CORRESPONDENCE

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Impact of shunt on the transpulmonary thermodilution curve

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Dear Editor,
We read with interest the comments by Nusmeier et al. [1] regarding our article entitled "Transpulmonary thermodilution curves for detection of shunt" [2]. The authors found that our explanation (Appendix, page 1086)

was confused [2]! Thus, these authors proposed a much simpler and easier mathematical method to support our explanations [1]. Indeed, they calculated mean transit time (MTt) as the ratio of intrathoracic thermal volume (ITTV) to cardiac output (CO) and the down slope time (DSt) as the ratio of intrapulmonary thermal volume (IPTV) to CO (see Fig. 1). In the end, their observations and conclusions were similar to our findings [1, 2].

However, retrospective calculations performed by these authors are based on mean values of three transpulmonary thermodilution (TPTD) curves [1, 2]. In this regard, although some of these disagreements may be only semantic, these differences are important in trying to explain our results (Fig. 1). Indeed, the retrospective calculated absolute values of MTt and DSt displayed in Table 1 are extrapolated from an inauthentic curve derived from the average of three TPTD curves [1]. From a

physiological point of view, we feel that even if Nusmeier et al. used a coupled mathematical analysis [3] to clarify our interpretations, the values of MTt and DSt they displayed [1] are not original. In contrast, as we had considered that no approach could provide absolute values of MTt and DSt in the absence of direct measurements on a curve [3], we proposed our "relative confused mathematical formulation." We hope to have clarified the key issues for the journal readers.

Conflict of interest The authors warrant that no ethical problem or conflicts of interest regarding this paper exist.

References

1. Nusmeier A, Lemson J, Van der Hoeven J (2010) Interpretation of the transpulmonary thermodilution curve in presence of a left-to-right shunt. Intensive Care Med. doi: 10.1007/s00134-010-2107-y.
2. Giraud R, Siegenthaler N, Park C, Beutler S, Bendjelid K (2010) Transpulmonary thermodilution curves for detection of shunt. Intensive Care Med 36:1083–1086. doi: 10.1007/s00134-010-1876-7
3. Lindvall T (1992) Lectures on the coupling method. Wiley, New York

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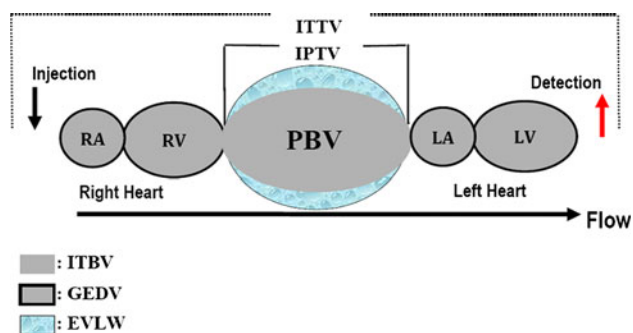Tel.: +41-22-3827460
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Fig. 1 Mathematical method used by authors to calculate MTt and DSt. *ITTV* Intrathoracic thermal volume, *IPTV* intrapulmonary thermal volume, *PBV* pulmonary blood volume, *GEDV* global end-diastolic volume, *ITBV* intrathoracic blood volume, *EVLW* extravascular lung water, *CO* cardiac output, *MTt* mean transit time, *DSt* down slope time, *RA* right atrium, *RV* right ventricle, *LA* left atrium, *LV* left ventricle. Formulas: GEDV = ITTV − IPTV = CO(MTt − DSt); ITBV = GEDV + PBV, MTt = ITTV/CO = EVLW + ITBV/CO, DSt = IPTV/CO = EVLW + PBV/CO = EVLW + (ITBV − GEDV)/CO