NON-INVASIVE GLUCOSE MONITORING IN PATIENTS WITH TYPE 1 DIABETES: REPEATABILITY IN THE SAME SUBJECTS

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A non-invasive multisensor device for continuous glucose monitoring, based on dielectric spectroscopy, combined with additional sensors for optical, sweat/moisture and temperature measurement has been developed. The motivation for the multisensory device is based on the understanding that various temporal fluctuations of the properties of skin, can introduce significant perturbations to the actual glucose related measurement. The aim of this study was to measure glucose excursions on different study days in the same subjects using an identical set of calibration parameters.

The device was worn on the upper right arm by 10 patients with Type 1 Diabetes (age 45±13 y, BMI 25.5±2.2 kg/m², duration of diabetes 22.5±10.5 y, HbA1c 7.0±0.5%). Glucose was administered orally to induce hyperglycemic excursions (max. 12-15 mmol/L) within 8 h. Euglycemia was re-established by i.v. insulin administration. Based on the sensor signals registered after the first study day, a global calibration model was derived, and the respective coefficients of the individual sensor signals were determined. On the second study day, 5 of these patients were again administered glucose orally to induce a glucose profile with one hyperglycemic excursion. The coefficients from the first study day were re-applied to the 5 test runs of the second study day in order to study the prediction power of the model.

Application of the calibration model from day one to day two yielded an $R^2 = 0.68$ and MARD of 27.3%.

These data indicate that a global model can be derived using training runs and successfully applied to a set of test runs with a different glucose profile.