Erythrocyte Aggregation before and after Haemodialysis

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Dear Sir,

Haemostatic and haemorheological disturbances have been documented in chronic renal failure (CRF) [1], such as reduced erythrocyte deformability [2-6], increased plasma viscosity and a recently reported increased erythrocyte aggregation (EA) [7]. These abnormalities might contribute to anaemia in CRF (destruction, production failure). Moreover, as thrombosis of arterio-venous fistulae is a frequent and serious complication in patients undergoing haemodialysis (HD) for CRF, and as EA increases in thrombotic states, it seemed interesting to study EA in CRF patients.

The influence of HD was assessed in 72 patients (mean age 66 years; range 22-87), undergoing thrice weekly HD for CRF of different aetiologies. Some patients received human recombinant erythropoietin (Eprex®).

Measurements were performed before and after HD: EA was examined by laser backscattering [8] with determination of aggregation time (AT) and partial and total dissociation thresholds. Plasma viscosity was evaluated in an automatic capillary viscometer. Fibrinogen levels, blood cell count, haemoglobin, haematocrit, protein, creatinine and some other biochemical parameters were also determined. The results were compared with those of a matched control group (mean age 51 years; range 25-89).

Anaemia was a common feature in most of these CRF patients. Our results (table 1) confirmed pre-HD erythrocyte hyperaggregation, which increased during HD, with significant changes in AT and in dissociation thresholds, suggesting strong cohesion of erythrocyte aggregates. Plasma viscosity was also elevated before HD and subsequently increased further; the same finding was observed for fibrinogen. The changes in EA (particularly AT) were greater than those in plasma viscosity and fibrinogen. Increased protein and decreased body weight were observed during HD but could not be related to EA parameters. Significant correlations were noted between

AT and plasma viscosity as well as AT and fibrinogen before and after HD ($r = 0.60$). Although the correlations were weak or absent between body weight, protein and haemoglobin before HD, the changes occurring during HD with the changes in AT were significantly correlated, as were the changes in plasma viscosity and fibrinogen ($p < 0.0001$). These results may be relevant to the haemoconcentration observed in HD. Recombinant human erythro-

Table 1. Parameters (means $\pm$ SD) of EA and some blood parameters before and after HD

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Table 2. Comparison during the course of HD between the 2 groups of patients treated (E+) and not treated (E-) by human recombinant erythropoietin

poietin may enhance erythropoiesis. Its effect on EA is still unclear. A further increase in hyperaggregability has been reported in 16 haemodialysed patients treated with erythropoietin [7]. We found no significant difference between patients on long-term Eprex treatment ($n = 24$) and untreated dialysed patients ($n = 33$; table 2). However, our study was carried out in patients on stable treatment, exhibiting similar haemoglobin concentrations in both groups.

No clear relationship could yet be established between the observed rheological alterations and the occurrence of thrombosis in our patients. This requires elucidation in a prospective study of different parameters, such as membrane viscosity [9], leucocyte activation, platelet functions, the coagulation and contact systems and haemodialysis membranes. It may also be helpful to investigate haemorheological changes in non-dialysed CRF patients at different stages of CRF and the influence of erythropoietin at the initiation of therapy.

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