Type 1, Type 2 Diabetes Can Overlap in Children

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For most pediatric patients with high blood sugar, the distinction between type 1 and type 2 diabetes is straightforward. However, there can be an overlap and patients who fit criteria for both conditions, making diagnosis and management more challenging.

Michelle Ditto is a California teenager and avid dancer diagnosed with type 2 diabetes 4 years ago, at age 11. "It was kind of scary," she said. "Type 2 kinda runs in my family," Michelle said in an interview. Her grandmother and an uncle not related by blood have type 2 diabetes, "so I knew what it was."

About 1½ years ago, Michelle switched physicians and had some blood tests. Results showed she had two of the three antibodies indicative of type 1 diabetes. "It was a shock."

Her dual diagnosis puts Michelle in a unique position to compare type 1 and type 2 diabetes.

"To me it just seems like there is more medication [with type 1], more insulin, more shots, so more inconvenience from my point of view as a kid," she said. "I have to bring my kit and my insulin to school now. As a kid it's a big deal."

"You can have a genetic predisposition to type 2 diabetes, be Hispanic and overweight, and yet develop type 1 autoimmune type. That is where diagnosis gets difficult," Susan Clark, M.D., director of endocrinology at Children's Hospital of Orange County, Orange, Calif., told this newspaper. "That is probably 5% or less of all cases, but that overlap is there."

"The overlap is certainly more common now than in the past because of the obesity epidemic," Floyd L. Culler, M.D., professor of pediatrics at the University of California, Irvine, said in an interview.

The growing obesity epidemic in the United States is driving an increased incidence of type 2 diabetes among children and adolescents. That may be intuitive, but there is also a suggestion that the growing number of overweight pediatric patients contributes to increased incidence of type 1 incidence as well.

"There has been a 3%-4% increase per year in the last few years in incidence of type 1 diabetes. Some have hypothesized that it may also be related to obesity," Francine R. Kaufman, M.D., head of the Center for Endocrinology, Diabetes, and Metabolism, Children's Hospital Los Angeles, California, said in an interview. "If you are overweight, it might accelerate destruction of the β-cells."

She is author of a book titled, "Diabesity: The Obesity-Diabetes Epidemic That Threatens America—And What We Must Do to Stop It (Bantam, March 2005).

To further complicate diagnosis, there are some patients with diabetes who do not fit criteria for type 1 or type 2, Dr. Culler said. "The more you know the more you find patients who don't fit in a category." Maturity-onset diabetes of the young (MODY), a subtype of non–insulin dependent diabetes mellitus, is an example.

Type 1 diabetes is an autoimmune disorder; the immune system attacks the pancreas and the cells that make insulin. With type 2 diabetes these cells become resistant to insulin, so insulin does not work well. "Early in the disease [type 2], they have high insulin levels, which leads to physical symptoms, such as a little fat around the middle and acanthosis nigricans," Dr. Clark said.

Comorbidities are another distinction. For example, people with type 1 diabetes can have other autoimmune conditions such as autoimmune thyroid disease or celiac disease. "In type 2 diabetes, you see more diseases associated with insulin resistance, such as polycystic ovarian syndrome," Dr. Kaufman said.

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Children with type 1 diabetes generally experience a faster onset than do those with type 2 diabetes. In addition, pediatric patients with type 1 diabetes are generally younger than are those with type 2.

Other clues can aid diagnosis. "Ethnicity is a big difference. Type 1 diabetes is primarily a Caucasian disease, and type 2 diabetes pretty much affects everyone else," Dr. Kaufman said. For example, type 2 is more common among American Indian, Hispanic, Asian, or Pacific Islander patients.

"My first recommendation to primary care physicians is to recognize abnormal weight gain early and aggressively intervene," Dr. Clark said. "No. 2 is with a child of any age who is drinking and urinating a lot and gaining weight, to think diabetes."

Her third recommendation is to address lifestyle issues with all children, whether an overweight patient has diabetes or not. "Every pediatrician can talk to patients and families about this, even during a short visit."

"It's best to have a healthy lifestyle for either kind [of diabetes], and appropriate portions of the right foods. There are benefits to having an ideal body weight," Dr. Kaufman said.

Monitoring the number of calories a child eats matters, Dr. Culler said. "Just to say you eat certain kinds of foods is not a solution to long-term weight loss." He recommends a low-calorie, low-fat diet with enough fruits and vegetables to keep the child healthy.

To address excess weight and lower the risk for diabetes, exercise is also important. Maximum health effects are seen with a combination of diet and exercise. "The benefit of exercise is through metabolic effects on how you burn calories," Dr. Culler said. "It's hard to exercise yourself thin. You can only burn a few hundred calories at a time, even in kids who are very active."

Despite differences between type 1 and type 2 diabetes, all children with diabetes share some common issues. Challenges for children include medication compliance, glucose monitoring, and managing their condition when their routine changes. There is a loss of normalcy and children with diabetes can face discrimination at school, Dr. Kaufman said. "These are huge challenges." ■

Clinical Capsules

Rosiglitazone and Obesity

Rosiglitazone may be an effective adjunct to insulin therapy in patients with type 1 diabetes and a body mass index (BMI) greater than or equal to 30 kg/m^2, reported Suzanne M. Strowig, R.N., and Philip Raskin, M.D., of the University of Texas Southwestern Medical Center in Dallas.

In an 8-month, randomized, double-blind study, 50 adults with a baseline BMI of 27 or higher were assigned to receive either insulin and rosiglitazone or insulin and placebo. HbA_{1C} levels declined significantly in treated subjects (–1.0%) and placebo subjects (–0.7%), but the placebo group required an 11% higher insulin dose (Diabetes Care 2005;28:1562-7).

Subjects with a baseline BMI of 30 or higher who were treated with rosiglitazone had significantly greater improvements in HbA_{1C} (–1.4%) and total cholesterol (–18 mg/dL) levels, compared with rosiglitazone-treated subjects whose BMI was less than 30.

These outcomes were not observed among placebo subjects. In fact, placebo subjects with a BMI of 30 or higher had the greatest increase in insulin dose of all placebo subjects (12.3 units/day), while patients with a BMI over 30 taking rosiglitazone lowered their daily insulin requirements (–5.7 units/day).

Obesity, Smoking, and Aging

Obesity and cigarette smoking are associated with accelerated aging in white women, reported A.M. Valdes, Ph.D., of the Twin Research and Genetic Epidemiology Unit, St. Thomas' Hospital, London.

Both smoking and obesity result in oxidative stress, which increases white blood cell telomere erosion; telomeres protect chromosomes from degradation by capping the ends of the chromosomes. This suggests that obese subjects and smokers will have shortened telomeres, a marker for aging (Lancet 2005;366:662-4).

In a study of 1,122 white female twins aged 18-72 years, telomere length in white blood cells decreased steadily with age at a mean rate of 27 base pair (bp) per year. The telomere length of obese women was 240 bp shorter, compared with lean women. There was also a dose-dependent relationship between smoking and telomere length: Each pack-year smoked was equivalent to an age-adjusted average of 5 bp of telomere length lost per year, an 18% decrease, Dr. Valdes and colleagues wrote. Lean women had significantly longer telomeres than women with BMIs in the middle of the range, who in turn had longer telomeres than obese women.

The data showed that the difference in telomere length between lean and obese women corresponded to 8.8 years of aging, and current or previous smoking accounted for 4.6 years of aging.

Nutritional Adjunct Tied to Savings

Supplementation with chromium picolinate plus biotin may substantially reduce the cost of treating type 2 diabetes, reported Joseph P. Fuhr Jr., Ph.D., of Widener University, Chester, Penn., and Thomas Jefferson University, Philadelphia, and his associates, based on an economic analysis.

Studies have shown that daily use of the supplement, at an average annual cost of less than $120, improved glycemic control in patients with poorly controlled type 2 diabetes over and above the improvement achieved by oral hypoglycemic agents, the authors noted. In patients with a baseline HbA_{1c} level of at least 10%, the average HbA_{1c} level decreased by 1.78% in users of chromium picolinate plus biotin, compared with 0.78% in placebo users (Dis. Manag. 2005;8:265-75).

The average 3-year cost savings of decreasing HbA_{1c} levels from 10.62% to 9.18% was estimated to be $1,636 for patients with poorly controlled type 2 diabetes and $5,435 for patients who also have heart disease and hypertension; the combination of chromium picolinate and biotin has been shown to affect both lipid and glucose levels. This could result in an average 3-year savings of between $3.9 and $52.9 billion in treating the 16.3 million patients who currently have type 2 diabetes, the authors estimated.

Body Mass and Stature

The acute response of the spine to loading may be a risk factor for low back pain in obese subjects, reported André Luiz Felix Rodacki of Paraná Federal University, Curitiba, Brazil, and his associates.

Ten obese men with a BMI greater than 30 kg/m^2 and 10 nonobese men with a BMI less than 25 had their stature measured at 3-minute intervals during two 30-minute walks and two 30-minute standing recovery periods. During one walk, subjects carried hand weights equal to 10% of their body weight ("loaded"), and during the other walk they carried nothing ("unloaded").

The obese subjects' stature loss was an average of 8.49 mm loaded and 7.02 mm unloaded, compared with the nonobese subjects, who had an average loss of 6.52 mm loaded and 3.55 mm unloaded. The obese group did not regain stature during the standing recovery period, while the nonobese group recovered stature (Clin. Biomech. 2005;20:799-805).

A longer recovery period may be necessary for obese subjects to reestablish their intervertebral disc height after loading, which "may help to explain the high incidence of back disorders in obese individuals," the authors wrote.

—Kevin Foley