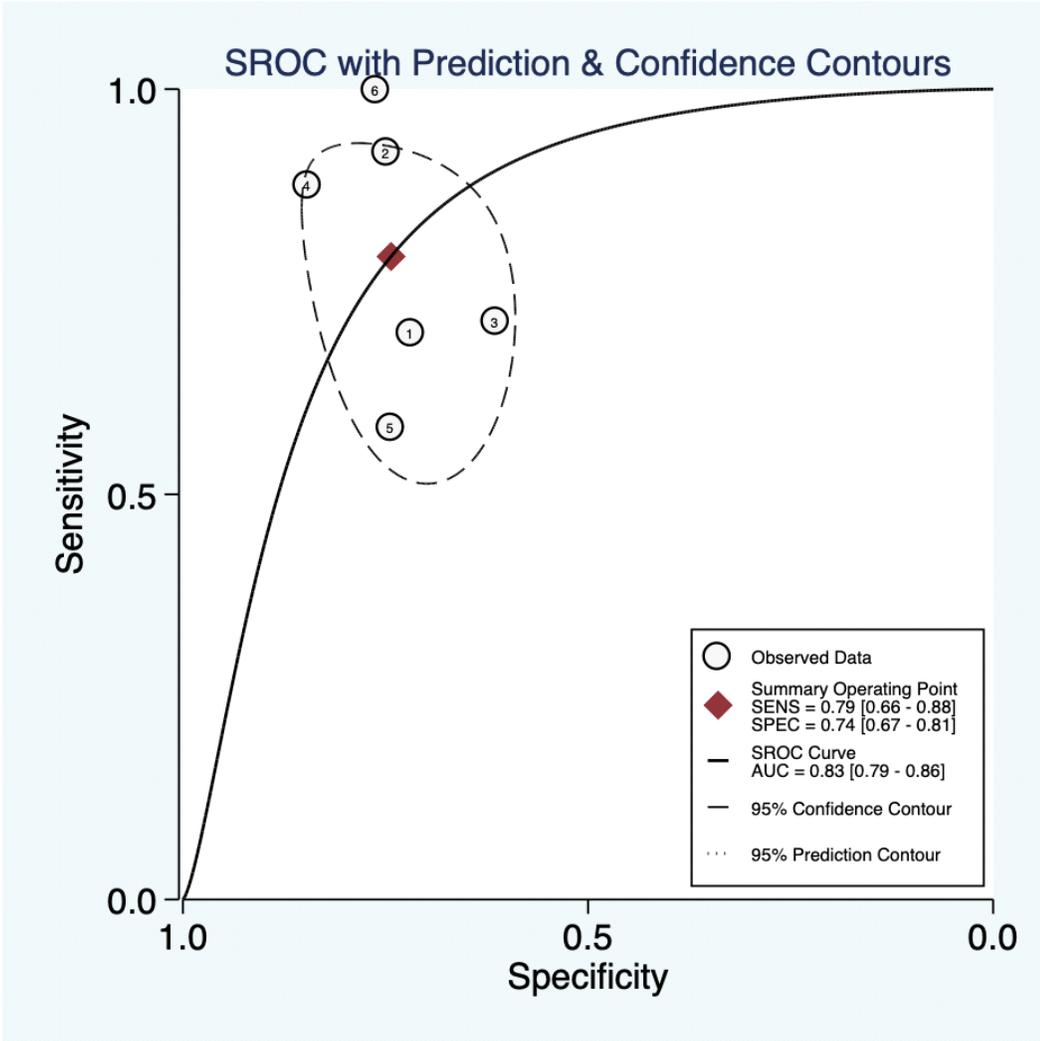[2] Epstein SK et al. *Chest* 112:186-192, 1997

Image :

Figure 1. Summary area under the curve with prediction and confidence contours