An effective method for skin blood flow measurement using local heat combined with electrical stimulation.

Almalty AM¹, Petrofsky JS, Al-Naami B, Al-Nabulsi J.

Abstract
Electrical stimulation (ES) is a modality used to increase skin blood flow (SBF) and to aid in wound healing. A greater SBF in non wounded skin is induced if ES is used in a warm environment compared to a thermoneutral environment, where ES is usually applied. Therefore, in this paper, a method to investigate the effect of local heating and ES on the SBF is developed. A total of 33 males (18-40 years) were divided into group G (n = 15) who received the ES during a global heating protocol and group L (n = 18) who received ES during a local heating protocol. In the global heating protocol, ES (30 Hz, 250 micros) was applied for 15 min on the subject's thigh in thermoneutral (25 +/- 0.5 degrees C) and warm (35 +/- 0.5 degrees C) environments. In the local heating protocol, ES was applied for 15 minutes at 25 degrees C, 35 degrees C and 40 degrees C local skin temperatures. A laser Doppler imager measured the SBF in both protocols pre, during, and post ES. The results of the experiment showed the significant differences in the SBFs were found at pre, during, and post ES in a thermoneutral environment or when the skin was locally cooled to 25 degrees C. The SBFs were significantly increased during and post ES after global heating or during local heating at 35 degrees C and 40 degrees C. There were no significant differences in SBFs between the warm environment and at 35 degrees C of local heating. However, the SBF response to ES was the highest at 40 degrees C of local heating. Thus, ES during local heating of the skin, as well as during global heating is an effective method to increase SBF.