



Rebuttal to: Berger D, Moller PW, Takala J. Reply to “Is the Guytonian framework justified in explaining heart lung interactions?” and “Venous return, mean systemic pressure and getting the right answer for the wrong reason”

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In my previous letter (1), I addressed specific concerns regarding the validity of the interpretations put forward by Berger and Takala as “*the impact of positive-pressure ventilation on systemic venous return*” (2), in the context of Guyton’s model of the systemic circulation.

I argued that the well-known effect of positive-pressure ventilation on cardiac output (their “venous return”) is univocally explained by the limiting effect of positive-pressure lung inflation on cardiac preload, according to Starling’s “Law of the Heart”, which they appropriately cited but as the same time referred to it as an “assumption” (2).

I also argued that the mechanism defended by the authors (namely, the “back-pressure” hypothesis) implies an “anti-Starling” relationship as right atrial (venous) pressure is viewed as an inverse function of systemic flow (3), i.e., an effective backward force impeding “venous return”, which equals cardiac output in Guyton’s literature. Moreover, the series of experimental essays carried out by the authors are based on this faulty premise (4-6), so far offering no feasible explanation about inconsistencies with fundamental principles of hydrodynamics and the conservation of energy (7).

Finally, I suggest that the back-pressure mechanism is especially appealing when explaining the hemodynamic effect of positive-pressure ventilation because of a fundamental confusion between the steady-state inverse relationship showed by Guyton, and the specific pattern of cyclic, transient variation of venous inflow to the heart

induced by the swing of intrathoracic pressures (1). As pointed out at several times (7-9), the former does not contemplate pulsatile, regional transients of flow, pressure or volume, and must not be confused. In this regard, the authors’ statements that “*Dalmau also ignores that transmural pressures of the intrathoracic veins decrease with inspiration, thereby reducing venous return to the right atrium*”, along with the idea that “*changes in right atrial pressure precedes changes in venous return*” (10) demonstrate such confusion.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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