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A universal number for wave reflection optimization of the mammalian cardiovascular system. NIEMA PAHLEVAN, MORTEZA GHARIB, California Institute of Technology — Quantifying the optimum arterial wave reflection and systemic arterial function is essential to the evaluation of optimal cardiovascular system (CVS) operation. The CVS function depends on both the dynamics of the heart and wave dynamics of the arterial network. Here, we are introducing a universal dimensionless number, called wave condition number (α) that quantifies the arterial wave reflection. An in-vitro experimental approach, utilizing a unique hydraulic model was used to quantify α in human aortas with a wide range of aortic rigidities. Our results indicate that the optimum value of the wave condition number is 0.1 at each level of aortic rigidity. Looking into mammals of various size (from mice to elephant), our results show that the optimum wave condition number remains 0.1 and is universal among all mammals. Clinical applications and the relevancy of the wave condition number will also be discussed.

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