The following is the abstract of the article discussed in the subsequent letter:

Joyner MJ, Dietz NM, and Shepherd JT. From Belfast to Mayo and beyond: the use and future of plethysmography to study blood flow in human limbs. J Appl Physiol 91: 2431–2441, 2001.—Venous occlusion plethysmography is a simple but elegant technique that has contributed to almost every major area of vascular biology in humans. The general principles of plethysmography were appreciated by the late 1800s, and the application of these principles to measure limb blood flow occurred in the early 1900s. Plethysmography has been instrumental in studying the role of the autonomic nervous system in regulating limb blood flow in humans and important in studying the vasodilator responses to exercise, reactive hyperemia, body heating, and mental stress. It has also been the technique of choice to study how human blood vessels respond to a variety of exogenously administered vasodilators and vasoconstrictors, especially those that act on various autonomic and adrenergic receptors. In recent years, plethysmography has been exploited to study the role of the vascular endothelium in health and disease. Venous occlusion plethysmography is likely to continue to play an important role as investigators seek to understand the physiological significance of newly identified vasoactive factors and how genetic polymorphisms affect the cardiovasc-ular system in humans.

A retrospective perspective

To the Editor: This Letter is a late response to a paper that was written by Joyner et al. in 2001 (9).

I retired in 1998 and lost touch with physiology literature. Recently, former colleagues sought help with a manuscript and drew my attention to the above article. While its objectives were worthwhile, the review of source material seemed blinkered, in light of the “future” projection in their title. Hokanson et al. (8) have had an immense impact on the use of plethysmography in blood flow (Q) research. Yet, why no mention of the Filtrass system (3)? This uses an exquisitely sensitive and self-calibrating, liquid metal-free sensor, thus lacking toxic mercury. The Filtrass analysis system was based on a well-tested mercury-in-Silastic plethysmographic (MSG) model (6). Filtrass can be used for a whole variety of nonvascilar microvascular investigations, including Q assessment.

Indeed, Tschakovskov et al. (11) did find good correlation between assessments of brachial Q using Doppler ultrasound and MSG. Similarly, changes in color duplex ultrasonography (CDU) and MSG signals were comparable when assessing lower limb Q (5), as venous congestion pressure was raised, using small cumulative pressure steps. Both the CDU and Q indexes remained constant, up to the subjects’ mean arterial pressure. Contrary to the predictions of Darcy’s law! These data supported suggestions that precapillary resistance is influenced by signals generated at the microvascular/postmicrovascular levels, and transmitted, retrogradely, via the endothelial cells (4). If correct, then values of Q, in patients manifesting endothelial cell dysfunction, might follow the Darcy prediction as congestion pressure increased.

Preeclampsia (PET) patients have such an endothelial cell dysfunction (10) and were used to test the retrograde transmis-sion hypothesis. After preliminary assessments (1), a longitudinal study (2) involving normal and hypertensive pregnant subjects, as controls, along with a group “at risk” of developing PET, was undertaken. However, only those who developed PET showed a fall in Q as cuff pressure was increased. Moreover, these changes preceded clinical diagnosis by several weeks, suggesting that changes in Q might be used as a predictive indicator.

Other references could be cited, of course, and those appended were only to illustrate a point. Incidentally, how could one overlook the pitfalls engendered by the venoarteriolar vasoconstrictor mechanism (7) in a review on plethysmographic assessment of Q?

Justified criticism is always welcome, for that is part of the process of scientific progression. However, doesn’t ignoring literature reflect as badly on a journal’s choice of referees as it does on the authors? But, perhaps scientific perspectives have changed since 1998—I do hope not.

DISCLOSURES

Disclaimer: the author has no financial interest in any company marketing Filtrass or any other such devices.

REFERENCES


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REPLY

To the Editor: The authors would like to thank Dr. Gamble for calling attention to the utility of the Filtrass system for venous occlusion plethysmography (VOP). This is clearly one of many approaches that can be used to estimate volume changes in the forearm or calf during VOP. We also agree completely that VOP can be used to quantify fluid shifts and venous function.
in the extremities. The problem of how venous congestion might either mechanically or neurally limit arterial inflow and thus the estimation of flow has been a chronic concern since VOP was first established. In this context, comparisons with Doppler techniques seem to confirm that the first few heartbeats of arterial inflow are only minimally affected by these potential problems. Our interpretation is that, when standard approaches to VOP are used, these problems can be minimized. Finally, the preeclampsia studies mentioned by Dr. Gamble highlight another condition where VOP has provided pathophysiological insight. We thank him for highlighting these key findings.

REFERENCES


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