Driving with Diabetes

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He serves as a member of the Editorial Board for the diabetic patient-centered journal Diastyl; and is both a cofounder and coordinator of an original charity project for a polyclinic in Kathmandu, Nepal.

He is president of Diacentrum, an international non-governmental organization, providing education to diabetus mellitus patients in both the Czech Republic and abroad. Jan Broz is also a member of the Executive Committee of the Czech Diabetes Society.

Marketa Tolarova, Bc. is a 6th year medical student of the Second Faculty, Charles University, Prague, Czech Republic with a special interest in endocrinology. She became fascinated with the topic of diabetes due to the interconnections of endocrinology and immunology, and due to the complex nature of proper patient care and therapeutic maintenance.

Assoc. Prof. Jan Polák, MD, PhD, works as an associate professor in the field of diabetology at the Institute of Sports Medicine and the 2nd Department of Internal Medicine, Faculty Hospital Kralovske Vinohrady. His research work is focused on metabolism and the endocrine function of adipose tissue as much as on the mechanisms for the development of diabetes in patients with sleep apnea syndrome. He is the author of many scientific studies and texts.

Brian Frier, BSc (Hons), MD, FRCP (Edin), FRCP (Glas), is Honorary Professor of Diabetes at the University of Edinburgh, affiliated to the Queen's Medical Research Institute, and formerly was a consultant physician at the Royal Infirmary of Edinburgh. His principal research interest is the pathophysiology of hypoglycaemia in humans with particular relevance to diabetes and he has published extensively in this field. Other research interests in diabetes include cognitive function and driving.

He is an invited speaker on hypoglycaemia at many national and international meetings and in 2009 was the Banting Memorial Lecturer for Diabetes UK.. In 2004 he received the Somogyi Award for his research on hypoglycaemia from the Hungarian Diabetes Association. Prof Frier was Vice-President of the Royal College of Physicians of Edinburgh (2008-12), and was Chair of the Medical Advisory Panel on Driving and Diabetes to the Secretary of State for Transport in the UK from 2001-2012.

The authors as well as the publisher have made a considerable effort so that the information about the medications, technical means and treatment procedures were in accordance with the latest knowledge at the time the work was prepared. However, neither the authors nor the publisher take responsibility for the content and recommend following the information printed in the information sheets supplied with pharmaceutical medications and to consult your doctor about any treatments.

Driving a motor vehicle

Nowadays, it is common to drive a car. The majority of the adult population of this country, if they do not drive regularly, drive occasionally or are at least possess a driving licence. However, driving a car or a motorbike is potentially hazardous, and can occasionally result in road accidents causing injuries, or may even be fatal.

In the case of a person with diabetes, especially when treated with insulin, there is an additional hazard, namely hypoglycemia. Hypoglycemia adds to the risks connected with driving a motor vehicle. It can have a significant negative effect on cognitive functions (perception of surroundings), decision making (evaluation of surrounding information) and reaction time (responses to external happenings). If hypoglycemia causes loss of consciousness while driving, the journey could end with very serious consequences. The objective of this text is to bring this danger to the attention of drivers who take insulin and to provide them with relevant information on how to minimize the risks.

What is hypoglycemia?

Hypoglycemia is a condition in which the glucose concentration in the blood falls below the lower limit of normal values. Glucose is the main energy source for the brain, which is rapidly affected if blood glucose falls. If hypoglycemia is present over a longer period of time or if the level of glucose concentration decreases very quickly, the person can become confused and drowsy and may even lose consciousness.

The risks of hypoglycemia

The dangers associated with hypoglycemia consist of interference with normal brain functions, which may be manifested by slower or partial perception of the environment, blurred vision, and also by slower, inaccurate or impaired decision-making abilities and progressive confusion. As mentioned, in the final phase of hypoglycemia, consciousness is reduced.

It is obvious that progressive drowsiness leading to loss of consciousness while driving a vehicle will rapidly interfere with driving performance and risk causing an accident. It is necessary to remember that even the initial symptoms of hypoglycemia such as sensations of anxiety and hunger may have a negative effect on the ability to react, and may also affect driving ability.

How to recognize hypoglycemia

The fall of blood glucose below the normal levels is usually accompanied by a number of characteristic warning symptoms that should alert the affected individual to the onset of hypoglycemia. The symptoms may develop in a random order, and with different levels of intensity. Some symptoms may be absent, especially if the fall in blood glucose is rapid.

Very typical symptoms and signs of hypoglycemia are:

- A feeling of hunger
- Nervousness or anxiety
- Pale skin
- Pounding heart
- Sweating
- Shakiness, especially of the hands
- Blurred vision
- Odd behavior
- Difficulty speaking
- Difficulty concentrating
- Confusion
- Drowsiness

When can hypoglycemia be expected?

It is important to always be on guard as hypoglycemia may occur unexpectedly at any time. These are the situations when the risk is greater:

- The riskiest period for hypoglycemia with a standard insulin regimen is in the 3 hours following injection of a short-acting insulin. During this time the level of insulin in the blood stream is still relatively high although much of the glucose from a meal has already been used by the body. Therefore, it may be necessary to eat a small snack in this period to prevent hypoglycemia.

- If the insulin dose is relatively high in relation to the amount of sugar in the consumed food.

- If the patient administers insulin when the glucose levels are relatively normal and either does not eat any food or postpones a meal.

- If the insulin dose has not been adjusted or more food has been consumed to accommodate increased physical activity (sport, physical work, long walk… etc).

- If more than 0.5 l of wine or a few shots of distilled liquor have been consumed. Alcohol blocks the release of glucose from the liver, which is the body's basic mechanism for protecting an organism against hypoglycemia. In this case even a glucagon injection may be ineffective. Alcohol should not be consumed when driving.

- Hypoglycemia may also occur in patients with type 2 diabetes if they are treated with some of the antidiabetes drugs taken by mouth (e.g. by sulphonylureas or glinides). Even with these drugs, hypoglycemia may be severe or frequently recurrent. Everyone with type 2 diabetes should consult their doctor about their medications and the possible risk of hypoglycemia being associated with them.

How to minimize the risks of hypoglycemia

- Consult your diabetologist about driving a vehicle
- Avoid driving if you are unable to recognize the symptoms of hypoglycemia. In this case, hypoglycemia may occur suddenly, making an adequate response impossible
- Avoid driving a vehicle if several episodes of severe hypoglycemia (needing help for recovery) have occurred recently
- Keep blood glucose levels above 5.0 mmol/l when driving
- Always measure blood glucose before you drive and have something to eat if it is lower than 5.0 mmol/l
- Measure blood glucose levels every two hours when driving
- Have some form of rapid-acting glucose immediately available in the vehicle in case hypoglycemia should occur

What to do if hypoglycemia occurs

If there is the slightest suspicion of hypoglycemia, it is important to stop driving immediately. Experienced patients are able to identify hypoglycemia at an early stage. Less experienced patients should check their blood glucose with a glucose meter. If hypoglycemia is present, it is necessary to immediately take some sugar, either in the form of glucose concentrate, a cube of sucrose, or sugar from a soft drink (not one that is sugar free). The recommended amount of sugar ranges between 10 – 40 g depending on the severity of symptoms and the blood glucose value. For easy reference: 10 g of sugar will raise blood glucose by approximately 0.7 mmol/l (1 – 4 dl of fruit juice or coke, tea with 1 – 4 cubes of sugar, etc.).

In severe hypoglycemia, the patient is unable to help himself because of confusion or diminished consciousness. Rubbing some form of sugar inside the mouth is not particularly effective and may cause the person to choke. It is generally recommended to give a glucagon injection (Glucagen- Hypokit), which every patient should carry. In any case, it is necessary to call for emergency medical assistance (the ambulance) immediately.

If hypoglycemia occurred while driving, a period of 45 minutes is necessary for the brain to recover and for mental functions to return to their usual level. Therefore, driving should not recommence until 45 minutes after blood glucose has returned to normal.

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