Original Article

LONG TERM STATUS OF PANCREATIC BETA CELL FUNCTION IN PATIENTS WITH NON-INSULIN DEPENDENT DIABETES OF THE YOUNG (NIDDY)

Snehalatha C, Ramachandran A, Mohan V, Rema, Mohan & Viswanathan M*

Abstract

Long-term status of the pancreatic beta cell function was assessed in 16 patients with non-insulin dependent diabetes of the young (NIDDY), by estimating the fasting and post-prandial serum C-peptide responses. The mean age at diagnosis was 16 ± 1.7 years and the mean duration of diabetes was 11.7 ± 4.8 years in these patients. A matched group of 16 classical non-insulin dependent diabetic patients were also studied. The mean values for the fasting and post-prandial C-peptide responses in NIDDY were 0.25 ± 0.2 and 1.0 ± 0.5 <SD) p mol/ml and the corresponding values in the NIDDM were 0.31 ± 0.21 and 0.94 ± 0.43 p mol/ml. Thus it was seen that the long-term beta cell function was similar in the NIDDY and NIDDM patients, despite the younger age at onset of diabetes in the former. The occurrence of secondary failure to oral hypoglycaemic agents was also similar in both groups.

The results, thus, show that the beta cell function is preserved well over a long period of time in NIDDY patients. The younger age at onset of the disease does not predispose to lower C-peptide response and faster deterioration of the beta cell function.

Key words : Non-insulin dependent diabetes of the young, Beta cell function, C-peptide, Secondary failure to oral drugs, Long-term diabetes.

There is high prevalence of non-insulin dependent diabetes of the young (NIDDY) in south India (1,2). Among the diabetic patients with age at onset below 30 years, 58% belong to this category (2). Most studies on beta cell function in young diabetics have dealt with insulin dependent diabetes (3,4). The few studies in non-insulin dependent patients have reported controversial findings (5,6). Cignarelli et al (5) noted that the long-term beta cell status is higher in patients with older age at onset whereas Group et al (6) noted no influence of age, age at onset or duration on the beta cell function in NIDDM patients. If the pancreatic beta cell function deteriorates faster in the younger patients with duration of diabetes (3-5), the number with secondary failure to oral hypoglycaemic agents (OHA) would be large. In order to test this possibility, an analysis of beta cell function was made in NIDDY patients with 5 or more years of duration of diabetes and the data was compared with a matched group of classical non-insulin dependent diabetic patients (NIDDM).

Patients and Methods

Sixteen NIDDY patients with age at onset of the disease below <; 20 years and duration of diabetes ranging from 6 to 20 years were studied. All of them were on high carbohy-

* M.Sc , D.Sc., Deputy Director, Diabetes Research Centre, 5, Main Road, Royapuram, Madras - 600 013.

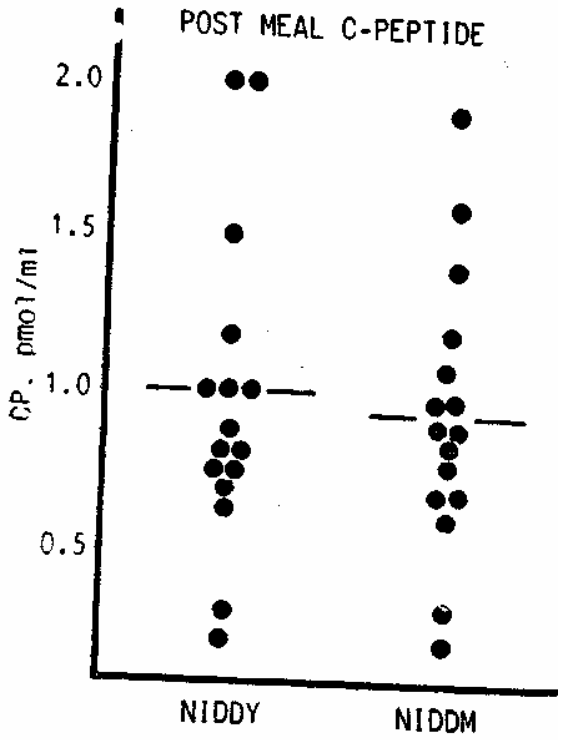

Figure showing the distribution of post-prandial C-peptide values in the NIDDY and NIDDM patients.

drate high fibre diet (7) and glibenclamide for a period of 5 or more years. There were 9 non-obese and 7 obese patients (BMI > 25 kg/m^2 for women and > 27 for men) and the male : female ratio was 6:10- A group of 16 classical NIDDM patients, diagnosed according to the WHO criteria (8), were also studied.

Fasting and post-prandial (90') blood samples were collected for the estimations of plasma glucose (glucose oxidase, PAP method, Boehringer Mannheim, W. Germany) and C-peptide Plasma samples for C-peptide were separated, stored at —20°C and assayed using Heding's method (9). The reagent kit with antiserum Ml230, from NOVO Research Institute, Denmark, was used. Samples from insulin treated patients were extracted with polyethyleneglycol prior to the assay (10).

Results

The clinical details of the study subjects are shown in Table I.

Table 1

Clinical Details of the Study Subjects

Group	M:F	BMI (kg/m*)	Mean age at diagnosis (years)	Mean duration (years)
NIDDY	6:10	26±2.2	16±1.7	11.7±4.8
(n=-16)			(15-20)	(6-20)
NIDDM	6:10	26.4 ±2.5	35 ±10	12.1 ±5.2
(n=16)			(32-51)	(6-21)

Figures in brackets show the range. Values are mean±SD.

Table 2

Plasma Glucose and C-peptide Responses in the Study Groups

Group	PLASMA GLUCOSE (mg/dl)		C-PEPTIDE (p mol/ml)	
	Fasting	Post-prandial	Fasting	Post-prandial
MIDDY (n=16)	150±51	198±40	0.25±0.2	1.0±0.5
NIDDM '(n=16)	143±21	212±54	0.31 ±0.21	0.94 ±0.43

Values are mean ± SD

The two groups of patients were well matched for sex, BMI and duration of diabetes. They were also matched for the degree of hyperglycaemia as shown in Table II.

Fasting and post-prandial C-peptide values in NIDDY and NIDDM patients were similar. Two patients in each group had low beta cell response defined by a post-prandial C-peptide value of < 0.6 p mol/ml. Figure 1 shows the scatter of the post-prandial C-peptide value in the two groups studied. The distribution of C-peptide values was similar in both groups. Secondary failure to OHA was observed after 7 or more years in 3 NIDDY and 2 NIDDM patients. Among them, 2 NIDDY patients and both the NIDDM patients had low C-peptide responses.

Discussion

The results of the study indicate that the beta cell function, assessed by the C-peptide response, is well preserved in most of the NIDDY patients, even after long duration of diabetes. The values are similar to those seen in classical NIDDM patients, thereby showing that the lower age at onset does not adversely affect the beta cell function in NIDDY patients. The C-peptide values are similar in both forms of non-insulin dependent diabetes. These results dispute the earlier view that lower age at onset results in lower beta cell response and its faster deterioration (5). The results are in agreement with that of Groop et al (6) who showed that the residual beta cell function in NIDDM is independent of age, age at onset and duration. The rate of occurrence of secondary failure to OHA in NIDDY also appears to be similar to that in classical NIDDM.

The results thus show that the beta cell function is well preserved in NIDDY over a long period and the younger age at onset does not predispose to faster deterioration of beta cell function.

Acknowledgements

We thank NOVO Industri, Denmark, for the C-peptide Kits. The study was partly supported by the Welcome Trust.

References

1. Mohan V, Ramachandran A, Snehalatha C, Mohan R, Viswanathan M. High prevalence of maturity onset diabetes of the young in south India. Diabetes Care 1985; 8 : 371-374.

2. Ramachandran A, Mohan V, Snehalatha C, et al. Clinical features of diabetes in the young as seen at a diabetes centre in south India. Diab Res Clin Pract 1988; 4: 117-125.

3. Ludvigsson J, Heding LG. C-peptide in children with juvenile diabetes: a preliminary report. Diabetologia 1976; 12 : 627-630.

4. Madsbad S. Factors of importance for residual beta cell function in Type 1 diabetes mellitus. Acta Med Scand 1983; 671 (Suppl.) 61-67.

5. Cignarelli M, Cospite MR, Stefanelli G, Guastamacchia E, Nardelli S, Giorgino R. Duration of residual beta cell function in maturity onset diabetes. Acta Diabetol Lat 1984; 21 : 161-166.

6. Groop L, Tolppanen EM. Factors influencing beta cell function and insulin sensitivity in patients with Type 2 (non-insulin dependent) diabetes. Acta Endocrinologica 1984; 106 : 505-510.

7. Viswanathan M, Mohan V, Ramachandran A, Snehalatha C, Anderson JW. Long-term experience with high carbohydrate high fibre diet in Indian diabetic patients. Diabetes 1984; 13 : 163-174.

8. WHO Expert Committee on Diabetes. Technical Report Series No. 646, Geneva, 1980.

9. Heding LG. Radioimmunological determination of human C-peptide in serum. Diabetologia 1975; 11 : 541-548.

10. Kuzuya H, Blix PM, Horwitz DL. Determination of free and total insulin and C-peptide in insulin treated diabetics. Diabetes 1977; 26 : 22-29.