

## Reliability of Lightguide Spectrophotometry (O2C<sup>®</sup>) for the Investigation of Skin Tissue Microvascular Blood Flow and Tissue Oxygen Supply in Diabetic and Nondiabetic Subjects

Thomas Forst, M.D.,<sup>1</sup> Cloth Hohberg, M.D.,<sup>1</sup> Eda Tarakci,<sup>1</sup> Senait Forst,<sup>1</sup>  
Peter Kann, M.D.,<sup>2</sup> and Andreas Pfützner, M.D., Ph.D.<sup>1</sup>

### Abstract

#### **Background and Aims:**

Skin microvascular assessment has progressed to an important evaluation in patients with diabetes mellitus. This study was done to evaluate a new device using micro-lightguide spectrophotometry in the assessment of skin microvascular function.

#### **Material and Methods:**

Twenty nondiabetic subjects (age  $46.6 \pm 14.8$  years; mean  $\pm$  SD) and 20 diabetic patients (age  $59.4 \pm 8.4$  years) participated in repeated microvascular measurements using micro-lightguide spectrophotometry. This technique allows simultaneous, noninvasive measurement of microvascular blood flow and hemoglobin oxygenation (SO<sub>2</sub>) at the same anatomical area in different tissue layers. A skin probe was placed on nonhairy skin at the thenar eminence of the left hand for the measurement of SO<sub>2</sub>, and the postischemic reactive hyperemia response (PRH) was measured in skin and underlying muscle tissue.

#### **Results:**

Repeated measurements in PRH revealed a good correlation at the superficial skin layer ( $r = 0.97$ ,  $p < 0.0001$ ) with a coefficient of variation at  $9.2 \pm 1.7\%$  and at the superficial muscle layer ( $r = 0.80$ ,  $p < 0.0002$ ) with a coefficient of variation at  $9.7 \pm 1.5\%$ . A slightly weaker correlation was observed for the SO<sub>2</sub> measurement at the skin layer ( $r = 0.69 \pm p < 0.0001$ ) with a coefficient of variation at  $17.5 \pm 3.8\%$  and at the muscle layer ( $r = 0.48$ ;  $p = 0.0016$ ) with a coefficient of variation at  $18.1 \pm 10.5\%$ .

#### **Conclusions:**

Lightguide spectrophotometry is an easy, noninvasive, and reliable method for simultaneous measurement of superficial microvascular blood flow by laser Doppler fluxmetry and skin oxygenation by spectrophotometry. Further studies are required to clarify the validity of these measures in special patient populations such as diabetes mellitus with specified microvascular complications.

*J Diabetes Sci Technol* 2008;2(6):1151-1156

**Author Affiliations:** <sup>1</sup>Institute for Clinical Research and Development, Mainz, Germany, and <sup>2</sup>Department of Endocrinology, Phillips University of Marburg, Marburg, Germany

**Abbreviations:** (bLDF) baseline microvascular blood flow, (CV) coefficient of variation, (LDF) relative blood flow, (O2C) micro-lightguide spectrophotometry, (PRH) postischemic reactive hyperemia response, (rHb) relative amount of hemoglobin

**Keywords:** diabetes mellitus type 2, endothelial function, laser Doppler flux, skin microcirculation, tissue oxygenation

**Corresponding Author:** Thomas Forst, M.D., Professor Internal Medicine, Institute for Clinical Research and Development, Parcusstrasse 8, D-55116 Mainz, Germany; email address [thomasf@ikfe.de](mailto:thomasf@ikfe.de)