Influence of Changes in Blood Pressure on Cerebral Oxygenation: Role of Skin Blood Flow?

To the Editor:

We read with interest the report from Lucas et al in the recent issue of Hypertension. We agree with the findings presented on cerebral blood flow with transcranial ultrasound Doppler, but we propose an alternative interpretation of the cerebral oxygenation data. As pointed out by the authors, at rest and under normal conditions, near-infrared spectroscopy (NIRS) monitors cerebral oxygenation faithfully. Also, current NIRS devices are spatially resolved and should distinguish between the differences in absorption of photons returning from deep rather than superficial tissue. Thus, their findings may, as noted, be explained by cerebral vasoconstriction or dilation introduced by the pharmaceutical agents. This is, however, debated, and little evidence suggests a direct role of nitroprusside or phenylephrine on the cerebral vasculature, although it cannot be ruled out. On the other hand, changes in skin blood flow are significant to the NIRS signal. Davis et al report that the NIRS-derived oxygenation obtained over the vastus lateralis muscle varies in direct proportion to laser Doppler-derived skin blood flow under conditions where muscle blood flow is not expected to change. Their findings strongly imply that, even with spatial resolved NIRS, changes in skin blood flow influence the NIRS signal. Therefore, manipulation of mean arterial pressure and, in turn, cerebral perfusion pressure with nitroprusside or phenylephrine may inadvertently influence NIRS measurements of cerebral oxygenation, because it is well known that these agents affect skin blood flow directly. Nitroprusside has been shown to increase skin blood flow, whereas phenylephrine decreases skin blood flow. As light emitted from the NIRS device travels through the skin, these findings may directly explain the seemingly puzzling differences in the response to pharmaceutical-induced changes in mean arterial pressure between cerebral oxygenation and blood flow findings. We, therefore, propose that future studies examining cerebral oxygenation involving vasopressor or dilator agents quantify skin blood flow for interpretation of the data.

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None.

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