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Diabetes Update

Vol. 4 | Issue 45| 2023

Dear Doctor,

Greetings from Micro Labs Limited. We are happy to bring you "DIABETES UPDATE" which contains latest and interesting news in the field of Diabetes and Endocrinology.

- **Effects of early-onset type 2 diabetes (EOD) versus late-onset type 2 diabetes (LOD) on nonfatal cardiovascular diseases (CVD)**
- **Evaluation of glycemic outcomes during the observational extension phase of the Continuous Glucose Monitoring (CGM) Intervention for Teens and Young Adults**
- **Effects of practicing the MIND diet on mortality rates in individuals with and without type 2 diabetes**
- **Rapid hyperglycemia correction: essential, but at what price? An overview of a patient with type 1 diabetes**

Should you require any specific article or medical information, please feel free to contact us at medicalservices@microlabs.in

Looking forward to your valuable feedback

Best Regards,

Medical Team, Micro Labs Limited

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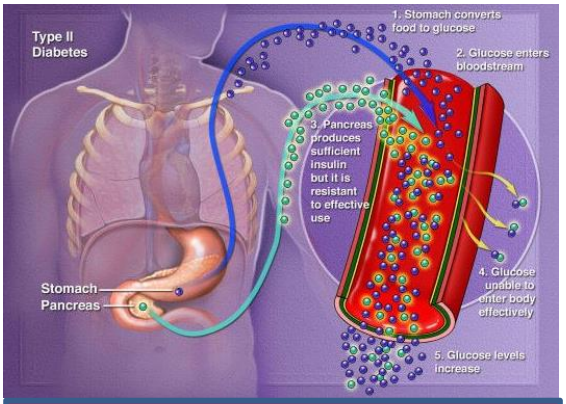
Effects of early-onset type 2 diabetes (EOD) versus late-onset type 2 diabetes (LOD) on nonfatal cardiovascular diseases (CVD)

INTRODUCTION

Globally, the prevalence of type 2 diabetes is rising rapidly. In 2000, there were 146 million global cases, a number that surged to 463 million by 2019, representing a more than threefold increase. Notably, Asian adults with type 2 diabetes exhibit a higher proportion among young and middle-aged individuals when compared to other global regions.[1] Previous studies found that Early-Onset Diabetes (EOD) was correlated with inadequate metabolic control and faster complication development. A specific study revealed a substantial increase in cardiovascular and renal risks in EOD compared to similarly aged Late-Onset Type 2 Diabetes (LOD) patients.[2] This study explored the impact of early-onset type 2 diabetes (EOD) compared to late-onset type 2 diabetes (LOD) on the occurrence of nonfatal cardiovascular diseases (CVD).



TYPE 2 DIABETES

Patients with EOD have a higher chance of nonfatal CVD. For EOD patients, individualized intervention and treatment strategies are required.

METHODS

A cross-sectional survey was conducted among 46,239 participants, with 4949 of them having type 2 diabetes selected for analysis. Those aged 20 years and above, residing in their areas for at least 5 years, were randomly chosen. Participants were categorized into Early-Onset Diabetes (EOD, <40 years) or Late-Onset Diabetes (LOD, ≥40 years) based on age at diagnosis. Of these, 889 had EOD, and 4060 had LOD. Physical exams, including measurements of height, weight, waist and hip circumference, and blood pressure, were conducted. A questionnaire covered family income, education, lifestyle, family disease history (limited to first-degree relatives), nonfatal CVD, and medication usage. Medications included hypoglycemics, antihypertensives, and lipid-lowering drugs. Fasting plasma glucose and lipid levels were checked after overnight fasting. Logistic regression analysis was utilized to investigate the nonfatal CVD risk.

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RESULTS

In contrast to the LOD group, the EOD group was more commonly male and to have unhealthy habits, like smoking, drinking alcohol, and engaging in erratic recreational physical activity. In addition, there was a higher family history of hyperlipidemia and diabetes in the EOD group. Interestingly, postprandial 2-hour glucose levels were lower in the EOD group compared to the LOD group, despite greater fasting glucose levels. When comparing EOD with and without CVD, those with CVD showed older ages, higher systolic blood pressure (SBP), raised Low-density lipoprotein cholesterol (LDLC) values, and a higher family history of hypertension, hyperlipidemia, and CVD. For both LOD with and without CVD, similar outcomes were noted. In comparison to the LOD group, the EOD group showed comparatively reduced levels of cardiovascular risk factors, including metabolic syndrome, high-density lipoprotein cholesterol (HDLC), diastolic blood pressure (DBP), SBP, and LDLC. The age-standardized prevalence of nonfatal CVD was considerably greater in the EOD group (11.4% vs. 4.4%), despite the fact that the crude prevalence of nonfatal CVD was higher in the LOD group (8.7% vs. 3.9%). Furthermore, Kaplan-Meier plots demonstrated that, beginning at age 40, individuals with EOD had a considerably higher frequency of nonfatal CVD compared to those with LOD (Figure 1). Even after adjusting for age, sex, smoking status, alcohol consumption, college education, regular leisure physical activity, BMI, SBP, LDLC, and use of hypoglycemic, antihypertensive, and lipid-lowering medications, the EOD group demonstrated a persistent 2.3-fold higher risk of nonfatal CVD compared to the LOD group. The higher risk did eventually diminish following additional adjustment for the duration of diabetes, which was significantly linked to nonfatal CVD. The duration of diabetes and other risk variables in this subgroup were taken into account, and the EOD group still showed a considerable lower risk of nonfatal CVD.

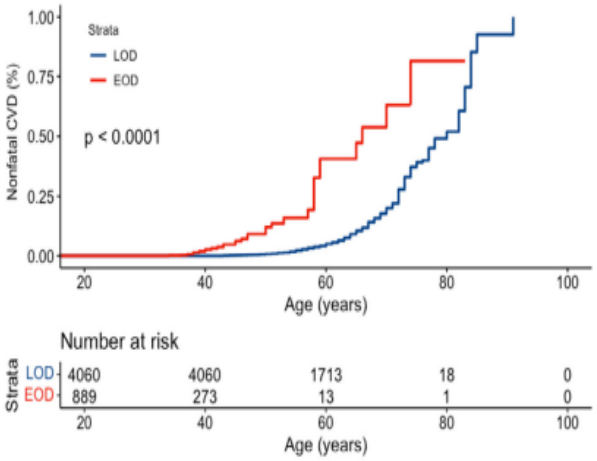

Figure 1. Kaplan-Meier curve showing the nonfatal CVD in the LOD and EOD groups.

DISCUSSION

The present research revealed that individuals with EOD had an elevated risk of nonfatal CVD compared to those with LOD after accounting for diabetes duration and other relevant risk factors. Particularly among patients with diabetes and metabolic syndrome, Early-Onset Diabetes was associated with a heightened risk of nonfatal CVD.[2] Individuals with young-onset and early-onset diabetes appear to carry an additional risk for mortality and vascular

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complications.[1] The presence of early-onset type 2 diabetes was notably correlated to an increased risk of CVD, with this association being more pronounced in individuals with obesity.[3]

CONCLUSION

Even after accounting for the duration of diabetes and other risk variables, EOD is associated with a higher risk of nonfatal CVD than LOD. These results remained consistent for those with metabolic syndrome and diabetes, demonstrating the need of management and preventative techniques for EOD patients.

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Evaluation of glycemic outcomes during the observational extension phase of the Continuous Glucose Monitoring (CGM) Intervention for Teens and Young Adults

INTRODUCTION

In young adults and adolescents with type 1 diabetes, the use of CGM lowers hypoglycemia and enhances glycemic control.

Regular Blood Glucose Monitoring (BGM) usage is linked to enhanced glycemic control, with more frequent measurements correlating to lower glycated hemoglobin (HbA1c) levels. Although BGM was the standard for type 1 diabetes, the introduction of Continuous Glucose Monitoring (CGM) in 2000 has gradually shifted this landscape. CGM offers continuous information on glucose levels in interstitial fluid (ISF) throughout the day, providing insights into both current levels and changes over time. While BGM delivers instant accuracy, it lacks information about temporal variations in glucose

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levels, a feature provided by CGM.[1] The study, CGM Intervention for Teens and Young Adults (CITY), aimed to determine if a newer CGM model could enhance glycemic control in youths with type 1 diabetes. The randomized clinical trial (RCT) followed by extension phase was conducted to evaluate the CGM group's longer-term results and to enable the BGM group to switch to CGM use. The purpose of the CGM cohort's extension phase was to determine if the favourable glycemic outcomes shown throughout the RCT were continuing for an extended period of time. The extension phase's goal for the BGM cohort was to determine if switching from BGM to CGM may result in a comparable glycemic benefit.[2] This study focused on evaluating glycemic outcomes during the extension phase of the CGM Intervention for Teens and Young Adults RCT.

METHODS

The randomized trial involved 153 participants aged 14 to <25 years with type 1 diabetes. Inclusion criteria included diabetes duration ≥1 year, insulin pump or multiple daily injections, total daily insulin requirement ≥0.4 units/kg/day, no recent CGM use, and HbA1c 7.5% to <11.0%. Participants were randomly assigned to CGM with Dexcom G5 or blood glucose monitoring (BGM). After a 26-week comparison, 89% in the BGM group adopted CGM (BGM–CGM cohort), and 95% in the CGM group continued CGM (CGM–CGM cohort) for an additional 26 weeks. Over 52 weeks, in-clinic visits occurred at 4, 6, 13, 26, 39, and 52 weeks.

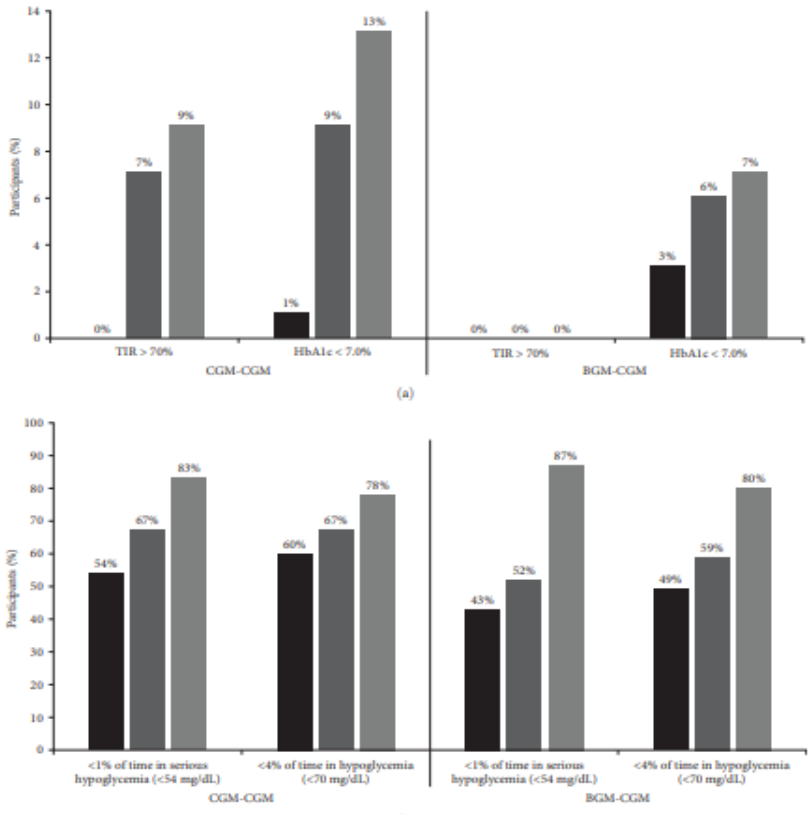

Figure 1. Proportion of participants in each group that met their glycemic goals. (A) HbA1c < 7.0% and Time-in-Range more than 70% of the 24-hour period. B) The proportion of time spent in hypoglycemia (<70 mg/dL) and severe hypoglycemia (<54 mg/dL) is less than 1% and 4%, respectively. Baseline is shown by a solid black bar. 26-week visit is represented by a solid dark grey bar. A solid light grey colour indicates a 52-week stay.

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RESULTS

In the CGM–CGM cohort, HbA1c levels dropped significantly from 8.9%±0.9% to 8.3%±1.3% at 52 weeks ($p<0.001$). More participants achieved HbA1c levels below 7.0% and 7.5% (Figure 1a). However, there was no significant improvement in time spent in the target range (TIR) 70–180 mg/dL. Median percent time <70 mg/dL decreased from 3.0% to 1.1% at 52 weeks. In the BGM–CGM cohort, HbA1c decreased from 8.9%±1.2% to 8.5%±1.3% after 26 weeks of CGM use ($p<0.001$), and TIR increased from 34%±12% to 38%±15% ($p=0.01$). The percentages of participants attaining HbA1c levels below 7.0% did not differ significantly (Figure 1b). Most participants (97%) in both cohorts relied on CGM for insulin dosing without BGM confirmation. There was minimal change in total daily insulin dose. In the CGM–CGM cohort, four participants reported severe hypoglycemic events with impaired cognition, while one participant in the BGM–CGM cohort reported such an event during the RCT phase. Three CGM–CGM participants experienced Diabetic ketoacidosis (DKA) during the RCT phase, and one during the extension phase. In the BGM–CGM cohort, one participant experienced DKA during the RCT phase, with no instances during the extension phase.

DISCUSSION

This study demonstrated that employing CGM enhances glycemic control and lowers hypoglycemia in adolescents and young adults with type 1 diabetes.[2] In a 7-year retrospective study involving 396 individuals (94% aged <18 years), initiating CGM within 1 year of diagnosis resulted in a sustained reduction in HbA1c compared to those not using CGM.[3] Utilizing CGM in young individuals with type 1 diabetes enhances time in target and lowers HbA1c levels compared to self-monitoring of blood glucose (SMBG).[4]

CONCLUSION

This additional assessment of CGM reinforces the conclusions of the previous RCT, indicating that CGM usage enhances glycemic control and reduces hypoglycemia in adolescents and young adults with type 1 diabetes.

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Effects of practicing the MIND diet on mortality rates in individuals with and without type 2 diabetes

INTRODUCTION

In individuals with type 2 diabetes, a strong correlation between the MIND diet and a lower risk of mortality from all causes and cardiovascular disease was found.

Type 2 diabetes (T2DM) is a major public health issue linked with considerable morbidity and mortality. Consuming whole grains, fruits, and vegetables can lower the risk of diabetes and complications by enhancing insulin and glucose metabolism.[1] Studying dietary patterns like the Mediterranean diet (MedDiet) is crucial in nutritional epidemiology. Observational studies and Randomized controlled trials(RCTs) consistently show the MedDiet's positive impact on reducing the risk of T2DM.[2] The Mediterranean-Dietary Approach to Stop Hypertension Intervention for Neurodegenerative Delay (MIND) diet is a novel approach integrating aspects of the Mediterranean and DASH diets, with a unique emphasis on restricting foods linked to the onset and progression of neurodegenerative disorders, including fried/fast foods, sweets, butter, and margarine, while incorporating principles from the MED diet and the DASH diet.[1] There was a limited evidence on the protective effects of the MIND diet in individuals with type 2 diabetes mellitus (T2DM). So, this study seeked to assess the influence of adhering to the MIND diet on mortality rates among both T2DM and non-T2DM patients.

METHODS

In this cohort study, 6887 participants, including 1021 individuals with T2DM, underwent analysis. The participants were categorized into four groups based on T2DM status and MIND scores (low MIND score/non-DM, high MIND score/non-DM, low MIND score/DM, and high MIND score/DM). Initial division based on MIND scores (low score [≤ 8.0] and high score [> 8.0]) was conducted. The MIND score gauged adherence to the MIND diet. Participants were followed for a median of 10 years, with all-cause and cardiovascular deaths as the primary study outcomes.

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RESULTS

Participants with high MIND scores were generally older, more likely to be white, non-Hispanic women, and smokers compared to those with low MIND scores. High MIND score individuals exhibited lower calorie consumption, waist circumference, and higher education and family income. Over a 10-year follow-up, those with high MIND scores had significantly reduced risks of all-cause death (Figure 1C) and cardiovascular death in patients with T2DM, but not in those without diabetes (Figure 1B). T2DM patients with high MIND scores had notably lower risks of all-cause and cardiovascular death compared to low MIND score counterparts. In the non-T2DM group, a lower risk of all-cause death was observed in those with high MIND scores, though no significant difference in cardiovascular death risk. Overall, high MIND scores were associated with a lower risk of death (Figure 1A). There was a substantial increase in the risk of all-cause death among individuals in the low MIND score/non-DM, high MIND score/DM, and low MIND score/DM groups as compared to those in the high MIND score/non-DM group. KM plots also revealed that, out of the four groups, those with low MIND score/DM had the highest risk of CV and all-cause mortality (Figure 1D).

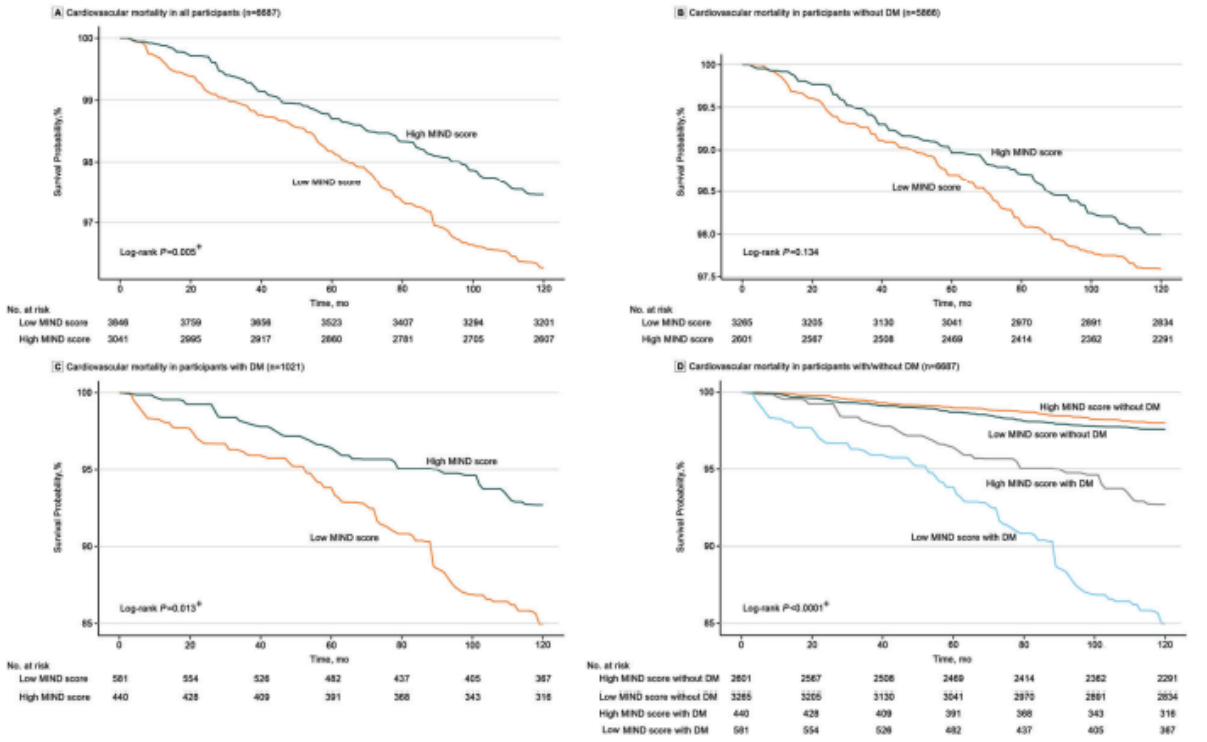

Figure 1. Kaplan-Meier graphs showing the CV mortality rates for the general population (A), participants without type 2 diabetes (B), and patients with type 2 diabetes (C). The Kaplan-Meier curves for CV mortality were displayed in (D) for the following groups: MIND diet Score-Low/non-DM, MIND diet Score-High/non-DM, MIND diet Score-Low/DM, and MIND diet Score-High/DM.

Subgroup analysis revealed a significant interaction between the MIND diet and advanced age (>65 years).

DISCUSSION

The study revealed a notable correlation between adherence to the MIND diet and a reduced risk of both all-cause and cardiovascular death in individuals with T2DM.[1] Regarding its influence on T2DM, a recent study, comprising 960 participants with T2DM, found that the MIND diet decelerated the deterioration of global cognition and executive function.[3] The results from Corley et al. indicate that a stronger adherence to the MIND diet was linked to a significantly reduced risk of all-cause mortality over a 12-year follow-up period, suggesting it could be a viable public health recommendation for extended survival.[4]

CONCLUSION

The study revealed a substantial correlation between the MIND diet and a lowered risk of all-cause and cardiovascular mortality in individuals with type 2 diabetes mellitus (T2DM). These findings underscore the potential advantages of adopting the MIND diet for the management and improvement of outcomes in individuals with T2DM.

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Rapid hyperglycemia correction: essential, but at what price? An overview of a patient with type 1 diabetes

INTRODUCTION

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Rarely, the simultaneous occurrence of various microvascular complications been reported in individual after rapid correction of chronic hyperglycemia.

Diabetes mellitus, a prevalent and potentially severe medical condition, has become a significant public health challenge in recent decades. As traditionally linked to complications like coronary heart disease, stroke, and peripheral arterial disease on a macrovascular level, as well as microvascular issues such as diabetic kidney disease, retinopathy, and peripheral neuropathy, it demands attention and comprehensive management.[1] Vascular complication in diabetes are typically associated with persistent high blood sugar levels. Managing and correcting chronic hyperglycemia are primary goals for individuals with diabetes, as it is the main contributor to diabetes-related complications. Paradoxically, in specific cases, the swift and intense correction of chronic hyperglycemia can actually increase the risk of microvascular complications.[2] In this present case, a rare and unfortunate occurrence of various microvascular complications in a young patient with type 1 diabetes was observed. These include Charcot neuroarthropathy affecting multiple joints, severe proliferative diabetic retinopathy, gastroparesis, bladder voiding disorders, and end-stage renal failure. The profound impact on the patient's quality of life likely because of rapid correction of long-term hyperglycemia.

CASE PRESENTATION

At the age of 9, a young woman was diagnosed with type 1 diabetes, a condition also presents in her sister who was three years older. Chronic hyperglycemia aggravated her diabetes management, persisting from adolescence into her twenties. Despite consistently high glycated hemoglobin (HbA1c) levels, reaching peaks of 13.3% at 24 years, she avoided seeking assistance until hospitalization in 2010 due to acute metabolic ketoacidosis. Refusing educational and therapeutic support, she eventually sought evaluation in November 2017 during an unplanned pregnancy, revealing an HbA1c level of 12%. Peripheral neuropathy and incipient nephropathy were noted, leading to rapid therapeutic intervention with a subcutaneous insulin infusion pump, reducing HbA1c to 7.4%. Ramipril was prescribed for early nephropathy. Over the following two years, she experienced severe microvascular complications, including Charcot

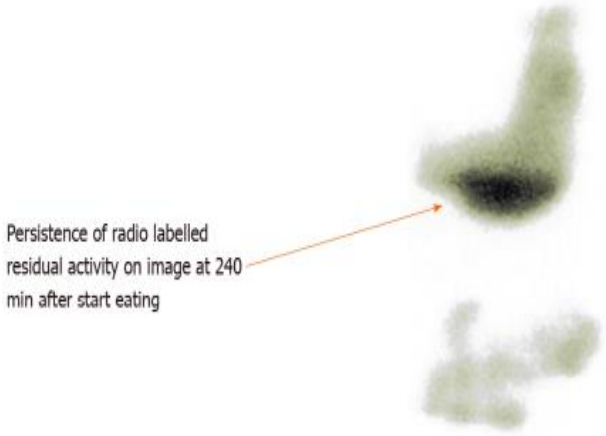

Figure 1. Gastric scintigraphy Image demonstrating a significant delay in the gastric emptying.

neuroarthropathy, proliferative diabetic retinopathy, gastroparesis (Figure 1), bladder voiding disorders, and end-stage renal failure. Interventions such as transtibial amputation, knee prosthesis surgery, retinopathy photocoagulation, and thrice-weekly hemodialysis were necessary for her complex condition.

DISCUSSION

In this case, multiple microvascular complications were observed after rapid correction of chronic hyperglycemia.[2] During the management of hyperglycemic crises, a rare occurrence of cerebral edema was observed due to excessively vigorous fluid resuscitation and rapid correction of hyperglycemia and hyperosmolarity.[3] The study demonstrated that persistent hyperglycemia linked to diabetes results in various ocular complications. The impact of rapid correction of acute hyperglycemia on the eye was not as widely acknowledged. The study warned about the potential risk of inducing angle closure glaucoma during the rapid correction of hyperglycemia.[4] A drawback of this case report was its retrospective nature, potentially complicating the interpretation of medical elements. Another limitation was the absence of data on glycemic variability, impeding precise HbA1c measurements. Regrettably, the patient consistently declined to share real-time glycemic data through capillary blood glucose monitoring or continuous glucose measurements.

CONCLUSION

This case report detailed a tragic and uncommon progression of several microvascular complications, including gastroparesis, end-stage kidney disease, severe proliferative diabetic retinopathy, and Charcot neuroarthropathy with multiple joint involvement. A young patient with type 1 diabetes suffered greatly from these catastrophic complications, which were likely brought on by the quick correction of long-term hyperglycemia.

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