Heads Up: Our Definition of "Normal" Matters

To the Editor

I would like to compliment Drummond[1] on his thoughtful and comprehensive review of blood pressure management and the brain. We will have to agree to disagree about the relative evidence for "waterfall" versus "siphon" (more properly, "open" versus "closed") physiology, as well as the applicability of the Starling resistor concept to the upright cerebral vasculature.[2,3]

With that said, there remains an important point that has less to do with physiology and more to do with logic. Our language has failed to capture the definition of "normal" in discussions about blood pressure management in the upright position. Humans spend approximately two-thirds of their lives in the head-up position, including the position that you are most likely in while you read this letter. Consequently, the normal blood pressure at head level during the majority of our lives is lower than the normal blood pressure measured at heart level in the sitting position, and lower than what we consider a baseline ambulatory heart-level blood pressure. If, for example, your blood pressure at heart level remains approximately 120/80 mm Hg whether you are supine or upright, the blood pressure at the level of your brain will be 120/80 mm Hg for only one-third of your life when horizontal, but 100/60 mm Hg for the majority (two-thirds) of your life when upright. Forcing the blood pressure at the level of the brain to 120/80 while it is in its normal, upright, position is not normal. It is abnormal. As a profession, we should be clear about that in our discussions. For some reason, we have not been.

If we should decide that the upright brain under anesthesia is more vulnerable than the upright brain during most of its waking life, then we may also eventually decide to push the blood pressure measured at the level of the upright brain to higher values than it is accustomed to in that position. However, if we do that, we will in fact be targeting a hypertensive result for the brain in that position, rather than maintaining a normal blood pressure. And, of course, to accomplish that goal, we will be forcing an abnormally high pressure at the level of the heart (140/100 mm Hg in this example) to support an abnormally high pressure at the level of the upright brain (120/80 mm Hg). If, for some valid reason, we decide to do that, we should at least be logical and honest and call that strategy what it is: a hypertensive strategy, not a normotensive strategy. On the other hand, if what we want is a normal blood pressure in the upright brain, all we need to do is maintain a normal blood pressure at the level of the heart. In answer to the question by Drummond[1] about whether the laws of physics pertain in his colleagues' beach chair cases, as they do in his own neurosurgical sitting cases, the answer is "yes." In neither case is there a need for a "hydrostatic correction."

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DOI: 10.1213/ANE.0000000000004283