DIABETES, ENDOCRINOLOGY, NUTRITION AND NURSING MANAGEMENT

Gerald C Hsu

EclaireMD Foundation, USA

COMPARISON OF GLUCOSE DATA AND PHENOMENA FROM TWO DIFFERENT MEASUREMENT METHODS (GH-METHOD: MATH-PHYSICAL MEDICINE)

BIOGRAPHY

Gerald C Hsu has completed his PhD in Mathematics and has been majored in Engineering at MIT. He has attended different universities over 17 years and studied seven academic disciplines. He has spent 20,000 hours in T2D research. First, he studied six metabolic diseases and food nutrition during 2010-2013, then conducted research during 2014-2018. His approach is math-physics and quantitative medicine based on mathematics, physics, engineering modeling, signal processing, computer science, big data analytics, statistics, machine learning and AI. His main focus is on preventive medicine using prediction tools. He believes that the better the prediction, the more control you have.

g.hsu@eclairemd.com

Introduction: This paper discusses glucose measurement results from two different methods, finger piercing and testing strip (Finger) and Libre's continuous glucose monitoring system (Sensor).

Method: The author has been collecting a total of 9,490 glucose data by finger measurement, including both fasting plasma glucose (FPG) once a day since 1/1/2014 (1,825 days) and postprandial plasma glucose (PPG) three times a day since 1/1/2012 (2,555 days). Recently, he has further collected 17,046 glucose data by applying a sensor on his upper arm to collect his glucose values continuously. This sensor measurement is conducted in parallel with his routine finger measurements. During the period of 5/5/2018 to 12/31/2018 (241 days), he has recorded his sensor glucose values about 71 times per day. The measurement rate is approximately every 15 minutes during the day and every hour during the night. In summary, he has collected a total of 964 waveforms- 241 FPG and 723 PPG. Other waveforms generated between meals or from eating snack/fruit are not included in this analysis.

Results: Sensor's time of peak glucose: 60 minutes after first-bite; PPG rising speed: 33 mg/dL per hour; PPG decaying speed: 20 mg/dL per hour (~60% of rising); Finger's average FPG/PPG: 110/116 mg/dL (as 100% baseline); Sensor's peak PPG & % over finger: 159 mg/dL & 138% (+43 mg/dL); Sensor's average PPG & % over Finger: 135 mg/dL & 117% (+19 mg/dL); FPG (period-from 00:00 to 07:00): Average FPG: 112 mg/dL; Peak (crest): 122 mg/dL; Valley (trough): 106 mg/dL; Period of trough (from 3am to 5am).

Conclusion: In average, PPG peak occurs one hour after first-bite of meal, not two hours after; PPG decaying speed is almost twice as slow than its rising speed; Averaged sensor's PPG is 16% higher (+19 mg/dL) than the Averaged finger's PPG; Peak sensor's PPG is 36% higher (+42 mg/dL) than the Averaged finger's PPG; FPG wave is much calmer than PPG wave and FPG's lowest trough range occurs during the deep sleep stage (from 3am to 5am).