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Glycemic Control with Improvement in HOMA2 IR and HOMA2 Beta: Impact of Digital Twin Enabled Precision Nutrition for Remission of Diabetes

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Abstract

Background and aims: Technology enabled precision nutrition, a combination of macro, micro and biota nutrients, along with Continuous Glucose Monitoring (CGM) have been demonstrated to be a key for reversal of diabetes. We sought to investigate the possible association between change in the glycated hemoglobin (HbA1c), insulin sensitivity (HOMA 2 Beta) and insulin resistance (HOMA 2 IR). These parameters were evaluated as the longitudinal follow up for three months

Materials and methods: We conducted an initial analysis (n=63) of the ongoing randomized controlled trial of Twin Precision Treatment (TPT): a novel whole-body digital twin enabled precision treatment for reversing diabetes. The TPN program entailed detailed patient food intake information with CGM readings as inputs to a machine learning. The machine learning algorithm integrated these multi-dimensional data to predict personalized postprandial glucose response. This leads to a predictive model, which enabled daily precision nutrition guidance to the patient. Physicians utilized, TWIN app recommendations based on the CGM values as a decision tool to down titrate medications

Results: The mean age (years) was 41 (± 9.2 , minimum 16, maximum 62, 95% CI 39 to 44). The duration of diabetes (years) was 3.1 (± 2.7 , maximum 8, 95% CI 2.4 to 3.8). There was a statistically significant improvement in HbA1c % (8.5 ± 1.6 , 95% CI 8.17 to 8.99 reduced to 5.6 ± 0.52 , 95% CI 5.52 to 5.79; $p < 0.0001$), HOMA2-IR (1.81 ± 0.71 , 95% CI 1.63 to 1.99 decreased to 1.11 ± 0.51 , 95% CI 0.98 to 1.24; $p < 0.0001$), HOMA2 Beta (51.78 ± 28 , 95% CI 44.6 to 58.97 increased to 94.42 ± 38.9 , 95% CI 84.62 to 104.2; $p < 0.0001$). 54% (n=34) and 37% (n=23) patients achieved complete (HbA1c < 5.7) and partial remission (HbA1c < 6.5), respectively. At 90 days, HbA1c in the range of 6.5-7% was achieved by five patients and one patient had HbA1c of 7.1%. 43% (n=27) patients at enrolment had normal HOMA2 Beta (>54.2), which changed to 88% (n=56). 22% (n=14) patients at enrolment had normal HOMA2 IR (<1.22), which changed to 70% (n=44). There was a significant negative correlation for the change in the HOMA2 beta and HbA1c (Pearson $r = -0.38$, 95% CI -0.57 to -0.14, $p = 0.0021$). There was a negative correlation for the change in the HOMA2IR and HbA1c (Pearson $r = -0.18$, 95% CI -0.411 to 0.068, $p = 0.15$ ns). At 90 days, all patients were off medications, other than two patients on metformin monotherapy. The mean Time Above Range (TAR) at baseline was 39.9%, reduced to 1.7 % and Time In Range (TIR) at baseline was 58%, increased to 74.8%)
Conclusion: The HbA1c and HOMA2IR decreased by 34% and 39%, respectively with 82% increase in HOMA2Beta, from baseline. 90% (n=57) achieved complete/ partial remission. Technology enabled precision nutrition, a combination of macro, micro and biota nutrients, with physician-led adoption and technology-driven intervention had positive implications for diabetes remission with improvement in insulin sensitivity and beta cell function.

Keywords: Digital, Remission

Funding and Conflicts of Interest

None