ald Building, 150 College Street, Toronto, Ontario, Canada M5S 1A8.

IDDM, insulin-dependent diabetes mellitus; GI, glycemic index; USDA, United States Department of Agriculture; CHO, carbohydrate.

References

1. Ahern JA, Gatcomb PM, Held NA, Petit WA, Tamborlane WV: Exaggerated hyperglycemia after a pizza meal in well-controlled diabetes. *Diabetes Care* 16: 578–80, 1993
2. United States Department of Agriculture: *Nutrient Database for Standard Reference, Full Version, Release 9.* (NTIS Order No. PB90–502527) NTIS Federal Computer Products Center, Springfield, VA
3. Wolever TMS: *The Glycemic Index: Aspects of Some Vitamins, Minerals and Enzymes in Health and Disease. World Rev Nutr Diet*, Bourne GH, Basel, Switzerland, Karger, Ed. 62:120–85, 1990
4. Ha M-A, Mann JI, Melton LD, Lewis-Barned NJ: Relationship between the glycaemic index and sugar content of fruits. *Diab Nutr Metab* 5:199–203, 1992
5. Wolever TMS, Vuksan V, Katzman-Relle L, Jenkins AL, Josse RG, Wong GS, Jenkins DJA: Glycaemic index of fruits and fruit products in patients with diabetes. *Int J Food Sci Nutr.* 43:205–12, 1993

Response To Wolever

We would like to thank Dr. Wolever for useful and insightful comments. He concludes that pizza has a higher GI, which results in higher blood glucose levels. However, we are reluctant to attribute the greater, late postprandial rise in plasma glucose, following the pizza meal compared with the control meal, solely to a higher GI for pizza. In most studies, the GI of a food is evaluated by the postprandial rise in plasma glucose within 2–3 h after ingestion of the food. In our study (1), blood glucose levels were similar for 3 h after both meals. It was only after 5 and 8 h that glucose levels were significantly higher after the pizza meal.

We appreciate Dr. Wolever's interest and expertise in this field and again thank him for his comments.

JoAnn Ahern, RN, MSN, CDE
Nancy Held, MS, RD, CDE
William Tamborlane, MD

From the Yale Program for the Management of Type I Diabetes, New Haven, Connecticut.

Address correspondence to JoAnn Ahern, MD, The Yale Program for the Management of Type I Diabetes, 20 York Street, Hunter 530, New Haven, CT, 06540.

GI, glycemic index.

References

1. Ahern JA, Gatcomb PM, Held NA, Petit WA, Tamborlane WV: Exaggerated hyperglycemia after a pizza meal in well-controlled diabetes. *Diabetes Care* 16: 578–80, 1993

Change of Lipoprotein(a) and Coagulative or Fibrinolytic Parameters in Diabetic Patients with Nephropathy

Lp(a) is a plasma lipoprotein of high atherogenicity that competes with plasminogen at the site of plasminogen receptors (1). We know diabetic patients show a hypercoagulable state, which might contribute to diabetic vascular complications. The role of Lp(a) in fibrinolysis in general and in diabetes in particular is a timely and important issue. In this study, we measured various lipoprotein and coagulative or fibrinolytic parameters in 3 groups of subjects: *1*) normal control subjects (n = 51), 2) NIDDM subjects without nephropathy (n = 39, no diabetic retinopathy and <50 mg/g · creatinine of urinary AEI in all subjects, and 3) NIDDM subjects with nephropathy (n = 29, diabetic retinopathy and >200 mg/g · creatinine of AEI in all subjects.

Creatinine was measured by Jaffe's rate assay. Urinary albumin was measured by means of latex turbidimetric immunoassay. TG and total cholesterol were measured by means of enzymatic determination. LDL cholesterol was measured by means of heparin/Ca precipitation method. ApoB100 and apoA-I were measured by a single radial immunodiffusion method. Lp(a) was measured by an ELISA method (Tint Elisa, Bio pool, Sweden). PT, APTT, and fibrinogen were measured by Baxter's kit. TAT and α2PIC were measured by enzyme immunoassay (for the former, Hoext Japan's kit, for the latter, Teijin's kit). D dimer was measured by an ELISA method (Dimertest EIA). The data were analyzed by a Student's t test.

BMI levels were not significantly different among the 3 groups. Fasting blood glucose and HbA_{1c} levels were not significantly different between the 2 diabetic groups. Levels of creatinine, TG, total cholesterol, LDL, apoB100, apoA-I, PT, APTT, and fibrinogen were not significantly different ($P > 0.05$) among the 3 groups; however, the diabetic subjects, in particular those with nephropathy, tended to have higher levels of TAT, α2PIC, and D-dimer as well as Lp(a). A significant positive correlation was detected between Lp(a) and α2PIC ($r = 0.4002$, $P < 0.05$) among the diabetic patients. α2PIC showed a significantly positive correlation with TAT ($r = 0.6188$, $P < 0.01$) in the diabetic patients, however, this significant correlation was not observed in the normal group. The observation was thought to

be consistent with the hypercoagulable and hyperfibrinolytic state of diabetes. Furthermore, the direct correlation between Lp(a) and α2PIC may reflect a physiologic interaction of the two parameters because Lp(a) competes with plasminogen, a precursor of plasmin enzyme that dissolves blood clots and α2PIC reflects the fibrinolytic enzyme system.

The fact that those diabetic patients with higher Lp(a) concentrations tended to have greater amounts of α2PIC may lend some support to the notion that α2PIC may compensate for the elevation of Lp(a), which induces thrombosis.

TAKASHI NAGAI, MD
TAKASHI TOMIZAWA, MD
MASATOMO MORI, MD

From the First Department of Internal Medicine, Gunma University School of Medicine, Gunma; Maebashi and the Department of Internal Medicine, Public Tomioka General Hospital, Gunma, Japan.

Address correspondence to Takashi Nagai, Department of Internal Medicine, Public Tomioka General Hospital, 2073–1 Tomioka, Tomioka, Gunma, 370–23, Japan.

Lp(a), lipoprotein(a); NIDDM, non-insulin-dependent diabetes mellitus; AEI, albumin excretion index; TG, triglyceride; LDL, low-density lipoprotein; ApoB100, apoprotein B100; apoA-I, apoprotein AI; PT, prothrombin time; APTT, active partial thromboplastin time; ELISA, enzyme-linked immunosorbent assay; TAT, thrombin-antithrombin III complex; $_a$2PIC, $_a$2 plasmin inhibitor-plasmin complex; BMI, body mass index.

Reference

1. McLean JW, Tomlinson JE, Kuang WJ, Eaton DL, Chen EY, Fless GM, Scanu AM, Lawn RM: cDNA sequence of human apolipoprotein(a) is homologous to plasminogen. *Nature (Lond)* 330:132–37, 1987

Insulin Administration via a Subcutaneous Catheter

Effects on absorption

This study evaluates whether a plastic subcutaneous catheter (Insuflon®, Pharma-Plast International A/S, Lynge, Denmark) can be recommended for insulin administration as an alternative to conventional insulin injections. We compared plasma free insulin profiles when insulin was injected either conventionally or via Insuflon®.

The study population was comprised of two series with 8 diabetic adolescent subjects in each series. All subjects were treated with highly purified biosynthetic human insulin. Short-acting insulin was given before meals and intermediate-acting insulin given once a day before supper. Series 1 subjects were examined while receiving conventional insulin injections and on day 1 of administration via the Insuflon® cannula, whereas series 2 subjects were examined on day 1 and day 5 of Insuflon® administration. The mean ± age in series 1 was 14.4 ± 2.2 yr, and the mean GHb was 10.9 ± 2.4% corresponding to a SD score of 5.5. The mean daily insulin dose was 0.84 ± 0.18 IU/kg. In series 2 the mean age was 13.4 ± 1.7 yr, and the mean GHb concentration was 11.7 ± 3.1%, i.e., a SD score of 6.6 and the mean daily insulin dose 0.89 ± 0.21 IU/kg.

The insulin was injected subcutaneously into the abdominal wall, the same area being used for both conventional and Insuflon® injections. The Insuflon® catheter was inserted in the evening and used for the first injection the following morning. The protocol was approved by the local ethical committee. Blood samples were collected before the insulin injections and at intervals of 30 min for 2 h after receiving short-acting insulin. After the intermediate-acting evening insulin, the blood samples were taken every 2 h during the night. Blood glucose concentrations were determined enzymatically and plasma concentrations of free insulin with a specific RIA (1). Antibody-bound insulin was precipitated immediately after collecting the blood samples (2). Two-way ANOVA for repeated measures was used to compare the 24-h plasma free insulin and blood glucose profiles.

The mean plasma insulin profiles, while receiving conventional injections and during day 1 of Insuflon® administration, are presented in Fig. 1*A*. No differences between the mean insulin concentrations were found at any time of the day. Also, no differences were observed between the two regimens in mean blood glucose levels (data not shown). The daily profiles of mean plasma insulin concentrations during

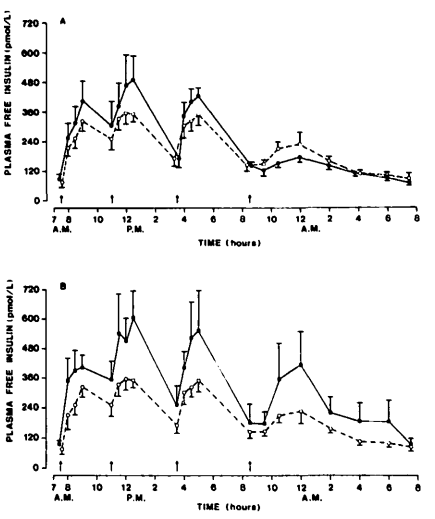

Figure 1—*Plasma free insulin concentrations over 24 h in 8 adolescent IDDM subjects receiving conventional insulin injections (●——●) and on day 1 receiving insulin via the Insuflon® catheter (○----○) (A) and in 8 other adolescent IDDM subjects on day 1 (●——●) and day 5 (■——■) of insulin administration via the Insuflon® catheter (B). The arrows mark the insulin injections. Data are means ± SE.*