

Relationship between residual endogenous insulin secretion and glycemic control in Japanese children and adolescents with type 1 diabetes

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No COI in authors regarding this study.

Background

Difficulty of glycemic control varies among subjects with type 1 diabetes (T1D). Influence of residual endogenous insulin detected by serum C-peptide reactivity (CPR) levels has noted to be on glycemic control. Flash glucose monitoring (FGM) detects glucose concentration in intercellular fluid (sensor glucose) every 15 minutes to reveal daily glucose profiles. In Japan, FGM has become available from 2017.

Aims

We tried to clarify the relationship between serum CPR and the excursion of blood glucose using FGM in Japanese children and adolescents with T1D.

Methods

- Eighteen (male 6: female 12) childhood onset T1D were enrolled at Saitama Medical University Hospital (6–24 years old).
- HbA1c, glycated albumin (GA) and CPR of casual (non-fasting) blood sample were measured. Sensor glucose values were measured using FreeStyle Libre Pro® (Abbott Diabetes Care Inc.).
- Mean (SGM), standard deviation (SGSD) and coefficient of variation (SGCV = SGSD/SGM) of sensor glucose values were calculated.
- The subjects were divided into 2 groups of depletion and non-depletion defined at the level CPR ≤ 0.01 ng/mL.
- We analyzed the relationship between serum CPR as the objective variable and glycemic control markers (HbA1c, GA, SGM, SGSD and SGCV) using Spearman's rank correlation coefficient, and compared glycemic control markers between 2 groups using Wilcoxon signed-rank test. All statistical analyses were performed using JMP® (version 9.0.2).

Results

Table 1 - Demographic and clinical characteristics of participant with type 1 diabetes. (n=18)

	Mean ± SD	Minimum	Median	Maximum
Age (years old)	13.1 ± 4.8	6.0	12.5	24.0
CPR (ng/mL)	0.19 ± 0.44	0.01	0.01	1.51
HbA1c (%)	8.4 ± 1.1	7.1	8.1	10.4
GA (%)	24.7 ± 4.6	17.9	24.7	33.9
SGM (mg/dL)	223.4 ± 36.8	174	224	276
SGSD (mg/dL)	100.2 ± 20.3	78	96	154
SGCV	0.45 ± 0.07	0.29	0.45	0.57

CPR: C-peptide reactivity, GA: glycated albumin, SGM: Sensor glucose mean, SGSD: Sensor glucose standard deviation, SGCV: Sensor glucose coefficient variation

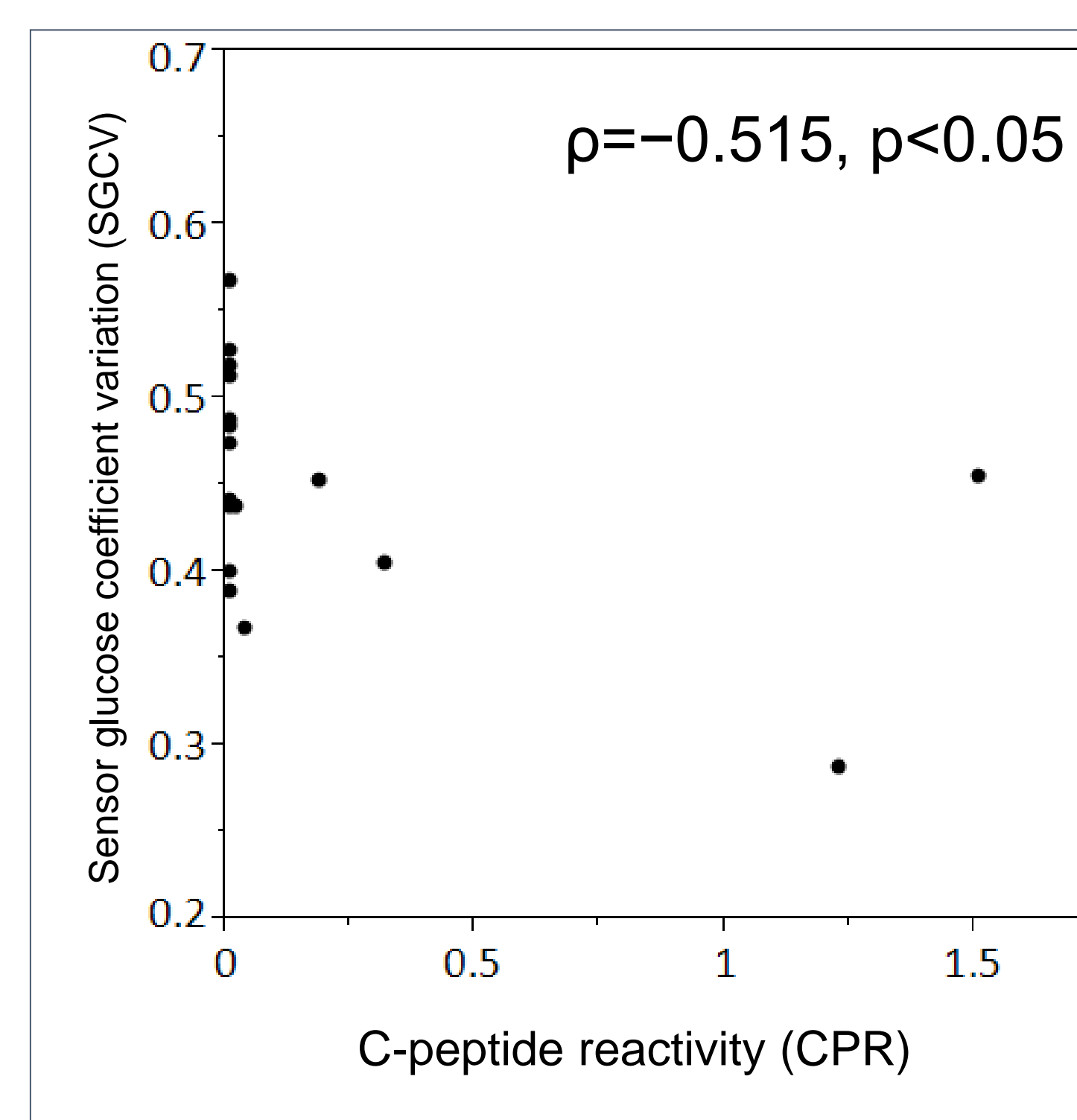


Figure 1 - Relation between CPR reactivity and sensor glucose coefficient variation.

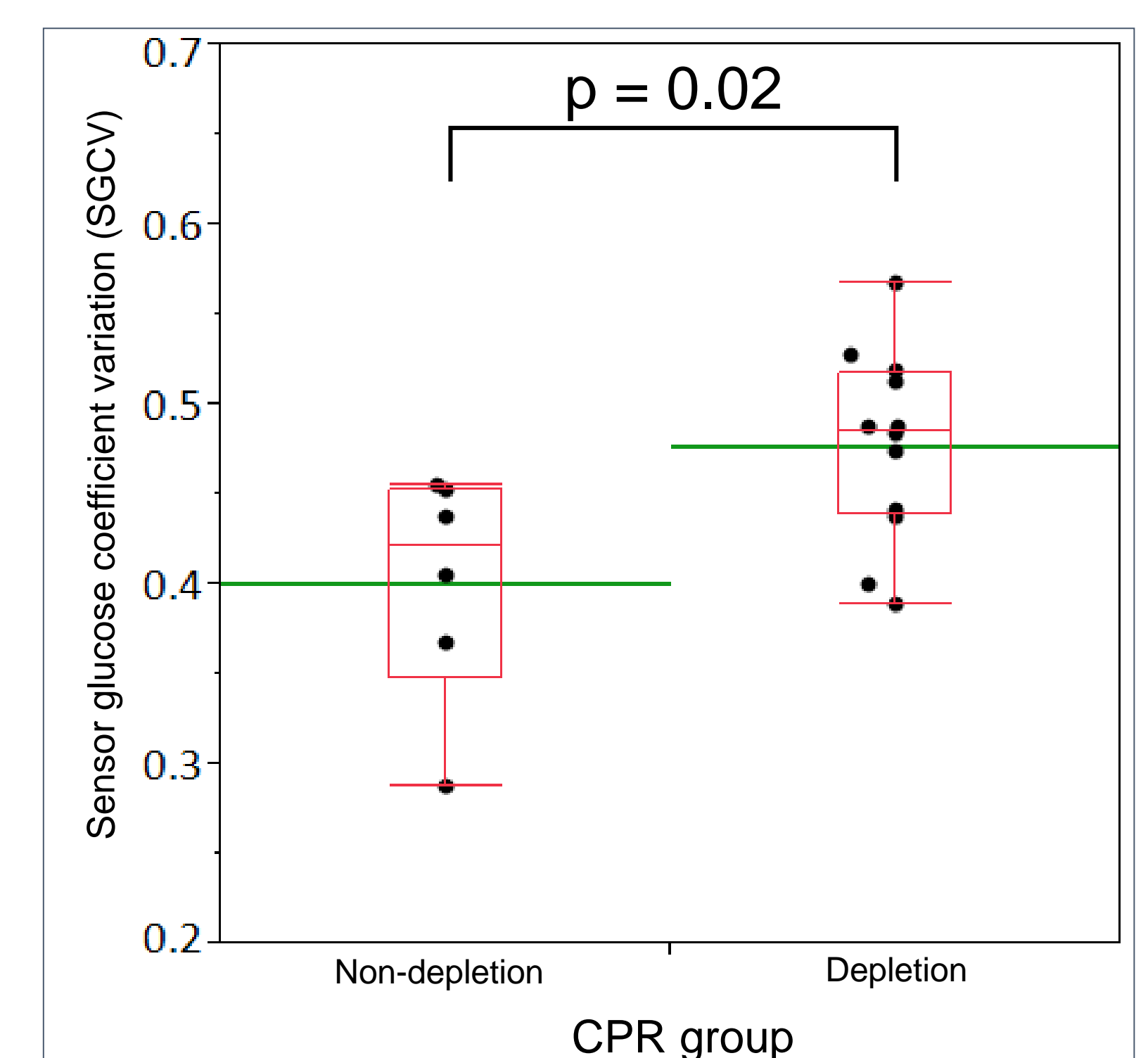


Figure 2 - Distribution of sensor glucose coefficient variation in groups CPR depletion and CPR non-depletion.

Table 2 - Comparison of sensor glucose level and glycemic marker between CPR depletion group and non-depletion group

	CPR depletion (n=12)				CPR non-depletion (n=6)				p
	Mean ± SD	Minimum	Median	Maximum	Mean ± SD	Minimum	Median	Maximum	
Age (years old)	14.1 ± 5.2	6.0	13.0	24.0	11.0 ± 3.3	6.0	11.0	15.0	NS
CPR (ng/mL)	0.01 ± 0.00	0.01	0.01	0.01	0.55 ± 0.65	0.02	0.26	1.51	NS
HbA1c (%)	8.4 ± 1.0	7.1	8.2	9.8	8.3 ± 1.3	7.2	7.7	10.4	NS
GA (%)	24.6 ± 3.8	19.1	24.7	33.9	24.8 ± 6.2	17.9	24.2	33.9	NS
SGM (mg/dL)	221.6 ± 35.4	178	219	276	227.1 ± 42.6	174	229	274	NS
SGSD (mg/dL)	105.7 ± 21.6	87	98	154	89.2 ± 12.6	78	86	111	NS
SGCV	0.48 ± 0.05	0.39	0.49	0.57	0.40 ± 0.06	0.29	0.42	0.46	0.02

CPR: C-peptide reactivity, GA: glycated albumin, SGM: Sensor glucose mean, SGSD: Sensor glucose standard deviation, SGCV: Sensor glucose coefficient variation, NS: not significant

p: Wilcoxon signed-rank test (CPR depletion group v.s. CPR non-depletion group)

- There was a significant inverse correlation between SGCV and casual CPR ($\rho = -0.515$, $p < 0.05$) (Figure 1). However, any other parameter did not show the correlation with serum CPR.
- SGCV showed significant difference between depletion group (n = 12) and non-depletion group (n = 6), 0.49 and 0.42 ($p = 0.02$), respectively (Figure 2).

Conclusions

- The glycemic excursion in childhood onset T1D was associated with residual endogenous insulin.
- Non-fasting (casual) serum CPR which is simple blood collect test can be a useful marker to estimate the excess excursion of glycemic control in T1D.