Media release

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Diabetes

Automatic regulation of blood sugar after kidney failure

Regulating blood sugar levels is very challenging when diabetes is coupled with kidney failure. A research group at Inselspital, Bern University Hospital together with the partner center of Addenbrooke’s Hospital in Cambridge UK published a study today in the Nature Medicine journal. Closed-loop systems that provide fully automated blood sugar regulation were analyzed. The study revealed that closed-loop systems significantly reduce blood sugar levels that fall outside the target range.

Fully automated closed-loop systems automatically monitor and correct blood sugar levels in diabetes patients. Separate measurement of blood sugar levels and insulin injections no longer necessary. Closed-loop systems, sometimes also called “artificial pancreas”, have been investigated in various studies and fields of application and have generally proven their effectiveness. The present study has now investigated their use for people with type 2 diabetes who are dependent on dialysis due to severe kidney damage. This patient group is fragile in health and blood sugar levels can easily slip out of normal values, rendering these individuals with multiple conditions vulnerable.

Closed-loop systems also effective for diabetes and severe kidney damage

The study, published in Nature Medicine, shows that monitoring blood sugar levels for diabetics dependent on dialysis can be significantly improved with a fully automated closed-loop system. Remaining within blood sugar target range was achieved 53% of the time compared to 38% with conventional insulin injection therapy. In addition, the risk of hypoglycemia was reduced with the closed-loop system.

Study leader Prof. Dr. med. Lia Bally concludes: “Closed-loop systems improve blood sugar monitoring and reduce hypoglycemia compared with standard insulin therapies, even in diabetic patients on dialysis who are particularly prone to blood sugar imbalance.”

Brief description of the study

In two centers (Bern University Hospital, CH, and University Hospital Cambridge, UK), 26 patients received closed-loop insulin therapy (intervention) or conventional insulin injection therapy in random order for 20 days each. Blood sugar levels were measured continuously with a glucose sensor. During the study period, participants received normal outpatient medical care (3 dialysis sessions per week) and were not restricted in their daily life.
The goal of the study was for the test persons to spend as much time as possible in the targeted blood sugar range of 5.6 to 10.0 mmol/l.
The study was conducted at Inselspital, Bern University Hospital in the Department of Diabetology, Endocrinology and Metabolism (UDEM) and the Department of Nephrology and Hypertension (cf. experts below).

Continue to develop closed-loop systems with adaptive learning
The study demonstrates the benefits of fully automated closed-loop insulin therapy in dialysis-dependent individuals with diabetes. Prof. Dr. med. Christoph Stettler, Chairman of Department of Diabetology, Endocrinology, Nutritional Medicine and Metabolism (UDEM) in Bern, explains: “This proves the benefits of modern diabetes technology in even this extremely vulnerable patient group: for more than 3.5 hours a day they remained within the blood sugar target range. That's a huge gain in terms of therapy control, safety and quality of life.”
In view of the fact that this study used systems that function fully autonomously and continually adapt to the patients’ individual needs via an intelligent learning algorithm, Prof. Bally adds: “The study demonstrates the tremendous importance of learning therapies tailored to the individual in a challenging patient population with rapidly changing insulin needs. Blood sugar control improved steadily during the 20-day observation period. Further increase in benefit with gestation beyond 20 days can be expected.”

Experts:
- Prof. Dr. med. et phil. Lia Bally, Head of Research and Supervisor of Nutrition and Metabolism, Department of Diabetology, Endocrinology, Nutritional Medicine and Metabolism (UDEM), Inselspital, Bern University Hospital and Cluster Chair “Patient Focused Research” at Multidisciplinary Center for Infectious Disease (MCID), University of Bern.
- Prof. Dr. med. Christoph Stettler, Chairman and Chief Physician, Department of Diabetology, Endocrinology, Nutritional Medicine and Metabolism (UDEM), Inselspital, Bern University Hospital
- Prof. Dr. med. Bruno Vogt, Chairman and Chief Physician, Department of Nephrology and Hypertension, Inselspital, Bern University Hospital

Links:
- Original publication: Charlotte K Boughton, Afroditi Tripyla, Sara Hartnell et al.: Fully automated closed-loop glucose control compared with standard insulin therapy in adults with type 2 diabetes requiring dialysis: an open-label, randomised crossover trial. DOI: 10.1038/s41591-021-01453-z
- Department of Diabetology, Endocrinology, Nutritional Medicine and Metabolism (UDEM), Inselspital, Bern University Hospital (Link to German Website)

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