Neurovascular Function and Sudorimetry in Health And Disease

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Abstract

In this review of thermoregulatory function in health and disease, we view the basic mechanisms controlling skin blood flow of the hairy and glabrous skin and illustrate the major differences in blood flow to glabrous skin, which is, in essence, sympathetically mediated, while hairy skin is dependent upon neuropeptidergic signals, nitric oxide, and prostaglandin, among others. Laser Doppler methods of quantification of blood flow—in response to iontophoresis of acetylcholine or heat—and nociceptor-mediated blood flow have relatively uniformly demonstrated an impaired capacity to increase blood flow to the skin in diabetes and in its forerunners, prediabetes and the metabolic syndrome. This reduced capacity is likely to be a significant contributor to the development of foot ulcerations and amputations in diabetes, and means of increasing blood flow are clearly needed. Understanding the pathogenic mechanisms is likely to provide a means of identifying a valuable therapeutic target. Thermoregulatory control of sweating is intimately linked to the autonomic nervous system via sympathetic C-fibers, and sweat glands are richly endowed with a neuropeptidergic innervation. Sweating disturbances are prevalent in diabetes and its precursors, and quantification of sweating maybe useful as an index of diagnosis of somatic and, probably, autonomic dysfunction. Moreover, quantifying this disturbance in sweating by various methods maybe useful in identifying the risk of progression from prediabetes to diabetes, as well as responses to therapeutic intervention. We now have the technological power to take advantage of this physiological arrangement to better understand, monitor, and treat disorders of small nerve fibers and the somatic and autonomic nervous system (ANS). Newer methods of sudomotor function testing are rapid, noninvasive, not technically demanding, and accessible to the outpatient clinic. Whether the potential applications are screening for diabetes, following poorly controlled diabetes subjects during alteration of their treatment regimen, or simply monitoring somatic and autonomic function throughout the course of treatment, sudorimetry can be an invaluable tool for today’s clinicians.