

Noninvasive Skin Fluorescence Spectroscopy Is Comparable to Hemoglobin A1c and Fasting Plasma Glucose for Detection of Abnormal Glucose Tolerance

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Abstract

Aim:

We compare performance of noninvasive skin fluorescence spectroscopy (SFS), fasting plasma glucose (FPG), and hemoglobin A1c (A1C) for detection of abnormal glucose tolerance (AGT).

Methods:

The NSEEDS trial evaluated SFS, FPG, and A1C in an at-risk population of 479 previously undiagnosed subjects from nine US centers, each of whom received a 75 g, 2 h oral glucose tolerance test (OGTT). Skin fluorescence spectra were collected and analyzed with SCOUT DS[®] devices. Disease truth was AGT, defined as OGTT \geq 140 mg/dl. Abnormal glucose tolerance sensitivity, false positive rate (FPR), and receiver operating characteristic (ROC) curves were computed for each measurement technique. Skin fluorescence spectroscopy reproducibility was also assessed.

Results:

The AGT sensitivity of SFS was 68.2%, higher than that of FPG (thresholds of 100 and 110 mg/dl) and A1C (thresholds of 5.7% and 6.0%). The FPR of SFS was 37.7%, comparable to A1C at the 5.7% threshold (30.7%). Partial ROC areas of SFS, FPG, and A1C were similar for FPRs of 20–50% (average sensitivities of 64.0%, 59.0%, and 68.6%, respectively). The interday coefficient of variation for SFS was 7.6%.

Conclusions:

Skin fluorescence spectroscopy has similar screening performance to FPG and A1C and is a viable approach for detection of AGT.

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Abbreviations: (A1C) hemoglobin A1c, (ADA) American Diabetes Association, (AGT) abnormal glucose tolerance, (AUC) area under the curve, (BMI) body mass index, (CV) coefficient of variation, (FPG) fasting plasma glucose, (FPR) false positive rate, (IGT) impaired glucose tolerance, (NGT) normal glucose tolerance, (OGTT) oral glucose tolerance test, (pAUC) partial area under the curve, (ROC) receiver operating characteristic, (SDS) SCOUT diabetes score, (SFS) skin fluorescence spectroscopy

Keywords: abnormal glucose tolerance, diabetes screening, fluorescence, noninvasive, SCOUT DS

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