Transpulmonary thermodilution cardiac output measurement is not affected by severe pulmonary oedema: a newborn animal study
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Abstract
BACKGROUND: The transpulmonary thermodilution (TPTD) technique is widely used in clinical practice for measuring cardiac output (CO). This study was designed to investigate the influence of various levels of pulmonary oedema on the reliability of CO measurements by the TPTD method.

METHODS: In 11 newborn lambs pulmonary oedema was induced using a surfactant washout technique. Serial CO measurements using TPTD (CO(TPTD)) were performed at various amounts of lung water. Simultaneously, CO was measured by an ultrasound flow probe around the main pulmonary artery (CO(MPA)) and used as the standard reference. CO was divided by the body surface area to calculate cardiac index (CI). Data were analysed using correlational statistics and Bland-Altman analysis.

RESULTS: One lamb died prematurely. A total of 56 measurements in 10 lambs were analysed with a median CI(MPA) of 2.95 (IQR 1.04) litre min(-1) m(-2). Mean percentage increase in extravascular lung water (EVLW) between the start and the end of the study was 126.4% (sd 40.4). Comparison of the two CO methods showed a mean bias CI of -0.16 litre min(-1) m(-2) (limits of agreement ±0.73 litre min(-1) m(-2)) and a percentage error of 23.8%. Intraclass correlation coefficients were 0.91 (95% CI 0.81-0.95) for absolute agreement and 0.92 (95% CI 0.87-0.95) for consistency. Acceptable agreement was confirmed by a tolerability-agreement ratio of 0.39. The within-subject correlation between the amount of EVLWI and the bias between the two methods was not significant (-0.02; P=0.91).

CONCLUSIONS: CO measurements by the transpulmonary thermodilution technique over a wide range of CI values are not affected by the presence of high EVLWI. The slight underestimation of the CO is independent of the amount of pulmonary oedema.