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Glycosylated Haemoglobin in Renal Failure

Dear Sir,

De Boer et al. [1] reported that levels of glycosylated haemoglobin [HbA_1] were elevated in patients with renal failure. On the other hand, Dandona et al. [2] reported that HbA_1 levels were decreased in patients with renal failure because of the shortened life-span of erythrocytes. In a recent publication in Diabetologia, Graf et al. [3] performed glucose tolerance tests in order to investigate the relationship between glucose tolerance and HbA_1 in renal failure. They found an elevation of HbA_1 levels which did not correlate with the degree of impaired glucose tolerance.

We have also investigated whether or not the elevation of HbA_1 values in patients with renal failure was related to impaired glucose tolerance using high-performance liquid chromatography, the microcolumn method, and the thiobarbituric acid colorimetric test [4] for the measurement of HbA_1. The high-performance liquid chromatographic quantification of components of the HbA_1 fraction showed that, in diabetic patients, the increase of HbA_{1c} was mainly due to an increase in the HbA_{1c} fraction (Table 1). In contrast, patients with renal failure showed increases not only in HbA_1, but also in the HbA_{1a+b} fractions. Thus, the fractional pattern of HbA_1 in patients with renal failure was similar to that seen in normal subjects rather than in diabetic patients. In another study, we have estimated HbA_1 levels in diabetic patients, in patients with renal failure and in normal subjects using the colorimetric method in which compounds generated from glycosylated haemoglobin on heating under acidic conditions were determined colorimetrically with thiobarbituric acid. These results were compared with data obtained by the microcolumn technique (Fig. 1).

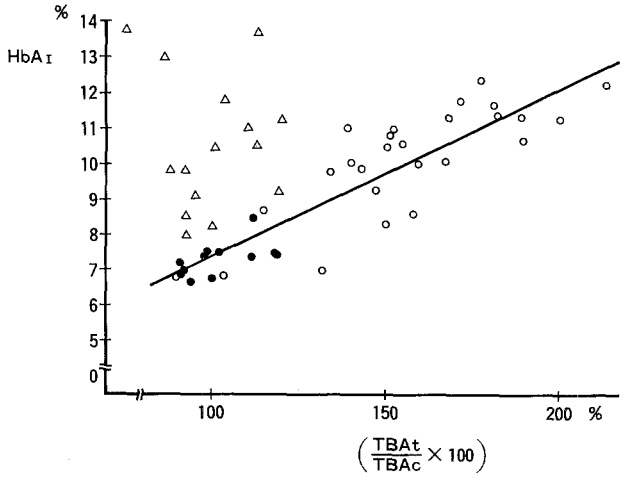

Fig. 1. Correlation between HbA_1 values measured by the microcolumn method and those measured by the thiobarbituric acid method. ○: diabetic patients; ●: normal subjects ($Y = 0.049X + 2.49$; $n = 38$, $r = 0.89$). △: uraemic patients not on haemodialysis ($Y = -0.096X + 11.53$; $n = 15$, $r = 0.07$). TBAt and TBAc represent the thiobarbituric acid colorimetric values for test and control samples, respectively

Table 1. HbA_1 components in normal subjects and in diabetic and uraemic patients

	Haemoglobin A_1			
	a + b	c	a+b+c	a+b/a+b+c
Normal subjects (n = 12)	2.6±0.1	4.6±0.2	7.2±0.2	36.1±1.0
Diabetics (n = 21)	3.6±0.2[a]	9.4±0.8[a]	12.9+1.0[a]	28.2±0.9[a]
Uraemic patients (n = 16)	3.5±0.1[a]	5.9±0.2[b]	9.4±0.3[a]	37.2±0.9

The results represent the mean ± SEM
There is a significant difference between normal subjects and patients with diabetes or uraemia ([a] $p < 0.001$; [b] $p < 0.005$)

In diabetic patients, there was a positive correlation between HbA_1 values obtained by the microcolumn method and those obtained by the thiobarbituric acid method. In patients with renal failure, however, no correlation was noted between the results obtained by the two methods. According to the thiobarbituric acid method, patients with renal failure showed HbA_1 levels similar to those observed in normal subjects.

These findings strongly suggest that HbA_1 in patients with renal failure might be the result of binding of something other than glucose to haemoglobin.

Yours sincerely,
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References

1. De Boer M-J, Miedema K, Casparie AF (1980) Glycosylated haemoglobin in renal failure. Diabetologia 18: 437–440
2. Dandona P, Freedman D, Moorhead JF (1979) Glycosylated haemoglobin in chronic renal failure. Br Med J I: 1183–1184
3. Graf H, Stummvoll HK, Schernthaner G, Müller MM (1980) Glycosycosylated haemoglobin in renal failure. Diabetologia 19: 555–556
4. Gabbay KH, Sosenko JM, Banuchi GA, Mininsohn MJ, Flükiger R (1979) Glycosylated hemoglobin: Increased glycosylation of hemoglobin A in diabetic patients. Diabetes 28: 337–340

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