Lack of Association between Diaphragm Thickening Fraction and Transdiaphragmatic Pressure Swing in COVID-19 Pneumonia during Helmet Continuous Positive Airway Pressure: Research Letter

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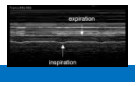
Background

Recently, evaluation of the diaphragm by means of ultrasound has become popular. The increase in diaphragm thickness during inspiration (thickening fraction) has been proposed as a noninvasive bedside measure of diaphragm function, although previous studies have reported wide variability between thickening, inspiratory effort, and transdiaphragmatic pressure.



Purpose

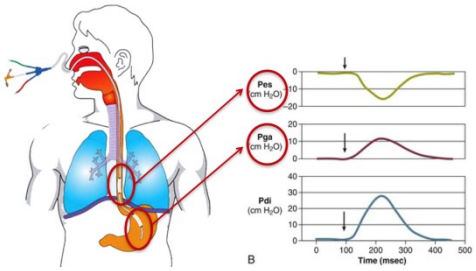
We hypothesized that the force-length and force-generating relationship in the diaphragm is altered by different positive end-expiratory pressure (PEEP) levels in patients with SARS-CoV-2.

Method

Thirty consecutive spontaneously breathing patients with helmet CPAP within 48 h of ICU

Esophageal and gastric balloon catheter (ΔPes and ΔPdi)

A trial of three levels of CPAP (0-5-10 cmH_2O)



Result

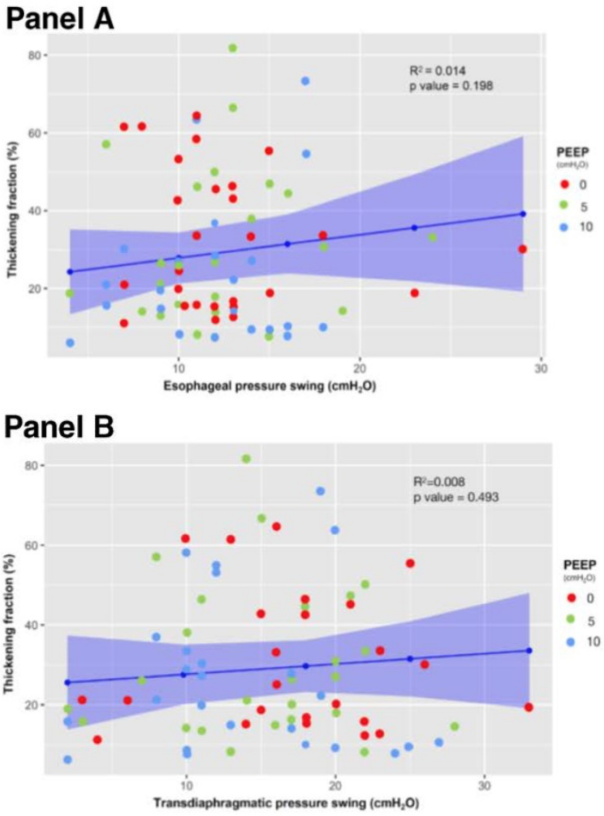


Fig. 1. Relationships between diaphragm thickening fraction, transdiaphragmatic pressures swings, and esophageal pressure swings. (A) Association between diaphragm thickening fraction and esophageal pressure swings at positive end-expiratory pressure (PEEP) 0 cm H_2O, 5 cm H_2O, and 10 cm H_2O (respectively, red, green, and blue circles, P = 0.198, marginal R_2 = 0.014 [95% CI, 0.001–0.03]). (B) Association between the diaphragm thickening fraction and the transdiaphragmatic pressure swings at PEEP 0 cm H_2O, 5 cm H_2O, and 10 cm H_2O (respectively, red, green, and blue circles, P = 0.493, marginal R_2 = 0.008 [95% CI, 0.001–0.092.

Conclusion

- In SARS-CoV-2 patients during helmet continuous positive airway pressure in the acute setting, an increase in inspiratory effort, as measured by transdiaphragmatic pressure swings, is not related to diaphragm thickening fraction.
- The assessment of diaphragm thickening should not be used as a surrogate for inspiratory effort.