Serum trypsin concentrations in diabetes mellitus

Abnormalities in exocrine pancreatic function occur in patients with diabetes mellitus and their prevalence is particularly high in insulin-dependent diabetics.[1] Measurement of serum trypsin is a relatively simple test of exocrine pancreatic function.[2] We therefore undertook a study of serum trypsin concentrations in diabetic patients.

Patients, methods, and results

Fifty patients (age range 14-65 years) with diabetes mellitus were studied; none of them had clinical evidence of chronic pancreatitis, chronic diarrhoea, or renal dysfunction. Duration of diabetes ranged from two weeks to 30 years. Patients were classified according to type of treatment: 25 were insulin-dependent diabetics; 15 were treated with sulphonylureas, including two newly discovered diabetics; in 10 patients, including one new patient, diabetes was stabilised with biguanides. Seventy-six healthy subjects and 20 hospitalised patients without pancreatitis, diabetes, or other gastrointestinal disease served as controls.

Serum trypsin concentration was measured by radioimmunoassay, by a double-antibody technique.[2] Highly purified trypsin was used for iodination and as an immunogen. Antibody was raised in rabbits. Iodination was carried out with chloramine. Within-assay variance was 7·5% at low concentrations and 2·7% at high concentrations. Repeat trypsin measurements in the same patients under similar conditions varied less than 20% at low trypsin concentrations. Blood samples were obtained at around 11 am, roughly two to three hours after breakfast and the injection of insulin or the intake of oral hypoglycaemic agents. Samples were allowed to clot, centrifuged, and the sera stored at −20°C until assay.

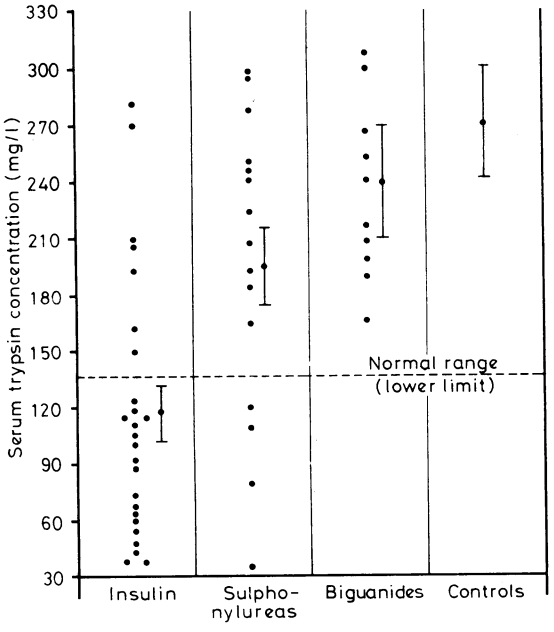
Eighteen out of 25 insulin-dependent diabetics had subnormal trypsin concentrations. The mean serum trypsin concentration in the insulin-dependent patients was subnormal and was also significantly lower ($P < 0.005$) than that in patients treated with sulphonylureas (figure). Four out of 15 patients treated with sulphonylureas also had subnormal trypsin concentrations; the mean for this group was in the low-normal range. Serum trypsin concentration in the group treated with biguanides was similar to that in the normal subjects, and was significantly greater than that in patients who received sulphonylureas ($P < 0.05$).

Comment

We found that serum trypsin concentrations were lowest and subnormal concentrations were more prevalent in insulin-dependent diabetics; trypsin concentrations were intermediate in patients treated with sulphonylureas; and no different from the controls in those treated with biguanides. This suggests that the degree of exocrine pancreatic deficit in diabetes parallels the endocrine beta-cell deficit. On the basis of the Lundh test a similar high prevalence of exocrine pancreatic abnormality was observed in insulin-dependent diabetics.[1] The magnitude of this abnormality is inversely related to beta-cell reserve as reflected in C-peptide concentrations.[3] Our observations extend this phenomenon to non-insulin-dependent diabetics.

None of our patients had diarrhoea or clinical malabsorption, despite having serum trypsin concentrations lower than those found in some patients with chronic pancreatitis with malabsorption. Since steatorrhoea is responsible for the diarrhoea in patients with malabsorption, it would be interesting to investigate whether pancreatic lipase secretion alters in parallel with that of trypsin. Equally perplexing is the possible mechanism underlying subnormal exocrine function in diabetes in view of the paucity of histological changes in the exocrine pancreas of diabetes. Nevertheless, some necropsy data suggest that the pancreas in insulin-dependent diabetics is smaller than in normal subjects,[4] and that the pancreas may be heavily infiltrated with fat[5] or with fibrous tissue.[4]

We conclude that serum trypsin concentration seems to be an easily measurable marker of exocrine pancreatic function in diabetes; exocrine pancreatic function as shown by serum trypsin measurements seems to parallel pancreatic beta-cell activity; and exocrine pancreatic dysfunction in diabetes may be related to pancreatic size and may be an integral component of the pathogenesis of type I diabetes mellitus.



Serum trypsin concentrations in patients with diabetes mellitus (classified according to mode of treatment) and in 96 controls.

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[2] Elias, E, Redshaw, M, and Wood, T, *Lancet*, 1977, **2**, 66.
[3] Frier, B M, *et al*, *Diabetologia*, 1978, **14**, 301.
[4] Doniach, I, and Morgan, A G, *Clinical Endocrinology*, 1973, **2**, 233.
[5] Herxheimer, G, *et al*, *Verhandlungen der Deutschen Gesellschaft für Verdauungs- und Stoffwechselkrankheiten*, 1932, **11**, 112.

(*Accepted 20 September 1978*)

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Tinel's sign and the carpal tunnel syndrome

Jules Tinel[1 2] described that tapping the proximal stump of an injured nerve may produce a tingling sensation (*fourmillement*) in its cutaneous distribution. He concluded that this indicated axonal regeneration. The value of Tinel's sign in assessing nerve injuries has been much debated.[3] He did not mention using his sign in relation to entrapment neuropathies. Nevertheless, many standard textbooks state that it is of value in diagnosing the carpal tunnel syndrome (CTS). Since this was contrary to our impression we carried out the following investigation.

Patients, methods, and results

Fifty-one hands affected by CTS which was not secondary to trauma or any localised or generalised disease were compared with normal hands of a group matched for age and sex. Many of the control hands were the asymptomatic contralateral hands of patients with CTS. Persons with diabetes mellitus or peripheral neuropathy were excluded. Sensory recordings were made with either needle or surface electrodes after stimulating the index finger with ring electrodes. Abnormal or doubtful potentials were measured by averaging 16 to 32 responses. Motor latencies were measured by standard techniques. The tests were made in a room with a controlled temperature of 20-22° C. The diagnostic criteria for CTS were the presence of three or more of the following: (1) sensory signs in the distribution of the median nerve in the hand; (2) thenar wasting or weakness; (3) a median nerve motor latency after stimulation at the wrist greater than 4·5 ms; (4) a latency of greater than 2·7 ms to the onset of the median sensory action potential, with the distance between the stimulating and recording electrodes corrected to 10 cm; (5) a median nerve sensory action potential at the wrist of less than 8·6 μV.

Patients and controls also had to have an ipsilateral ulnar sensory action