Clinical Usefulness of Serum α_1 -Microglobulin as a Sensitive Indicator for Renal Insufficiency

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Sir,

Human α_1 -microglobulin (α_1 -m) is a low molecular weight glycoprotein of 33,000 daltons and consists of 20% carbohydrates and 167 amino acid residues [1,2]. Since the first report by Ekström et al. in 1975 [3], it has been demonstrated that serum and urinary α_1 -m is elevated in patients with renal failure, suggesting that the kidney is a site of catabolism [4]. We have established the assays for α_1 -m and demonstrated that it is not an acute-phase reactant and that it does not show diurnal changes in its level [5,6]. In the present study, serum α_1 -m levels were measured in 9 normal individuals and 60 patients with renal failure of various degrees by using single radial immunodiffusion [5] and were compared with those of serum creatinine (Cr) and β_2 -microglobulin (β_2 -m) which has been routinely used in tests of renal function. Endogenous creatinine clearance (24-hour Cr) was also determined. The serum level of α_1 -m was 18.9 ± 5.6 mg/l in normal

subjects, and that in patients was elevated gradually as renal function became more impaired, reaching 147.2 ± 38.9 mg/l (mean $\pm$ 1 SD) in 13 patients with chronic renal failure on hemodialysis. A good correlation was obtained between α_1 -m and β_2 -m ($r = 0.75$) (fig. 1) and Cr ($r = 0.70$), respectively. Since the α_1 -m value was inversely correlated with 24-hour Cr ($r = -0.68$), a rough indicator of glomerular filtration rate (GFR), the increase in α_1 -m seems to reflect the impaired GFR. It is noteworthy that with a mild degree of renal dysfunction, the increase in serum α_1 -m preceded that of Cr (data not shown) and β_2 -m, which actually remained within their normal ranges (fig. 1). The precise mechanism is unclear, though, because of its larger molecule or stronger negative charge, α_1 -m may be prevented from passing through the glomerular capillary wall, causing its elevation in the serum. The present results indicate that the determination of serum α_1 -m could be very simple and useful for a more sensitive screening test for the evaluation of renal function.

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α_1 -m levels, mg/l

Fig. 1. Comparative determination of serum α_1 -microglobulin and β_2 -microglobulin in patients with chronic renal failure. — = Normal

ranges.

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References

Ekström, B.; Berggard, I.: Human α_1 -microglobulin. *J. biol. Chem.* 252: 8048–8057 (1977).

Takagi, T.; Takagi, K.; Kawai, T.: Complete amino acid sequence of human α_1 -microglobulin. *Biochem. biophys. Res. Commun.* 98: 997–1001 (1981).

Ekström, B.; Peterson, P. A.; Berggard, I.: A urinary and plasma α_1 -glycoprotein of low molecular weight. *Biochem. biophys. Res. Commun.* 65: 1427–1433 (1975).

Takagi, K.; Kin, K.; Itoh, Y.; Enomoto, H.; Kawai, T.: Human α_1 -microglobulin levels in various body fluids. *J. clin. Path.* 33: 786–791 (1980).

Takagi, K.; Itoh, Y.; Enomoto, H.; Koyamaishi, Y.; Kawai, T.: A comparative study of serum α_1 -microglobulin and β_2 -micro-globulin in cancerous and other diseases. *Clinica chim. Acta* 108: 277–283 (1980).

Itoh, Y.: Diurnal change of α_1 -microglobulin in normal subjects. *Nephron* 29: 204 (1981).