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Medium term carbohydrate metabolism in subjects with sickle cell anaemia

Short communication

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The syndrome of sickle cell anaemia (SCA) is characterized by a proneness to multiple organ infarctions following blockade of capillaries by sickled erythrocytes. No organ appears to be exempt from these infarctions in subjects with SCA (Edington and Gilles, 1976). It is conceivable, therefore, that infarctions of the endocrine pancreas might occur resulting in carbohydrate intolerance.

Few studies concerning carbohydrate tolerance in SCA have been reported (Addae and Odonkor, 1984). In this study we have examined the status of carbohydrate metabolism in the medium term in SCA, using a methodology that requires only a single blood collection, i.e. determination of glycosylated haemoglobin (GHb) levels (Goldstein et al., 1982).

Subjects, Materials and Methods

Thirty-two subjects with proven sickle-cell anaemia (29 subjects with HbSS, 3 with HbSC) and 20 normal subjects (haemoglobin electrophoresis pattern AA) were studied. The characteristics of the study subjects are summarized in Table 1. None of the subjects had a personal or family history of diabetes mellitus.

Venous blood was obtained from each subject once either in the fasting state or at least 2 h post-prandially. Blood sugar levels were determined by the method of Asatoor and King (1954) and GHb or haemoglobin A₁C (Hb A₁C) was quantified by the thiobarbituric acid colorimetric method as described by Gabbay et al. (1979). GHb values are expressed as A₄₄₃ per 10 mg haemoglobin of the haemolysate (A₄₄₃/10 mg Hb).

Results are given as mean \pm standard deviation. The statistical significance of differences between mean values was determined by Student's 't' test and $p \leq 0.05$ taken as the level of significance of alpha.

Results and Discussion

The subjects with SCA and the controls were similar in age and sex distribution. However, the control subjects were significantly heavier ($p < 0.01$) (Table 1). The mean casual blood sugar level of the subjects with SCA was insignificantly lower than the one from the control subjects. The mean level of GHb in subjects with SCA is lower than that of the controls (Table 2). This difference is, however, not statistically significant ($p > 0.05$). Determination of glycosylated haemoglobin (GHb) levels is an efficient, convenient and cost-effective means of assessing the time averaged blood glucose level in the preceding couple of weeks (Goldstein et al., 1982).

The finding in this study is that the medium term averaged blood glucose level (as represented by the GHb level) of subjects with sickle cell anaemia (SCA) is not significantly different from that of normal subjects. This might suggest that the endocrine pancreas is exempted from the common

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Table 1. Characteristics of study subjects

Subjects (N)	M:F	Age (yr.)	Weight (kg)	Spot blood glucose (mg/100 ml)
Control subjects (20)	12:8	23 (4.1)	60.5 (6.5)	62.2 (7.5)
Subjects with SCA (35)	20:15	20.5 (3.5)	47.3 (6.2)	55.4 (6.8)

Values stated as mean (one SD)

Table 2. Levels of glycosylated haemoglobin in study subjects

Subjects (N)	Mean GHb $A_{443}/10 \text{ mg Hb}$	Range
Normal subjects (20)	0.171 (0.017)	0.148–0.201
Subjects with SCA (35)	0.164 (0.019)	0.136–0.190

vaso-occlusive infarction of SCA. This finding, however, needs confirmation although it is in agreement with two other reports on oral glucose tolerance test in sicklers (Addae and Odonkor, 1984; Okafor and Osamo, 1981). Both reports observed a flat glucose curve in these patients and attributed their finding to a possible intestinal malabsorption consequent upon vaso-occlusive infarction of the intestinal villi. However, no workers have reported villous infarction in sicklers and flat glucose curves are common in normal subjects (Tullock and Patel, 1969; Sisk et al., 1970).

More detailed studies of the exocrine and endocrine pancreas as well as related target endocrine organs are needed before any definitive conclusions about carbohydrate metabolism and pancreatic beta cell function in particular can be made in the subject with SCA. However, evidence from this study and others does not suggest that carbohydrate intolerance is a problem in sicklers. The rarity of diabetes mellitus in sicklers might further support this contention.

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