OBSERVATIONS

OmniPod Insulin Management System

Patient perceptions, preference, and glycemic control

This 30-day study, supported by a grant from Insulet, assessed the comfort, function, and use of the OmniPod system (Pod) compared with the use of a conventional insulin pump among subjects with type 1 diabetes.

The OmniPod system features the Pod, a lightweight, watertight, self-enclosed insulin pump with automated cannula insertion. The Pod delivers insulin according to preprogrammed instructions transmitted wirelessly from the personal diabetes manager, a hand-held device that programs the pump with customized insulin instructions, monitors the operation of the pump, performs suggested bolus calculations, and contains an integrated blood glucose meter.

Twenty subjects with type 1 diabetes used the OmniPod system (Insulet, Bedford, MA) to manage their diabetes (15 female and 5 male subjects; mean age 43 years [range 27–68]; mean diabetes duration 20.8 years [4–53]). The following was the inclusion criteria: use of continuous subcutaneous insulin infusion therapy for at least 6 months, an HbA_{1c} (A1C) ≤8.5% (mean 7.1% [range of initial A1C 5.5–8.1]), measures glucose at least four times each day, and no more than one severe hypoglycemic or ketoacidosis episode within the past year and none within the past 3 months. The following were the exclusion criteria: clinical diagnosis of hypoglycemic unawareness, known dermal hypersensitivity to products that contain Beiersdorf Hypafix medical adhesive, pregnancy, and taking prescription medications that could complicate the management of glycemic control (i.e., steroids, diuretics, β-blockers).

Subjects recorded daily activities, insulin dosages, glucose results, and observations and were required to check glucose values using the personal diabetes manager's integrated Freestyle blood glucose meter (Abbott, Alameda, CA). Clinic visits were scheduled on days 3, 14, and 30 to reinforce the study protocol procedures and to evaluate patient status. Subjects completed an exit questionnaire. Each question required the subject to answer on a scale from 1 to 5, where 1 = most favorable, 5 = least favorable, and 3 = neutral response. The following are the results comparing the Pod with their current pump: convenience of using the OmniPod system = (means ± SD) 1.85 ± 0.93, satisfaction with wearing the OmniPod system = 1.7 ± 0.98, pain associated with automated cannula insertion = 2.0 ± 0.65, satisfaction with current insulin pump = 1.9 ± 0.45, wearing while sleeping = 1.15 ± 0.49, wearing while showering = 1.10 ± 0.45, and time involved in the OmniPod change process = 2.05 ± 0.89.

Ninety percent of subjects (18 of 20) preferred using the OmniPod's automated cannula insertion system versus inserting with their current infusion sets. All 20 subjects completed the 30-day study. A1C values at the end were significantly lower (mean 6.8% [range 5.4–7.6]; *P* value <0.002).

The results suggest that the OmniPod system was well received among existing pump therapy type 1 diabetic patients. Most subjects preferred the OmniPod system to their conventional insulin pump. Preliminary A1C results, in addition to feedback supplied by patients, indicate that there may be additional benefits related to using the OmniPod system that need to be studied further.

HOWARD ZISSER, MD
LOIS JOVANOVIC, MD

From the Sansum Diabetes Research Institute, Santa Barbara, California.

Address correspondence to Lois Jovanovic, MD, Sansum Diabetes Research Institute, 2219 Bath St., Santa Barbara, CA 93105. E-mail: ljovanovic@sansum.org.

DOI: 10.2337/dc06-0986

Use of U-500 Regular Insulin in Type 2 Diabetes

In a recent report in *Diabetes Care*, experience using U-500 regular insulin (U-500) in syndromic forms of insulin resistance was described (1). Due to its higher concentration, U-500 has pharmacokinetics that are believed to be similar to U-100 NPH insulin peaking later and lasting longer than U-100 regular insulin. These authors suggest that U-500 may be used in type 2 diabetic patients with severe insulin resistance who fail usual treatment (1). We report our experience using U-500 insulin in type 2 diabetic patients with poor glycemic control despite >200 units of insulin/day.

We studied 15 patients (7 men and 8 women, mean age 59.8 years, mean weight 126.6 kg) using a mean daily dose of insulin U-100 of 219 units and mean HbA_{1c} (A1C) of 9.8%. After initiation of U-500, the A1C decreased to 7.9% at 3 months and to 7.6% at 1 year. The patients required a mean of 285 units of U-500 at 3 months and 335 units at 1 year (this corresponds to the 57 and 67 markings on a U-100 syringe, respectively). Their weight increased by 3.2% at 3 months and by 1.6% at 12 months. At baseline, hypoglycemia rarely occurred (one to two episodes per month). The frequency of hypoglycemia did not change at 3 and 12 months after the initiation of U-500, and none of these episodes were severe. With the exception of insulin U-500, no other changes were made in the antidiabetes medications.

Reports on the use of U-500 in type 2 diabetic patients have been limited to several case reports and case series (2–4). The largest series examined 20 poorly controlled diabetic patients with severe insulin resistance, and a 1% reduction in A1C was observed after 6 months of administration of U-500 (4). In our series, reduction in A1C was more pronounced.

Our experience adds to the evidence from others that U-500 can be used effectively in a subset of type 2 diabetic patients with poor glycemic control despite >200 units of insulin daily (1–4). An ~2% reduction in A1C, small weight gain, and no increase in hypoglycemia were observed. This improvement in glycemic control could be related to delivery of higher doses of insulin, better absorption, and/or differences in duration of action. Large, prospective studies are needed to confirm these findings. Pharmacodynamic and pharmacokinetic studies of U-500 would be helpful to better understand optimal U-500 dosing regimens in this difficult-to-control subgroup of patients.

WAFIC S. WAFA, MD
MUKHTAR I. KHAN, MD, FACE

From the Division of Endocrinology, Diabetes and Metabolism, Department of Internal Medicine, State University of New York Upstate Medical University, Joslin Diabetes Center, Syracuse, New York.

Address correspondence and reprint requests to Mukhtar I. Khan, MD, FACE, Joslin Diabetes Center, 90 Presidential Plaza, Syracuse, NY 13202. E-mail: khanm@upstate.edu.

DOI: 10.2337/dc06-1148

References

1. Cochran E, Musso C, Gorden P: The use of U-500 in patients with extreme insulin resistance. *Diabetes Care* 28:1240–1244, 2005
2. Fain JA: Insulin resistance and the use of U-500 insulin: a case report. *Diabetes Educ* 13:386–389, 1987
3. Knee T, Seidensticker D, Walton J, Solberg L, Lasseter D: A novel use of U-500 insulin for continuous subcutaneous insulin infusion in patients with insulin resistance: a case series. *Endocr Pract* 9:181–186, 2003
4. Neal J: Analysis of effectiveness of human U-500 insulin in patients unresponsive to conventional insulin therapy. *Endocr Pract* 11:305–307, 2005

Exposure to Rosiglitazone and Fluoxetine in the First Trimester of Pregnancy

Rosiglitazone is a thiazolidinedione oral hypoglycemic drug that seems to be a promising alternative not only as an oral hypoglycemic agent but also for women with polycystic ovary syndrome. However, information regarding exposure to rosiglitazone in pregnancy is limited to two previous case reports. In the first case, a 35-year-old woman was exposed until the 8th week of pregnancy to 4 mg/day rosiglitazone and to glicazide, acarbose, atorvastatin, spironolactone, hydrochlorothiazide, carbamazepine, thiridazine, amitryptiline, chlordiazepoxide, and pipenzolate bromide (1). The second case was a woman exposed to 4 mg/day rosiglitazone between gestational weeks 13 and 17 (2). The two cases delivered normal babies at gestational weeks 36 and 37, respectively.

We are reporting the case of a 29-year-old Korean primiparous woman with a 6-month history of type 2 diabetes. She had been taking 400 mg metformin and 2.5 mg glibenclamide every 12 h. Because of the difficulties in controlling her hyperglycemic levels, 500 mg metformin every 12 h was added to her combined treatment. Five months later, her physician decided to switch her treatment to 4 mg rosiglitazone maleate every 12 h. In addition, she received 20 mg fluoxetine hydrochloride every 12 h for a body weight reduction plan. She had control of her diabetes and took both medications until the 5th week of gestation, when she had symptoms of pregnancy.

She was seen at The Korean Motherisk Program at 8 weeks of pregnancy, where she reported negative exposure to other medications, alcohol, illicit drugs, cigarette smoking, or radiation. She was not taking folic acid. Her BMI was 31.2 kg/m^2 (weight 85 kg and height 165 cm). Her fasting plasma glucose and HbA_{1c} levels were 138 mg/dl and 6.8% (normal range 4.5–6.0), respectively. A single embryo of 20 mm crown-lump length and normal heart rate was identified by ultrasound. Her treatment with rosiglitazone was switched to insulin, and fluoxetine administration was discontinued.

She was followed up periodically by clinical, laboratory, and ultrasound examinations. There were no ultrasonographic evidences of fetal malformations at the different follow-up examinations. The course of her pregnancy was considered to be normal. Previous to delivery, her total weight gain was 15 kg and her BMI was estimated to be 36.7 kg/m^2. At 40 weeks of gestational age, she vaginally delivered a 3.7-kg male baby. A detailed neonatal examination did not detect any clinical evidence of external, cardiac, pulmonary, or gastrointestinal congenital malformations. His cephalic circumference was 34.5 cm (within normal range), and his neurological development was found to be normal by a detailed physical and neurological examination. The baby was periodically followed up by a pediatrician. At the age of 18 months, the child was weighing 13.5 kg, was a healthy baby, and had a neurological development similar to that expected for his age-group.

Preclinical studies on rosiglitazone (GlaxoSmithKline, Mississauga, ON, Canada) found no increase in congenital malformations in rats and rabbits treated with 19 and 73 times the human dose, respectively. The two previous case reports, in addition to the present one, suggest that this drug is also not teratogenic in humans. On the other hand, fluoxetine is a serotonin reuptake inhibitor antidepressant drug with sufficient reproductive and developmental studies in humans to prove a lack of an increased risk of teratogenicity.

June-Seek Choi, MD[1,2]
Jung-Yeol Han, MD[1,2]
Hyun-Kyong Ahn, MD[1,2]
Joong-Sik Shin, MD[2]
Jae-Hyug Yang, MD[2]
Mi-Kyoung Koong, MD[3]
Alejandro A. Nava-Ocampo, MD[4]

From the [1]Korean Motherisk Program, Cheil Hospital and Women's Health Care Center, Sungkyunkwan University School of Medicine, Seoul, Korea; the [2]Division of Maternal Fetal Medicine, Cheil Hospital and Women's Health Care Center, Sungkyunkwan University School of Medicine, Seoul, Korea; the [3]Division of Infertlilty, Department of Obstetrics and Gynecology, Cheil Hospital and Women's Health Care Center, Sungkyunkwan University School of Medicine, Seoul, Korea; and the [4]Division of Clinical Pharmacology and Toxicology, The Hospital for Sick Children, Toronto, Ontario, Canada.

Address correspondence to Dr. Jung-Yeol Han, The Korean Motherisk Program, Division of Maternal Fetal Medicine, Department of Obstetrics and Gynecology, Cheil Hospital, Sungkyunkwan University, School of Medicine, 1-19 Mookjung-Dong, Choong-Gu, Seoul 100-380, Korea. E-mail: hanjungyeol@yahoo.com.

DOI: 10.2337/dc06-1214

References

1. Yaris F, Yaris E, Kadioglu M, Ulku C, Kesim M, Kalyoncu NI: Normal pregnancy outcome following inadvertent exposure to rosiglitazone, gliclazide, and atorvastatin in a diabetic and hypertensive woman. *Reprod Toxicol* 18:619–621, 2004
2. Kalyoncu NI, Yaris F, Ulku C, Kadioglu M, Kesim M, Unsal M, Dikici M, Yaris E: A case of rosiglitazone exposure in the second trimester of pregnancy. *Reprod Toxicol* 19:563–564, 2005

Recent Trend Toward Decrease in the Incidence of Childhood Type 2 Diabetes in Tokyo

We previously reported that the annual incidences of children with type 2 diabetes as detected by urine glucose screening at school in Tokyo during 1981–1995 were significantly higher than the incidence in 1974–1980 (1). We evaluated recent changes in the annual incidence of childhood type 2 diabetes in Tokyo. The results were analyzed using Fisher's exact probability test.

From 1974 to 2004, a total of 9,242,259 school students were tested for glucosuria to detect diabetes. A total of 236 children were diagnosed as having type 2 diabetes through this screening program. Overall, 83.9% of children with diabetes were obese. The overall incidence was 2.55 per 100,000 per year. Junior high school children had a significantly higher incidence than primary