P2-281: INSULIN DYNAMICS AND BIOCHEMICAL MARKERS FOR PREDICTING IMPAIRED GLUCOSE TOLERANCE IN THAI OBESE YOUTH

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Background

- Subjects with impaired glucose tolerance (IGT) are at risk for type 2 diabetes mellitus (T2DM) and cardiovascular disease. The predictors of IGT in obese youth are not well described.

- The aims of this study were to: 1) describe fasting biochemical markers and fasting- or OGTT-derived indices of insulin resistance and secretion in obese youth; and 2) identify the cut-off values of fasting glycemic markers and insulin dynamic indices that could be used to predict IGT.

Methods

- We studied 115 obese Thai children who underwent an oral glucose tolerance test (OGTT). Plasma glucose and insulin levels were calculated for assessment of β-cell function. Hemoglobin A1c (HbA1c), lipid profile, and clinical parameters were also used to determine predictors of IGT.

Table 1 Clinical and biochemical characteristics of obese youth with normal and impaired glucose tolerance

Characteristics	NGT (n=82) Median (range)	IGT (n=30) Median (range)	P value
Age (yr)	12.5 (8.8-17.5)	13.0 (8.4-14.8)	0.356
Wt-SDS	3.0 (0.4-5.1)	3.4 (1.4-5.4)	0.438
BMI (kg/m^2)	32.8 (24.0-55.0)	32.8 (25.1-57.5)	0.945
BMI-SDS	3.2 (2.0-4.6)	3.2 (2.4-4.3)	0.708
Family history of T2DM	53 (64.7%)	22 (73.3%)	0.374
Pubertal status			
Prepuberty	20	9	0.548
Puberty	62	21	
Fasting parameters			
HbA1c (%)	5.7 (4.0-6.9)	5.9 (4.8-7.9)	0.400
Triglyceride (mg/dl)	102 (39-486)	104 (50-201)	0.571
Total chol (mg/dl)	177 (108-291)	183 (110-248)	0.507
HDL (mg/dl)	44 (23-74)	45 (25-73)	0.982
LDL (mg/dl)	109 (51-210)	120 (58-195)	0.451
Uric acid (mg/dl)	6.3 (3.6-10.0)	6.8 (4.1-9.5)	0.796
AST (IU/L)	25 (13-117)	25 (16-202)	0.505
ALT (IU/L)	33 (8-189)	31 (8-284)	0.710
GGT (IU/L)	30 (7-188)	27 (18-72)	0.751
ALP (IU/L)	214 (78-476)	171 (55-347)	0.169
OGTT parameters			
FBG (mg/dl)	81 (63-116)	83 (67-123)	0.034*
1-hr postload glucose (mg/dl)	129 (74-195)	160 (71-264)	<0.001*
Fasting insulin (µU/ml)	16.1 (1.0-446.0)	19.6 (1.0-92.8)	0.257
1-hr postload insulin (µU/ml)	123.0 (12.7-588.0)	122.0 (33.2-984.0)	0.396
2-hr postload insulin (µU/ml)	87.3 (8.1-849.0)	194.0 (55.9-986.0)	<0.001*
Insulin resistance			
HOMA-IR	3.2 (0.2-84.8)	4.2 (0.2-27.3)	0.107
AUC$_{ins}$	13033.5 (2088.0-58224.0)	16456.5 (5581.5-75132.0)	0.243
QUICKI	0.321 (0.220-0.535)	0.310 (0.247-0.516)	0.107
WBISI	2.6 (0.2-20.4)	2.0 (0.3-11.6)	0.029*
FG/FI	5.2 (0.2-90.0)	4.2 (1.3-87.0)	0.470
Insulin secretion			
HOMA-β	315 (13-11468)	345 (15-1134)	0.884
IGI	2.2 (3.0-12.6)	1.7 (0.1-6.6)	0.303

Figure 1 ROC curves of HbA1c, FBG, and 1-h postload glucose for predicting impaired glucose tolerance.

AUC of 1-h postload glucose = 0.712 (0.600–0.824, P< 0.001)
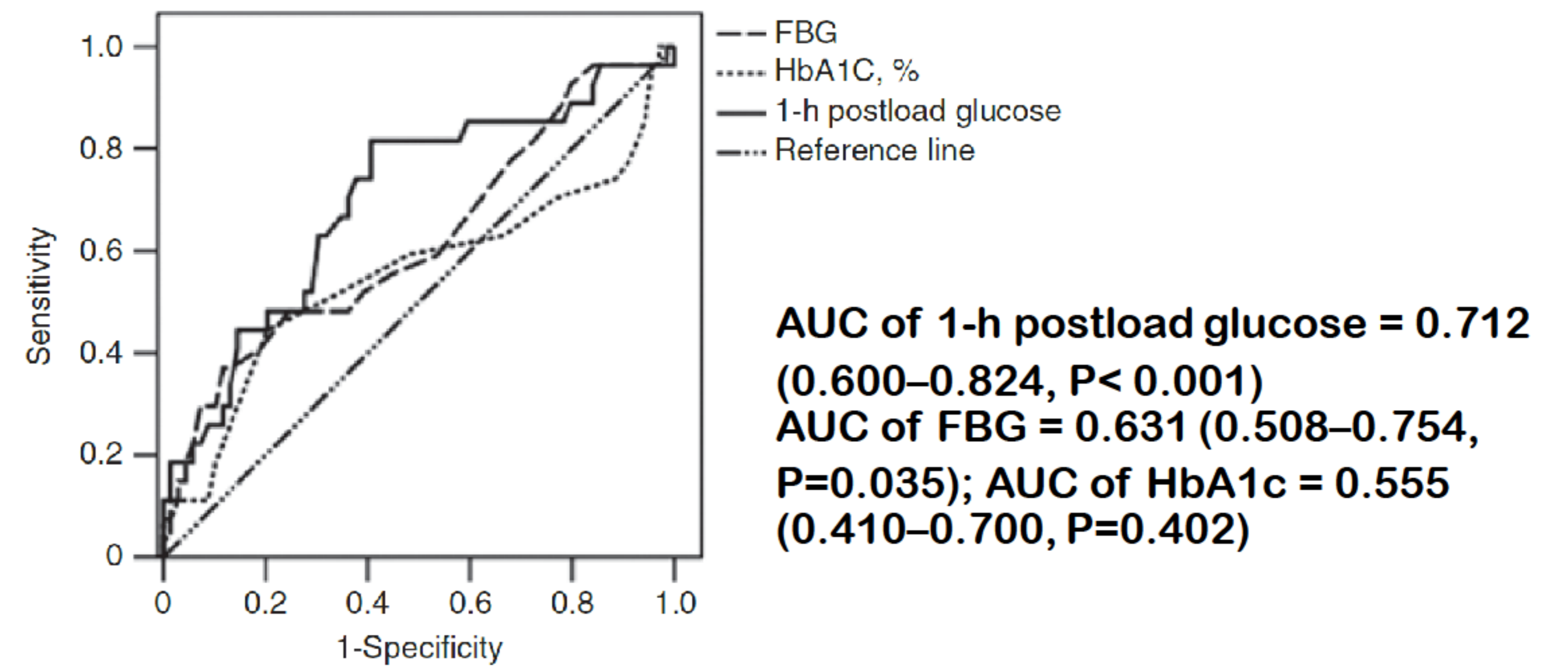AUC of FBG = 0.631 (0.508–0.754, P=0.035); AUC of HbA1c = 0.555 (0.410–0.700, P=0.402)

Table 2. Metabolic profiles and insulin dynamic indices of the subjects by 1-hr post load glucose ≤ 155 mg/dl or > 155 mg/dl

	1-hr postload glucose ≤ 155 mg/dl (n=80) Median (range)	1-hr postload glucose > 155 mg/dl (n=32) Median (range)	P value
HbA1c (%)	5.7 (4.6-6.6)	5.9 (4.0-7.9)	0.063
Triglyceride (mg/dl)	100 (39-277)	114 (48-486)	0.125
Total cholesterol (mg/dl)	180 (110-248)	176 (108-291)	0.464
HDL (mg/dl)	45 (23-74)	41 (25-67)	0.040*
LDL (mg/dl)	110 (58-186)	108 (51-210)	0.456
HOMA-IR	3.6 (0.2-84.8)	4.1 (0.2-27.3)	0.081
AUC$_{ins}$	12546 (2088-58224)	17647 (3376-75132)	0.004*
QUICKI	0.316 (0.220-0.535)	0.311 (0.247-0.525)	0.081
WBISI	2.7 (0.2-20.4)	1.8 (0.3-13.0)	0.001*
FG/FI	5.1 (0.2-90.0)	4.0 (1.3-87.0)	0.104
HOMA-β	320.9 (13.3-11468.6)	379.2 (15.0-1134.0)	0.271
IGI	2.2 (3.0-12.6)	1.7 (0.1-5.8)	0.205

Results

- We found that three patients had T2DM and 30 subjects had IGT. IGT patients had significantly higher fasting glucose (FG), 1-h postload glucose, 2-h postload insulin, and lower whole-body insulin sensitivity indices than in normal glucose tolerance subjects whereas other indices were comparable.
- By ROC curve analyses, 1-h postload glucose was the best predictor of IGT, but FG or HbA1c represented a poor diagnostic tool for prediabetes screening.
- Subjects with 1-h OGTT glucose > 155 mg/dL had significantly lower high-density lipoprotein levels, lower insulin sensitivity, and more insulin resistance than those with 1-h postload glucose of ≤ 155 mg/dL.

Conclusion

- Abnormal glucose tolerance is highly prevalent in obese Thai youth. Several fasting indices and HbA1c fail to predict IGT. An 1-h OGTT glucose of > 155 mg/dL appears to be more associated with adverse insulin dynamics and metabolic profile than 2-h postload glucose.

ESPE 2015

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Diabetes and Insulin

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DOI: 10.3252/pso.eu.54espe.2015

Poster presented at:

Poster SessionOnline.com