Retinol binding protein 4 and adiponectin levels during oral glucose tolerance test in obese children newly diagnosed of type 2 diabetes

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Introduction

Retinol binding protein 4 (RBP4) and adiponectin are known to be related with insulin resistance and type 2 diabetes.

Objective

This study was aimed at investigating (RBP4) and adiponectin secretion in obese Korean children and adolescents with newly diagnosed type 2 diabetes (T2DM).

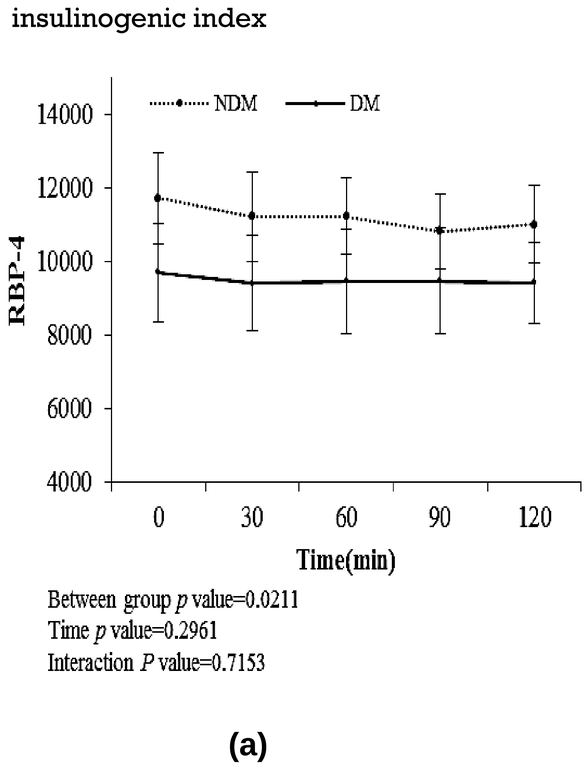
Methods

Nine obese children and adolescents with newly diagnosed T2DM (DM group) and 10 obese age-matched subjects without T2DM (NDM group) were included. An oral glucose tolerance test (OGTT) was conducted for all patients, and insulin, C-peptide, glucagon, RBP4, and adiponectin were measured.

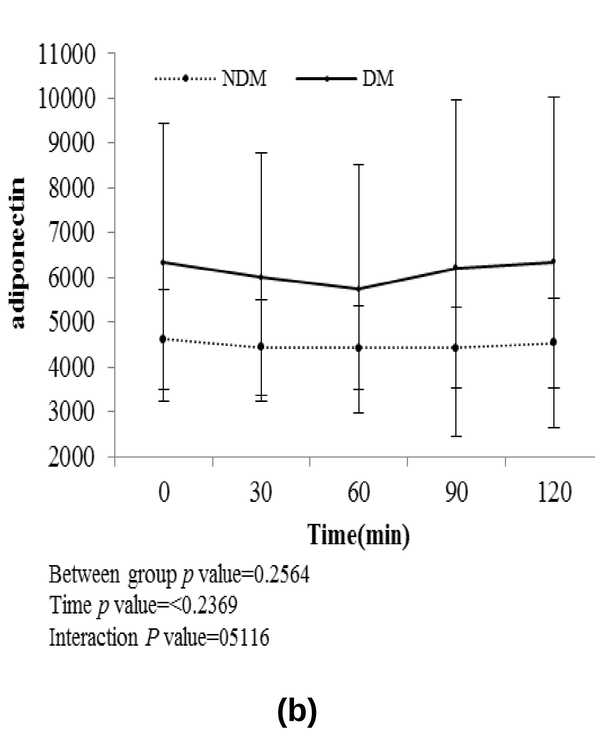
Table 1. Demographics and clinical characteristics of the study subjects

	Total (N = 19)	NDM (n = 10)	DM (n = 9)	*P* value
Age (years)	13.79 ± 1.95	13.31 ± 2.19	14.33 ± 1.58	0.305
Gender (%)				
Male	12 (63.16)	6 (60.00)	6 (66.67)	>0.999
Female	7 (36.84)	4 (40.00)	3 (33.33)	
BMI	29.41 ± 3.51	29.39 ± 3.11	29.44 ± 4.10	0.903
BMI Z-score	2.13 ± 0.48	2.22 ± 0.46	2.02 ± 0.52	0.178
Waist:hip ratio*	0.89 ± 0.06	0.90 ± 0.05	0.87 ± 0.07	0.688
Total cholesterol (mg/dL)	200.63 ± 40.03	176.50 ± 26.33	227.44 ± 35.90	0.004
LDL (mg/dL)	128.92 ± 34.08	115.54 ± 23.53	143.78 ± 38.96	0.072
HDL (mg/dL)	37.26 ± 10.58	40.90 ± 5.88	33.22 ± 13.34	0.153
Triglyceride (mg/dL)	187.21 ± 315.04	98.80 ± 50.53	285.44 ± 447.01	0.066
FBS (mmol/L)	9.15 ± 5.30	5.21 ± 0.56	13.52 ± 4.68	<.001
HbA1C (%)	8.49 ± 3.55	5.52 ± 0.10	11.79 ± 2.25	<.001
HOMA-IR	8.13 ± 0.70	8.25 ± 1.11	8.01 ± 0.90	0.967
HOMA- β	256.99 ± 58.99	448.93 ± 66.45	43.74 ± 14.54	<.001
IGI	1.24 ± 1.37	2.31 ± 1.03	0.05 ± 0.12	<.001

Data are presented as mean ± SD or as n (%).
P values show significant differences between the NDM and DM groups (chi-square and Wilcoxon rank sum test).
*One patient whose waist:hip ratio value was missing had to be excluded (n = 18).
Abbreviations: HOMA-IR, Homeostasis Model Assessment of Insulin Resistance; IGI, insulinogenic index



(a)



(b)

Figure 1. Basal and stimulated responses of retinol binding protein-4 (RBP4) (a) and adiponectin (b) during the oral glucose tolerance test in subjects with obese type 2 diabetes (DM) and obese non-diabetes (NDM).

Results

The mean age of the patients was 13.8±2.0 years, and the mean BMI Z-score was 2.1±0.5. Both groups were comparable in age, sex, pubertal state, BMI Z-score, and waist:hip ratio. The DM group had significantly lower homeostasis model assessment of β and insulinogenic index values (Table 1, $P<0.001$). The homeostasis model assessment of insulin resistance was not different between the two groups. Insulin and C-peptide total area under the curve (TAUC) and incremental AUC (iAUC) values were significantly lower in the DM group than in the NDM group (Table 2, $P<0.001$). RBP4 levels were higher in NDM group than in the DM group during OGTT (Fig 1, $P=0.021$). However, there were not significantly different in RBP4 and adiponectin concentration according to time difference in both groups.RBP4 TAUC was significantly higher in the NDM group than in the DM group (Table 2, $P = 0.046$), while adiponectin TAUC was not different in the two groups.
RBP4 was positively correlated with serum insulin ($r = 0.379$, $P = 0.001$, Fig 2-a), while adiponectin was negatively correlated with serum insulin (r = -0.235, P = 0.022, Fig 2-b). RBP4 iAUC was negatively correlated with BMI (r =-0.46, P = 0.49). Adiponectin iAUC was positively correlated with HDL and negatively correlated with total cholesterol (r=0.62, P=0.005; r= -0.5, P=0.03).

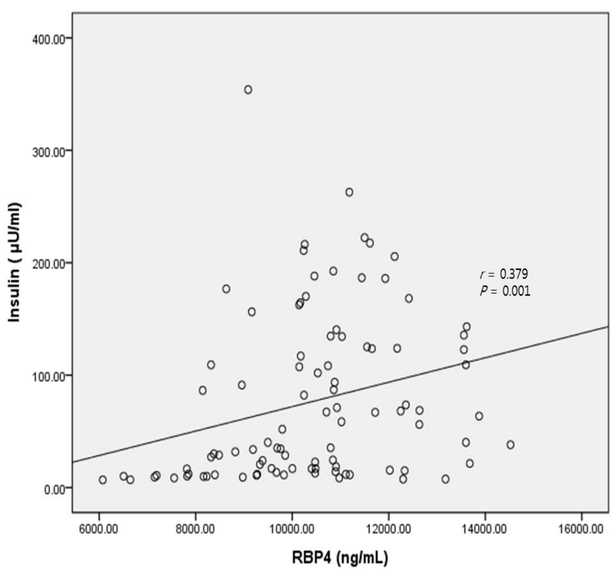
Conclusion

Obese Korean children and adolescents with newly diagnosed T2DM had lower insulin levels than those without T2DM. Serum adiponectin and RBP4 levels might not be related with the degree of hyperglycemia in T2DM.

Table 2. Comparison of islet hormone, retinol-binding protein-4, and adiponectin secretion between the non-diabetes and diabetes groups

	NDM (n = 10)	DM (n = 9)	*P* value
Insulin TAUC (μU/mL)	15517.49 ± 1684.52	2873.15 ± 674.87	<.001
C-peptide TAUC (pmol/L)	189785.03 ± 9432.91	65625.98 ± 10139.44	<.001
Glucagon TAUC (pmol/L)	3567.30 ± 458.07	4245.00 ± 852.74	0.838
RBP-4 TAUC (ng/mL)	1340083.27 ± 53051.87	1137245.90 ± 63907.68	0.046
Adiponectin TAUC (ng/mL)	536021.39 ± 51786.45	728879.85 ± 164708.20	0.540
Insulin iAUC (μU/mL)	11272.01 ± 1446.23	1216.67 ± 658.58	<.001
C-peptide iAUC (pmol/L)	87754.92 ± 11136.88	16537.65 ± 830.45	<.001
Glucagon iAUC (pmol/L)	0.00 ± 0.00	591.89 ± 217.67	<.001
RBP-4 iAUC (ng/mL)	28617.73 ± 12540.89	38447.34 ± 14525.23	0.902
adiponectin iAUC (ng/mL)	9935.51 ± 5542.53	17470.47 ± 12105.71	0.202

Data are presented as mean ± SEM.
P values show significant differences between the NDM and DM groups (Wilcoxon rank sum test). Abbreviations: TAUC, total area under the curve; iAUC, incremental AUC; RBP-4, retinol-binding protein-4.



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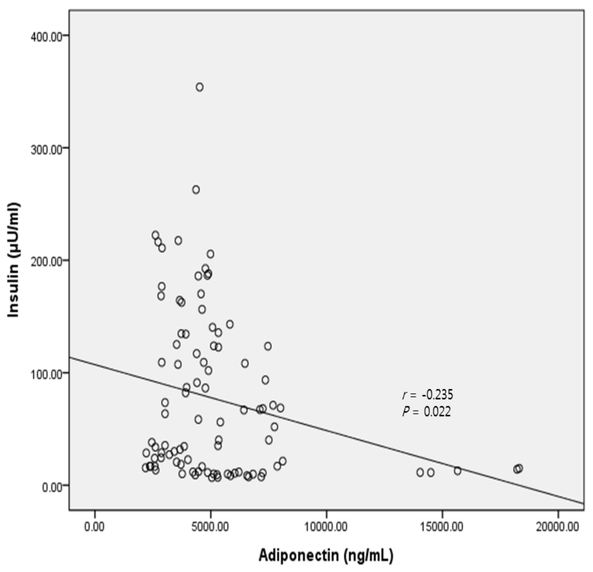

(b)

Figure 2. Correlations between insulin and retinol binding protein-4 (RBP4) (a), and insulin and adiponectin (b).

Disclosure statement : There are no conflicts of interest to declare for any of the authors.