

# Glycaemic Variability Data using Continuous Glucose Monitoring in a 5-year Randomized Controlled Trial of Roux-en-Y Gastric Bypass versus Best Medical Treatment for Type 2 Diabetes in Adults with Class 1 Obesity

Ester Yeoh<sup>1</sup>, Angela Moh<sup>2</sup>, Serena Low<sup>1,2</sup>, Chun Hai Tan<sup>3,4</sup>, Benjamin Lam<sup>4</sup>, Tavintharan Subramaniam<sup>1,2</sup>, Sum Chee Fang<sup>1,2</sup>, Su Chi Lim<sup>1,2</sup>, Anton Cheng<sup>3,4</sup>

<sup>1</sup>Diabetes Centre, Admiralty Medical Centre; <sup>2</sup>Clinical Research Unit; <sup>3</sup>General Surgery; <sup>4</sup>Integrated Care for Obesity and Diabetes, Khoo Teck Puat Hospital, Singapore.

**Background:** This study compared glycaemic variability (GV) from continuous glucose monitoring (CGM) data between Roux-en-Y gastric bypass (RYGB) versus best medical therapy in patients with Type 2 Diabetes (T2D) and Class I Obesity (BMI 27 – 32 kg/m<sup>2</sup>), data for which is currently limited.

**Methods:** Participants were randomized to RYGB or best medical treatment using novel anti-diabetic medications with weight-loss benefits [i.e. glucagon-like peptide 1 receptor agonist (GLP1RA) and/or sodium-glucose cotransporter-2 inhibitors (SGLT2i)]. CGM was performed over 4 time-points (baseline, 6 weeks, ≤3 years and >3 years). EasyGV<sup>®</sup> software was used to calculate GV.

**Results:** From 26 subjects enrolled into the study (Table 1 shows baseline characteristics by group assignment), CGM data from 25 subjects (13 medical, 12 RYGB) was analysed. There were no differences in percent time in range (glucose 4-10mmol/L) and percent time above range (glucose>10mmol/L) between the groups. However, percent time below range (glucose<4mmol/L) was higher in the RYGB group over time ( $P=0.048$ ). Among the GV parameters, lability index and mean absolute glucose was higher in the RYGB than the medical group over time (Table 2). RYGB group had greater percentage weight change compared to medical group ( $-15.7 \pm 4.8$  vs.  $-4.5 \pm 2.3\%$ ,  $P<0.001$ ) and 42% achieved diabetes remission at year 5, while all medical subjects remained on medications (Figure 1).

	RYGB (N=12)	Medical (N=14)
Age (years)	40 ± 11	48 ± 9
T2D duration (yrs)	5 (4 – 9)	6 (3 – 9)
Weight (kg)	77.1 ± 9.5	78.4 ± 12.2
BMI (kg/m <sup>2</sup> )	29.1 ± 1.6	29.7 ± 1.6
HbA1c (%)	9.9 ± 1.4	9.3 ± 1.4

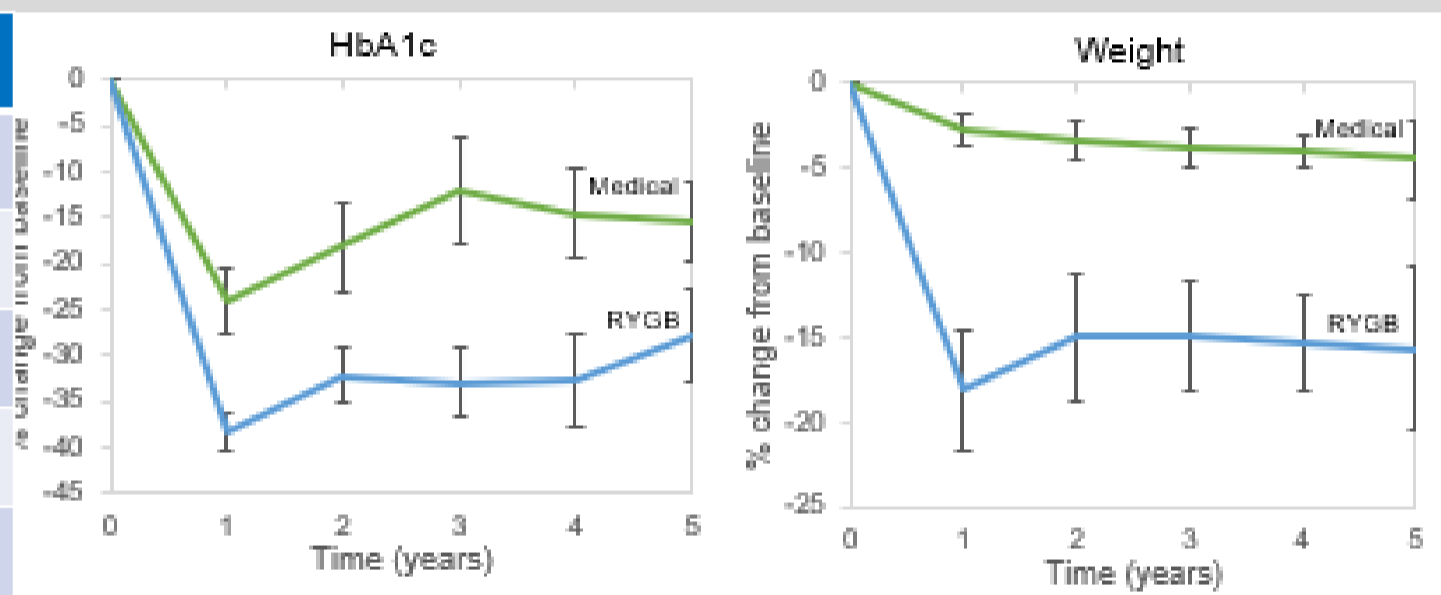


Table 1: Baseline characteristics of participants

Figure 1: HbA1c and Weight changes

CGM	Baseline		6 weeks		≤ 3 years		> 3 years		Group P	Time P	Group x Time P
	RYGB (N=12)	Med (N=13)	RYGB (N=12)	Med (N=13)	RYGB (N=9)	Med (N=13)	RYGB (N=6)	Med (N=8)			
Mean glucose (mM)	10.8 ± 2.3	11.3 ± 3.5	7.4 ± 1.7	8.1 ± 1.4	7.5 ± 1.4	8.2 ± 1.8	7.0 ± 1.1	8.2 ± 0.9	0.900	<0.001	0.532
SD	3.0 ± 0.9	2.6 ± 0.4	2.0 ± 0.9	2.0 ± 0.7	2.6 ± 0.8	1.9 ± 0.7	2.6 ± 0.9	2.2 ± 0.7	0.587	0.093	0.763
LI	4.0 ± 1.9	3.5 ± 1.3	4.1 ± 5.0	2.7 ± 1.8	8.1 ± 5.4	2.5 ± 1.6	9.0 ± 6.5	3.0 ± 1.7	0.341	0.603	<0.001
MAG	1.9 ± 0.4	1.7 ± 0.4	1.6 ± 0.8	1.5 ± 0.5	2.3 ± 0.8	1.4 ± 0.4	2.4 ± 0.8	1.5 ± 0.4	0.578	0.241	0.008
TIR (%)	45.7 ± 24.3	43.5 ± 34.1	86.8 ± 17.5	77.8 ± 18.5	78.8 ± 11.7	77.9 ± 25.8	80.3 ± 6.7	77.8 ± 13.3	0.795	<0.001	0.796
TBR (%)	1.1 ± 1.7	0.5 ± 1.0	1.7 ± 1.9	1.5 ± 2.4	4.1 ± 7.4	0.2 ± 0.4	6.5 ± 7.8	2.5 ± 5.0	0.502	0.341	0.048

Table 2: Glycaemic variability from CGM of participants [SD, standard deviation; LI, lability index; MAG, mean absolute glucose; TIR, Time-in-range; TBR, Time-below-range. Data expressed as mean ± SD. Linear mixed model used to examine for statistical significance.

**Conclusion:** RYGB results in greater weight loss and diabetes remission benefits but improvements in GV and overall glycaemia measured on CGM is comparable in both groups. The impact of higher hypoglycaemia rates and glucose lability in RYGB warrants further study.