

Design and Clinical Pilot Testing of the Model-Based Dynamic Insulin Sensitivity and Secretion Test (DISST)

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Abstract

Background:

Insulin resistance is a significant risk factor in the pathogenesis of type 2 diabetes. This article presents pilot study results of the dynamic insulin sensitivity and secretion test (DISST), a high-resolution, low-intensity test to diagnose insulin sensitivity (IS) and characterize pancreatic insulin secretion in response to a (small) glucose challenge. This pilot study examines the effect of glucose and insulin dose on the DISST, and tests its repeatability.

Methods:

DISST tests were performed on 16 subjects randomly allocated to low (5 g glucose, 0.5 U insulin), medium (10 g glucose, 1 U insulin) and high dose (20 g glucose, 2 U insulin) protocols. Two or three tests were performed on each subject a few days apart.

Results:

Average variability in IS between low and medium dose was 10.3% ($p = .50$) and between medium and high dose 6.0% ($p = .87$). Geometric mean variability between tests was 6.0% (multiplicative standard deviation (MSD) 4.9%). Geometric mean variability in first phase endogenous insulin response was 6.8% (MSD 2.2%). Results were most consistent in subjects with low IS.

Conclusions:

These findings suggest that DISST may be an easily performed dynamic test to quantify IS with high resolution, especially among those with reduced IS.

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Abbreviations: (AUC) area under curve, (CV) coefficient of variation, (DISST) dynamic insulin sensitivity and secretion test, (EGP) endogenous glucose production, (EIC) euglycemic hyperinsulinemic clamp, (IFG) impaired fasting glucose, (IR) insulin resistance, (IS) insulin sensitivity, (ITT) insulin tolerance test, (IVGTT) intravenous glucose tolerance test, (MSD) multiplicative standard deviation, (NGT) normal glucose tolerance, (PK) pharmacokinetic, (SD) standard deviation, (T2DM) type 2 diabetes mellitus

Keywords: insulin resistance, insulin sensitivity, physiological modeling, pilot study, type 2 diabetes diagnosis

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