action of rapid-acting insulin injected in the morning. The evening analysis before dinner reflects the action of intermediate-acting insulin injected in the morning. The bedtime analysis reflects the action of rapid-acting insulin injected in the evening. Morning analysis reflects the action of intermediate-acting insulin injected the previous day toward the end of the afternoon. Patients learn how to adjust their insulins every day, namely, according to retrospective glucose level measurements, and to use compensatory modifications with moderation not forgetting adjustments to physical activity (7). In my study, the mean frequency of monthly blood glucose monitoring is higher than that reported by Bougnères et al. in the conventional (65 vs. 52) and particularly in the intensive (94 vs. 59) therapy groups. I found a weak but significant inverse correlation between HbA_{1c} levels and frequency of HBGM. Moreover, I don't systematically reject urine analyses during the day as Bougnères does. The insulin dose alteration recommended by him is done only once a week according to algorithms based on a maximum of 15 blood glucose measurements each week (8). In the basal-bolus system, dose alteration of rapid-acting insulin may be guided not only by the preprandial blood glucose measurements, but also by postprandial blood glucose targets. That is the reason why it often is necessary to increase HBGM frequency if a young diabetic patient wants to benefit with greater freedom in respect to daily life and dietary habits.

Diet

The allocation of carbohydrates throughout the day is essential in the twice-daily injection regimen. The proportion of carbohydrates of the mid-morning snack must be more important than that of breakfast (9). Indeed, the peak activity of the so-called rapid-acting insulin occurs only 1.5–3.0 h after injection. If the carbohydrate content of breakfast is higher than that of the snack taken at ~ 1000, there is a risk of hyperglycemia after breakfast and of hypoglycemia at the end of the morning period. Unfortunately, this corresponds to Bougnères' recommendation of consuming 20% of the daily carbohydrate intake during breakfast and only 10% at 1000 (10).

In conclusion, the frequency of HBGM and of clinic attendance helps maintain better metabolic control, and the multiple insulin injection regimen per se doesn't necessarily improve HbA_{1c} levels. Successful glycemic control in young diabetic patients depends mainly of the quality of education and of follow-up by an experienced team in the out-patient clinic, but also by specialized nurses going to the children's homes and to their schools.

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Effect of Magnesium Treatment on Glycemic Control and Metabolic Parameters in NIDDM Patients

Magnesium deficiency, defined on the basis of intracellular or extracellular magnesium levels, has been reported to be common among patients with non-insulin-dependent diabetes mellitus (NIDDM) (1). It may contribute to insulin resistance in NIDDM (2) and has been suggested to predispose patients to excess cardiovascular morbidity (1). Treatment with magnesium has been shown to be effective in diabetic patients with acute complications, such as focal

seizures (3) and ketoacidosis (4). The effect of routine supplementation in the clinical settings, however, has not been properly evaluated. The aim of our double-blind study, therefore, was to examine the effect of magnesium supplementation in NIDDM on glycemic control as assessed by fasting glucose levels and HbA_{1c}, lipid profile, renal function, blood pressure, and muscle strength.

Fifty-six patients with NIDDM who were 64 ± 8 years of age and had the disease for at least 1 year participated after giving informed consent. One patient dropped out from each group because of intercurrent illness. Eleven patients received diet alone, 19 oral hypoglycemic agents, and 24 insulin (in which the diagnosis was confirmed by a stimulated C-peptide level >0.7 nM). After a pre-study period of 2 weeks in which all patients received placebo tablets, the patients were randomly assigned to receive either 15 mmol daily of magnesium-lactate-citrate tablets (n = 25) or matching placebo (n = 29) in a double-blind fashion for 4 months. The two groups (magnesium vs. placebo group) were comparable at baseline with regard to age, sex, duration of diabetes (9.8 ± 8.6 vs. 10.1 ± 9.7 years) and body mass index (25.4 ± 3.7 vs. 25.3 ± 4.1 kg/m^2). The following measurements were done before the pre-drug period, before randomization, and at the end of the study: fasting venous blood samples (glucose, HbA_{1c}, Mg, Na, K, Ca, P, creatinine, cholesterol, triglycerides), blood pressure, maximal handgrip strength, and microalbuminuria (a 12-h urine was collected during the night). Magnesium was measured by atomic absorption spectrophotometry, HbA_{1c} by chromatography (Bio-Rad method, Richmond, CA), and maximal handgrip strength was measured in the sitting position with a strain-gauge dynamometer (Martin).

The results are expressed as means ± SD. Student's t test was used to compare mean values in the two groups, and paired Student's t test was used to analyze within-group changes. A significance level of 5% was used.

Glycemic control values, as assessed by fasting glucose levels and HbA_{1c}, were similar at baseline and did not change significantly during treatment. The following values were obtained at baseline and at the end of study, respectively: glucose was 8.8 ± 2.3 and 9.6 ± 3.2 mM during magnesium and 8.5 ± 2.7 and 8.9 ± 3.0 mM during placebo; HbA_{1c} was 7.3 ± 1.5 and 7.8 ± 1.5% during magnesium and 7.4 ± 1.6 and 7.4 ± 1.5% during placebo. Serum electrolytes (Na, K, Ca, P, and Mg), lipid profile (cholesterol and triglycerides), renal function (creatinine, albuminuria), blood pressure, and maximal handgrip muscle strength were also similar at baseline and did not change significantly in either group during 4 months of treatment.

A lack of effect from magnesium could not be attributed to interference with weight, physical activity, or drug treatment, because these variables did not change. We do not know whether the subjects studied actually were in magnesium deficit, because determination of intracellular magnesium was not available. Serum magnesium for the whole group was within the normal range, and no difference in metabolic responses was observed between patients with serum magnesium < or >0.80 mM. However, this does not exclude a possible magnesium deficit, because serum magnesium may be an unreliable guide to tissue magnesium content.

Administration of a magnesium-potassium–containing salt to elderly hospitalized patients has been shown to improve glucose tolerance (5), and magnesium supplementation may reduce the requirement of insulin in IDDM (but, like our present study, HbA_{1c} and fasting glucose levels remained unchanged) (6). Therefore, we cannot exclude a possible effect of magnesium on insulin levels or resistance. A clinically important effect on glucose homeostasis may be excluded. However, the main disadvantage of these studies was an open and uncontrolled design. Thus, this placebo-controlled study contradicts earlier suggestions that routine supplementation of magnesium is beneficial for NIDDM. A placebo-controlled study should be conducted to evaluate the effect of magnesium supplementation to selected patients with proven tissue deficit of magnesium.

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