HIGH PREVALENCE OF STEATORRHEA IN DIABETIC PATIENTS WITH LOW FECAL ELASTASE 1 CONCENTRATIONS

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Background:

In the past there have been reports on pathological changes in pancreas morphology and exocrine pancreatic secretion in patients with diabetes mellitus. Morphologic changes included ERCP findings, CT-findings and histology [1-4]. Using direct function tests reduced exocrine pancreatic secretion has been observed in up to 77% of diabetic patients [5-8]. More recently, the measurement of fecal elastase 1 concentrations (FEC) has been used as a screening test for exocrine function finding highly pathological results (< 100 µg/g) in 26-30% of type 1 and 12-17% of type 2 diabetes mellitus [9-11]. However, the clinical importance of this finding remained unclear. In the present study we investigated the fecal fat excretion in diabetic patients with low fecal elastase 1 concentrations.

Patients and Methods:

Patients with type 1 or type 2 diabetes mellitus were screened for low fecal elastase 1 concentrations in a multicenter setting. Measurements were performed by ELISA (Schebo Biotech, Giessen, Germany) in the laboratory of Prof. Klör, Giessen, Germany. Patients were included to further studies if fecal elastase 1 concentrations were below 100 µg/g. Patients with history of gastrointestinal cancer, gastrointestinal surgery, alcohol abuse or inflammatory diseases were excluded. The patients were on a fat-standardized nutrition for 4 days. The dietary intake was recorded. Complete stool collection was performed the last 72 hrs. Fat excretion was determined according to van de Kamer in the laboratory of Prof. Lankisch, Lüneburg, Germany. The coefficient of fat absorption (CFA) was calculated (CFA = (fat intake-fat excretion/fat intake)). Clinical findings were recorded using a standard case record form. Only patients with complete data sets were further evaluated.

Results:

101 patients (50,7 years (25-74); 28 female, 73 male; 30 type 1, 71 type 2 diabetes, mean diabetes duration 10,1 years (SD 8,32)) were evaluated. Patient´s characteristics and clinical data are shown in tables 1 and 2. The mean fat intake was 118,87 g (SD 26,8), the mean stool weight was 185,7 g (SD 100,1); the mean fat excretion was 9,19 g (SD 5,39) (see figure 1 and table 3). Only 41 patients had normal fat excretion below 7g/d. 12 patients had fecal fat excretion > 15 g/d (see figure 2). The mean CFA was reduced to 91,79% (SD 5,22). Fat excretion depending on CFA is shown in figure 3. The fat excretion did not correlate with diabetes type, duration or clinical findings.

Table 1: Patient´s characteristics (28 fem, 73 m; 30 Type1 and 71 Type 2 Diabete mellitus)

	Mean	SD*	Minimum	Maximum
Age (Years)	50,77	9,26	25	74
BMI** KG/m²	28,86	3,6	20,9	36,86
FEC*** µg/g	56,03	27,06	5	100
Diabetes-duration (Years)	10,1	8,32	0	39

*SD = Standard Deviation; **BMI = Body Mass Index;
**FEC = Fecal Elastase 1 Concentration

Table 2: Clinical Findings in Patients with Diabetes mellitus and fecal Elastase 1 concentrations < 100 µg

	1	2	3	4
Stool frequency/day	76,9 %	20,2 %	1,9 %	1,0 %
Stool consistence*	64,4 %	8,7 %	26,9 %	
Abdominal pain**	87,5 %	10,6 %	1,9 %	
Bloating***	42,3 %	39,4 %	16,4 %	1,9 %

*1 = formed/normal; 2 = hard; 3 = watery **1 = no; 2 = mild; 3 = moderate
***1 = no; 2 = mild; 3 = moderate; 4 = severe

Table 3: Fat digestion in patients with Diabetes mellitus and fecal Elastase 1 concentrations < 100 µg/g

	Mean	SD*	Minimum	Maximum
CFA (%)**	91,79	5,22	76	98,6
Fat intake (g/day)	118,87	26,8	49,6	224,1
Fat excration (g/day)	9,19	5,39	1,4	31,3
Stool weight (g/day)	185,7	100,1	47,6	669,2

*SD = Standard Deviation ** CFA = Coefficient of Fat Absorption

Figure 1: Fat excretion in patients with Type 1 and Type 2 Diabetes mellitus and fecal Elastase 1 concentrations < 100 µg/g

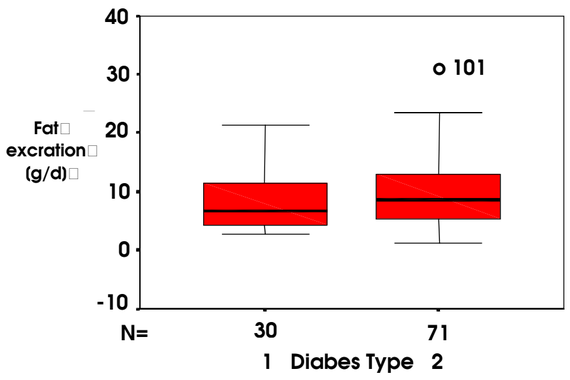


Figure 2: Frequency of normal and pathological fat excretion in 101 patients with Diabetes mellitus and fecal Elastase 1 concentrations < 100 µg/g

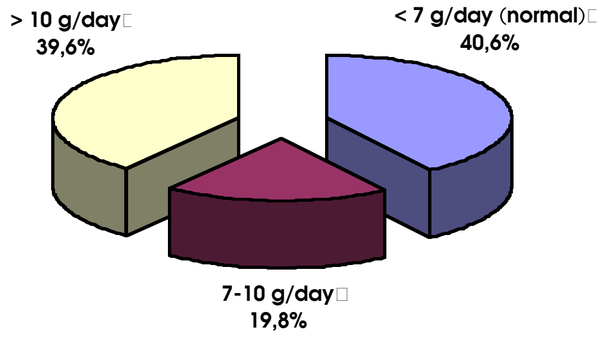
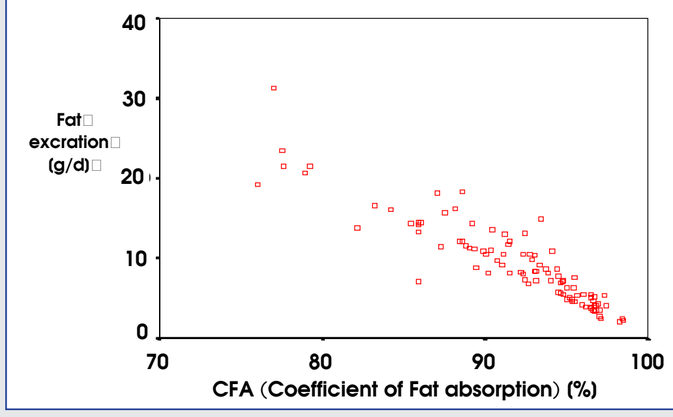


Figure 3: Fat excration and Coefficient of fat absorption in patients with Diabetes mellitus and fecal Elastase 1 concentrations < 100 µg/g



Conclusion:

We could show that a reduction of fecal elastase 1 concentrations <100 µg/g indicates significant steatorrhea in a high percentage of diabetic patients. Since fecal elastase 1 concentrations < 100 µg/g have been frequently observed in type 1 and type 2 diabetic patients, this is an important clinical finding with impact on therapy and pathophysiological concepts. Fat maldigestion might influence glucose metabolism [12-14]. Furthermore qualitative malnutrition could be of relevance in osteoporosis [15,16]. The frequent coincidence of exocrine and endocrine disease could be explained if diabetes secondary to chronic pancreatitis was more frequent than believed so far [5]. Another explanation might by a pathophysiological process affecting the whole gland e.g. an autoimmune process [17-19].

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