Serum Levels of Beta-2-Microglobulin in Patients Undergoing Long-Term Hemodialysis

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Dear Sir,

A significant correlation between the duration of hemodialysis and the incidence of carpal tunnel syndrome [1] or destructive cystic lesions of bone with shoulder and joint pain [2, 3] has been previously reported. Recently, amyloid deposition has been found to be associated with or to directly cause these lesions in most cases. This amyloid protein has been identified to be homologous to β_2 -microglobulin [4].

These complications have been observed increasingly in patients undergoing long-term hemodialysis. Since proximal tubular cells are the major site of β_2 -microglobulin catabolism, this protein accumulates in the serum of patients with advanced renal insufficiency and those on hemodialysis. It has been demonstrated that there is little or no clearance of this protein by cellulose or polyacrylonitrile dialysis membranes [5]. Complications due to accumulation of this amyloid protein have not yet been reported with continuous ambulatory peritoneal dialysis. However, there has been found to be no difference in serum β_2 -microglobulin levels between patients on hemodialysis and patients on continuous ambulatory peritoneal dialysis [6], even though peritoneal dialysis is associated with a significant loss of protein including molecules larger than β_2 -microglobulin [7].

It has been postulated that the pathogenesis of this type of amyloidosis is related to persistently elevated β_2 -microglobulin concentration in tissues, serum, and other extracellular fluids. We studied serum β_2 -microglobulin levels in 81 hemodialysis patients (52 men, 23 women), their age ranged from 15 to 77 years. The average duration of dialysis was 87.4 ± 5.4 months. Using a Behring laser nephelometer mean serum β_2 -microglobulin concentrations were found to be 30.5 ± 1.3 mg/l. Similar to the report by Gejyo et al. [8], we noted a poor correlation between serum β_2 -microglobulin levels and the duration of hemodialysis even though our correlation coefficient was better (regression line $y = 0.078x + 25.24$; correlation coefficient $r = 0.31$). Thirteen out of these 81 patients had serum β_2 -microglobulin concentrations measured by the same method in 1977. The mean serum β_2 -microglobulin levels were significantly higher in 1986 than in 1977 (fig. 1). Serum β_2 -microglobulin levels in patients treated with cuprophran did not differ from

Duration of hemodialysis, months

Fig. 1. Relation between serum concentration of β_2 -microglobulin and duration of hemodialysis treatment in 13 patients from 1977 to 1986.

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those of patients partially treated with a polyacrylonitrile dialysis membrane.

The fact that there is poor correlation between the serum β_2 -microglobulin level and the duration of hemodialysis (with a large degree of value variation at the onset of treatment) demonstrates that the metabolism of this protein is modified in uremic patients by either defective production or by an extrarenal catabolic pathway or both. Therefore, serum β_2 -microglobulin levels should not be useful markers for hemodialysis-associated amyloidosis. Our results demonstrate, however, that serum β_2 -microglobulin levels increased in the 13 patients studied over a 9-year period. We believe, then, that these continuously increasing and prolonged elevations of serum β_2 -microglobulin may play an important pathogenic role in the origin of the carpal tunnel syndrome and cystic bone lesions in patients on chronic hemodialysis.

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