Subjects: Persons with diabetes mellitus (DM, n=13), and without DM (NO-DM, n=15) participated. For (DM vs. NO-DM) data (mean ± standard error (SE)) were as follows: ABI: 1.1 (1.04 ± 0.04 vs. 1.13 ± 0.02; Height: 67.2 (1.05 ± 0.06 vs. 69.1 (1.11 inches); Weight: 205.2 (5.17 ± 4.1 vs. 156.9 (5.11 lbs); p<0.05; Age: 65.3 (± 5.3 ± 11 years; p<0.05; BP: systolic, 134 (± 2.5 ± 17.4 ± systolic, 134 (± 2.5 ± 17.4 ± diastolic, 75.8 (± 4.5 diastolic, 75.8 (± 4.5 mmHg. Duration of DM was 7.5 (± 1.5 years. Five subjects were on insulin; remainder on oral medication for type II DM. Ha1C for the group was 8.5 ± 2.2 and their morning blood sugar level averaged 144 ± 33 mg/dL.

Protocol: Subjects lay on a support surface with their left heel positioned on the end cell of a support surface (Figure 1). Pressure in this cell was under computer control, and could be made to vary between 20 mmHg and a variable lower limit of either 5 or 0 mmHg. The test sequence was initiated after supine rest of 15 minutes during which the heel was not loaded (0 mmHg, Figure 2). Tests were conducted in a room with a well-controlled ambient temperature. Room temperatures were 24.1 ± 0.4 °C at the start and 24.3 ± 0.4 °C at the end.

Blood Perfusion: Heel skin blood perfusion (SBF) was monitored with a laser-Doppler probe on the heel (Figure 3). Blood pressure was measured during computer loading. Heel pressure could be rapidly raised to 0-25% while monitoring local SBF responses. This heat response was used to provide an index of the relative hyperemic potential for each subject. Skin temperature at non-heated sites in the foot dorsum and heel was measured with an infrared thermometer prior to the experiment start and at the end of the experiment. Skin temperatures did not differ between groups or were there significant changes at the skin sites from start to finish.

Results

For AR and QR there was a greater response if the heel was relieved to 0 mmHg compared to relief to 5 mmHg, showed a greater AR and QR for NO-DM group. Further, for the DM group, full pressure relief was associated with a significant reduction in SBF (Figure 3). For the DM group, which characterizes the SBF heat response on the foot dorsum, a significantly reduced value was observed in the DM group (p<0.05).

Heel hyperemic responses were assessed by two measures. During the first five minutes after pressure relief to either 5 mmHg or 0 mmHg, the area under the SBF curve was calculated and the ratio of this area to the corresponding five minute pre-load baseline was determined (Figure 6). This parameter is denoted as Qh. In addition, the peak SBF during the first five minutes of pressure relief was determined and the ratio of it to the five-minute pre-load baseline was calculated, denoted as AR. For the heat response on the foot dorsum, the peak SBF that occurred during a four minute heating cycle was determined and a ratio of its value to a four-minute average SBF prior to heating was determined. This parameter is denoted as QR. For the heat response to test overall differences in responses of AR and QR and within and between groups were done with a general linear model (GLM) for repeated measures. Follow-up tests of SBF responses (AR and QR) were done by analysis of variance. A p-value < 0.05 was considered statistically significant.