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Lack of relation between glycosylated haemoglobin concentrations and number of daily insulin injections: cross sectional study in care of ambulatory diabetes

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Abstract

Diabetic treatment aims at achieving a normal blood glucose concentration as reflected by the glycosylated haemoglobin concentration. Intensive treatment by insulin pump or multiple insulin injections is thought to achieve this. In an unselected group of outpatient diabetics metabolic control was the same after one, two, three, or more injections, which suggests that the mode of treatment was optimal for each group.

Introduction

Evidence of a relation between the degree of glycaemic control and development of late complications in diabetes is increasing. Thus the aim of diabetic treatment is to achieve as normal blood glucose concentrations, reflected by glycosylated haemoglobin concentrations, as possible. Recent studies have shown that intensive treatment, by either insulin pump^{1,2} or multiple insulin injections,³ can achieve this goal. This study aimed at determining any relation between the degree of metabolic control and the number of insulin injections given a day in an unselected group of outpatient diabetics.

Patients, methods, and results

The study included 289 consecutive diabetics treated with insulin who were attending an outpatient clinic. The glycosylated haemoglobin concentration was determined by ion exchange chromatography with microcolumns (BIO-RAD).

The patients were divided into groups according to the number of insulin injections given a day: group A received one injection early in the morning; group B two a day, in the morning and at 4-5 pm; group C two a day, in the morning and at 9-10 pm; and group D three or more a day.

The table shows no difference in glycosylated haemoglobin concentrations between the four groups regardless of the number of insulin injections given a day. No correlation existed between glycosylated haemoglobin concentration and age, age at onset, duration of diabetes, amount of insulin given a day (IU/kg), or body mass index in any of the groups (data not shown). To ensure that the results were not influenced by the type of diabetes, the patients were also divided into groups according to age at onset of diabetes. Patients aged under 30 at onset were considered to have type I diabetes and those over 30 type II diabetes. The table shows no differences between the groups in either type I or type II diabetics. Furthermore, within each group the age at onset did not significantly influence the degree of metabolic control when expressed as glycosylated haemoglobin concentration.

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Mean (SEM) percentages of glycosylated haemoglobin concentrations in four groups of diabetics

Groups	All patients	Patients aged under 30 at onset	Patients aged over 30 at onset
A	7.8 (0.2) (n=67)	8.1 (0.3) (n=28)	7.6 (0.2) (n=39)
B	8.3 (0.1) (n=133)	8.3 (0.1) (n=88)	8.1 (0.2) (n=45)
C	8.3 (0.2) (n=36)	8.2 (0.3) (n=28)	8.5 (0.3) (n=8)
D	8.2 (0.2) (n=53)	8.3 (0.2) (n=43)	7.5 (0.5) (n=10)

Student's *t* test.

Discussion

Recently several studies have shown that intensified insulin treatment, by either multiple insulin injections³ or subcutaneous insulin infusion systems,^{1,2} gives normal or near normal glycosylated haemoglobin concentrations in selected groups of patients. In most studies, however, intensive engagement of the physicians might be as important a factor as the mode of treatment. Thus in everyday practice the question remains of whether metabolic control of diabetes improves with the number of insulin injections given a day in an unselected group of outpatient diabetics.

In this study, regardless of whether the patients received one, two, three, or more injections a day, the degree of metabolic control was the same. In our opinion this reflects the fact that the mode of treatment was optimal for each group. The study does not tell whether further improvement might have been achieved if patients given one or two injections a day had been given more intensive treatment. On the other hand, as the glycosylated haemoglobin concentration was the same in all four groups the number of insulin injections per se does not seem to be the most important factor to improve metabolic control. Other factors, such as intensive attention by the health care team and the patients' self control of blood glucose concentrations, might be just as important.^{4,5} The conflicting results between this and other studies showing improved metabolic control with multiple insulin injections may show this.

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