

Could Continuous Glucose Monitoring Facilitate Identifying Diabetes Patients with a Higher Risk of Hypoglycemia during Driving?

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An extensive article about driving with diabetes mellitus by Kohrman and coauthors¹ was published in *Journal of Diabetes Science and Technology*. The authors mentioned that a hypoglycemic episode during driving is generally considered as one of the main risk factors for driving mishaps. Furthermore, they suggested the use of continuous glucose monitoring (CGM) as one of the possible tools to prevent hypoglycemia during driving.¹ A survey of 1076 adults with type 1 diabetes mellitus revealed that the distribution of severe hypoglycemia was highly skewed, with 5% of subjects accounting for 54% of all episodes.² In almost all the studies concerning hypoglycemia during driving, information is obtained through questionnaires filled in by the patients themselves. The value of such questionnaires is limited, because patients tend to describe the occurrence of hypoglycemia in a more positive fashion.³ Moreover, unrecognized hypoglycemia remains undetected. Continuous glucose monitoring provides information about fluctuation in blood glucose levels and can also uncover asymptomatic hypoglycemia.⁴ Unfortunately, the use of CGM is not widespread, and it is also limited by its cost.

We tried to identify drivers at possible risk regarding hypoglycemia employing CGM. A blinded continuous glucose monitor was used in type 1 diabetes patients treated with continuous subcutaneous insulin infusion (CSII) in order to determine glycemic excursions during driving periods. A group of 12 male patients with type 1 diabetes mellitus treated with CSII with a disease duration of 10.0 ± 3.5 years and a duration of treatment with CSII of 6.4 ± 3.2 years was investigated. Each patient was monitored for 3–5 consecutive days, unable to see the measured glycemic values. Patients were asked to record all important events, such as insulin injections, exercise, meals, and working periods as much as the periods of driving.

Thereafter, continuous glucose curves were reviewed to identify glycemic excursions during periods of car driving, with a special emphasis on hypoglycemic episodes (≤ 70 mg/dl) and periods of glycemia with values between 70 and 81 mg/dl, i.e., in the range with a considerable risk of developing hypoglycemia.

In total, 3460 min of driving were evaluated, an average of 72.1 ± 30.3 min/day. Patients recorded two symptomatic hypoglycemic episodes while driving. Three periods of asymptomatic hypoglycemia were found, all occurring in two patients, with a total duration of 40 min (1.2% of total driving time), while the total time spent in the low glycemic range between 70 and 81 mg/dl was 165 min (4.8% of total driving time).

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Abbreviations: (CGM) continuous glucose monitoring, (CSII) continuous subcutaneous insulin infusion

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Thus, a risk of hypoglycemia during driving, even in well-experienced patients with type 1 diabetes mellitus treated with CSII, is considerable and should be regularly brought into focus in education. Blinded CGM could also identify patients who tend to drive with glycemic values at higher risk of hypoglycemia and who should be referred to more extensive education.

References:

1. Kohn DB. Driving with diabetes: precaution, not prohibition, is the proper approach. *J Diabetes Sci Technol.* 2013;7(2):350–5.
2. Pedersen-Bjergaard U, Pramming S, Heller SR, Wallace TM, Rasmussen AK, Jørgensen HV, Matthews DR, Hougaard P, Thorsteinsson B. Severe hypoglycaemia in 1076 adult patients with type 1 diabetes: influence of risk markers and selection. *Diabetes Metab Res Rev.* 2004;20(6):479–86.
3. Loftus EF, Palmer JC. Reconstruction of automobile destruction: an example of the interaction between language and memory. *J Verbal Learn Verbal Behav.* 1974;13(5):585–9.
4. Klonoff DC. Continuous glucose monitoring: roadmap for 21st century diabetes therapy. *Diabetes Care.* 2005;28(5):1231–9.