The Cardiovascular System as a System of "Organs" in Series. Cardiovascular Components and the Balance Equation of Blood Pressure Regulation

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Background:

The Balance Equation of Blood Pressure Regulation(1) serves as a model of the haemo-dynamic changes that occur when sodium intake is altered in normotensive subjects(2,3). ΔSBP was related to age and initial SBP whereas ΔDBP was not age related though ΔDBP and ΔSBP correlated(3).

Results:

Differing results for ΔDBP and ΔSBP indicated that response to change in sodium intake is related directly to volume and indirectly to capacitance factors(2,3).

The Balance Equation is represented as follows: Systolic blood pressure (SBP) response; $\Delta SBP=K(\Delta SV.\Delta AC^{-1})$, where SV is Stroke Volume and AC is aortic compliance and where K=Constant=1, which represents cardiac contraction, Δ is change and $^{-1}$indicates reciprocal. Diastolic blood pressure (DBP) response to sodium intake; $\Delta DBP=K(\Delta Vol.\Delta CAP^{-1})$ where Vol is blood volume and CAP is venous capacitance.

Conclusion:

Regarding the aorta as an end-organ pathophysiologically and for risk assessment and the circulation as a system in series helps in much the same way that one does other systems, e.g. GIT, GUT with each component differing in physiological contribution, yet are interdependent. Similarly ΔDBP and ΔSBP correlated but different variable affected each. This explains why ΔSBP, which is related to age is more predictive of stroke and arteriosclerotic disease than ΔDBP. Reduced aortic compliance in older people may reflect capillary pruning in the adventitiaa (4) that relates to capillary pruning elsewhere i.e. to vascular dementing illness or periventricular white matter degenerative disease (5,6) and also to reduced renal plasma flow and glomerular integrity as Creatinine clearance was lower on the reduced sodium diet in older patients(2,3).

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