Pump+Sensor Beats Daily Shots to Trim HbA_{1c}

Gains in glucose control must be weighed against demands the high-tech pumps place on patients.

BY MIRIAM E. TUCKER

FROM THE ANNUAL SCIENTIFIC SESSIONS OF THE AMERICAN DIABETES ASSOCIATION

ORLANDO — Sensor-augmented insulin pump therapy resulted in significant improvements in hemoglobin A_{1c} levels without increasing hypoglycemia, compared with multiple daily injection therapy, in a 1-year randomized, controlled trial of 485 patients with type 1 diabetes.

Participants in the prospective, multicenter Sensor-Augmented Pump Therapy for A_{1c} Reduction (STAR)–3 study were seen at 30 sites in the United States and Canada. All patients (aged 7-70 years) had type 1 diabetes treated with multiple daily injections that included a long-acting analogue insulin during the previous 3 months and had an HbA_{1c} value between 7.4% and 9.5% (mean 8.3% in both groups), Dr. Richard M. Bergenstal reported. The findings were published simultaneously in the New England Journal of Medicine online on June 29 (doi:10.1056/NEJMoa1002853).

All patients received intensive diabetes management training, with the sensor-augmented pump group receiving additional training in the use of the pump. The multiple daily injections (MDI) group wore a continuous glucose monitor that did not display glucose data to the patient. Both groups downloaded their data to an online software system.

For the study's primary end point, change in HbA_{1c} between the sensor-augmented pump and multiple daily injection groups at 1 year, results were highly significant: The mean HbA_{1c} decreased from 8.3% to 7.5% in the sensor-augmented pump group and to 8.1% in the MDI group, translating to a fourfold greater reduction with the sensor-augmented pump, said Dr. Bergenstal, executive director of the International Diabetes Center in Minneapolis.

In the 329 adults aged 19 and older, mean HbA_{1c} was decreased to 7.3%, compared with 7.9% in the MDI group. In the 156 children and adolescents aged 7-18 years, the value was reduced to 7.9% with sensor-augmented pump vs. a slight increase to 8.5% with MDI.

The adult group had achieved that 7.3% value within 3 months and had remained consistent over the entire year; the children and adolescents achieved a mean of 7.5% at 3 months, but the value then drifted upward. However, in the pediatric group the 1-year difference from baseline was still statistically significant, noted Dr. Bergenstal, the ADA's president for medicine and science.

A linear relationship was seen between sensor use and HbA_{1c}, with reductions of just 0.19 percentage points among those who wore the sensor 21%-40% of the time, compared with a reduction of 1.21 percentage points in those who wore it 81% of the time or more. Results were statistically significant in those who wore the sensor 41% of the time or more, he said.

The proportion of patients who achieved an HbA_{1c} value of 7% or less at 1 year was 27% with sensor-augmented pump, compared with 10% with MDI, a highly significant difference. In adults, the difference was 34% vs. 12%. In the children and adolescents, the proportions achieving the ADA recommendations of less than 7.5% for those aged 13-19 years and less than 8% for 6- to 12-year-olds were 44% with sensor-augmented pump and 20% with MDI.

Diabetic ketoacidosis was rare in both groups and did not differ between the groups. The amount of time spent in hypoglycemia also did not differ between the two groups. Severe hypoglycemia occurred in 13.31 patients per 100 person-years in the sensor-augmented pump group, compared with 13.48 patients in the MDI group. Among the adults, weight gain was greater with SAP, at 2.4 kg, compared with 1.8 kg with MDI, Dr. Bergenstal said.

In an editorial that accompanied the study report, Dr. Howard Wolpert of the Joslin Diabetes Center, Boston, noted that "continuous glucose monitoring can be viewed as a compass that tells patients where their glucose is heading. However, to reach that goal, patients need to be skilled in diabetes self-management. The expert training and guidance received by patients in clinical trials cannot be readily duplicated in a busy clinical practice," he said (N. Engl J. Med. 2010 June 29; doi:10.1056/NEJMe1006098).

The benefits of improved glucose control must also be weighed against the demands that the technology places on the patient, he wrote.

"The use of continuous glucose monitoring by patients will almost certainly grow as the next generation of smaller, simpler devices with increased reliability and accuracy becomes available. The development of an infrastructure to support training and follow-up care will also be essential," Dr. Wolpert concluded. ■

VITALS

Major Finding: Mean HbA_{1c} decreased from 8.3% to 7.5% with the use of a sensor-augmented pump vs. 8.1% with multiple daily injections.

Data Source: Randomized, controlled trial with 485 patients.

Disclosures: The study was funded by Medtronic MiniMed, maker of an insulin pump and continuous glucose monitor system. Several investigators disclosed that they have earned consulting fees, honoraria, grants, or travel reimbursements from numerous pharmaceutical companies and device manufacturers, including Medtronic, Bayer Healthcare, Lifescan, Novo Nordisk, and Becton Dickson. Those companies also supplied the study with insulin aspart and glucose monitors. Dr. Wolpert disclosed having been a consultant to Abbott, Novo Nordisk, and Insulet.

Gestational Diabetes Flags Elevated Risk for Hypertension

BY SUSAN LONDON

FROM THE ANNUAL MEETING OF THE SOCIETY FOR PEDIATRIC AND PERINATAL EPIDEMIOLOGIC RESEARCH

SEATTLE — Women who have had gestational diabetes may be at elevated risk for hypertension even after established risk factors are taken into account, a nested cohort study indicates.

Using data from the Nurses' Health Study II, researchers followed more than 26,000 women from an index pregnancy for up to 14 years. Those with gestational diabetes during that pregnancy were 41% more likely to develop hypertension even after adjustment for potential confounders such as body mass index, diet, and family history of hypertension.

"These women may represent a target group for intervention to prevent or delay the onset of hypertension, which is a public health concern in the United States," lead investigator Deirdre K. Tobias concluded.

"The mechanism by which gestational diabetes mellitus could lead to an increased risk of hypertension and other metabolic complications is not yet established," said Ms. Tobias, who is a doctoral student at the Harvard School of Public Health, Boston.

VITALS

Major Finding: Women who had gestational diabetes were 41% more likely to develop hypertension during a 14-year follow-up, compared with those who had not had the condition.

Data Source: A nested prospective cohort study of 26,384 women initially aged 25-44 years who had at least one singleton pregnancy.

Disclosures: Ms. Tobias reported that she had no relevant conflicts of interest.

One possibility is that these conditions have shared risk factors, she noted. Another is that gestational diabetes itself increases the risk of hypertension, for example, by causing vascular damage that manifests later in time.

Overall, 9% of the women developed hypertension during the follow-up period, and the cumulative incidence was higher among those who had had gestational diabetes.

The Nurses' Health Study II is a prospective cohort study of women aged 25-44 years at baseline that began in 1989.

Extensive questionnaires completed at baseline and biennially include questions about physician-diagnosed gestational diabetes and hypertension.

Ms. Tobias and her colleagues included in their sample the 26,384 women who reported having at least one singleton pregnancy between 1991 (the first year in which dietary data were collected) and 2005, did not have type 2 diabetes or hypertension, had not experienced gestational diabetes in a previous pregnancy, and had not had previous cardiovascular disease.

Study results showed that 6% of the women had gestational diabetes during their index pregnancy. Women with and without gestational diabetes had a mean age of 32 years at baseline, and 7% in each group were current smokers.

However, those with gestational diabetes had a higher body mass index (25 vs. 23 kg/m^2), and were more likely to have a family history of hypertension (51% vs. 46%) and diabetes (21% vs. 11%), and a personal history of toxemia, preeclampsia, or hypertension during pregnancy (16% vs. 8%).

Overall, 9% of the women developed hypertension during follow-up, and the cumulative incidence was higher among those who had had gestational diabetes.

After adjustment for potential confounders, women who experienced gestational diabetes still had a 41% higher risk of developing hypertension.

Moreover, compared with women who experienced neither gestational diabetes nor type 2 diabetes, those who experienced both had a near tripling of the risk of developing hypertension.

"It is possible that there was residual or unmeasured confounding," acknowledged Ms. Tobias. "For example, in our cohort, we were unable to capture pregnancy-related characteristics, such as weight gain or severity of gestational diabetes."

The generalizability of the findings may be limited, given the women's higher age at baseline and the fact that most were white, she noted. ■