Hemorheological Changes Following Renal Transplantation

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Dear Sir,

Roberts et al. [1] reported recently that the rheological (flow) properties of both red and white blood cells changed during graft rejection in cardiac transplant patients. The hemorheological changes were regarded as a nonspecific reaction to the rejection process that had the potential to be used as a monitor of graft function, with abnormal results requiring specific investigations to exclude acute rejection.

We have extended these observations by assessing whether or not plasma viscosity may provide a rheological marker of acute rejection in renal transplant recipients. As plasma viscosity is influenced by changes in the concentration or composition of plasma proteins, the test provides a rapid measure of a systemic response to an inflammatory or immunological reaction [2].

Ten renal transplant patients (6 males, 4 females; mean age 33.7 ± 16.9 years; 9 cadaveric; 1 living/related donor) took part in a longitudinal study. Plasma viscosity was measured according to recommended procedures [3] in a capillary viscometer (Coulter Electronics, Luton, England, UK) on samples collected daily for the first 30 days following transplantation and then twice weekly for the next 60 days (mean number of observations per patient 49 ± 18). Daily body weight was also recorded as a measure of the patient's state of hydration.

For statistical analysis, the critical differences for plasma viscosity and plasma creatinine concentration were determined [3]. This value designates the change that must occur in a variable before significance

($p < 0.05$) can be claimed, taking into account both analytical and within-subject variation (plasma viscosity, increase $> 10.4\%$; plasma creatinine concentration, increase $> 14\%$).

The temporal changes in mean plasma viscosity and body weight are shown in figure 1. On the first postoperative day, plasma viscosity fell significantly in all patients [mean decrease 10.0% (0.17 mPa.s); $p < 0.05$], after which it increased gradually although never reaching mean preoperative levels. The decrease in plasma viscosity was reflected by a rise in body weight, with this relationship being especially evident in the early post-transplant period, when the patients were well hydrated (correlation between plasma viscosity and body weight, in the 10-day post-transplant period $r = 0.70$; $p < 0.05$).

Rejection occurred in 7 patients with a total of 11 episodes being diagnosed (4 by renal biopsy). The mean elapsed time until first acute rejection was 7.4 ± 2.4 days. Critical differences in plasma viscosity were associated with 6 of the 11 rejection episodes. However, rises of a similar magnitude also occurred on a total of 9 occasions in 5 of the patients who had episodes of acute rejection, but at times when there was no clinical or laboratory evidence of rejection. The reason for these other rises in plasma viscosity is unknown, except for 1 patient who had surgery for a

ureteric obstruction. No critical rise in plasma viscosity was observed at any time in patients without acute rejection. Consistent with this finding, these patients had lower mean plasma viscosity levels compared with patients with rejection, with this dif-

f

+4 -i

+2-

1/8

-2-

1.80 -

Patients with rejection (n=7) Patients without rejection (n=3)

Rejection episodes ($\pi=11$)

P 1.70

Fig. 1. Mean plasma viscosity and changes in mean body weight following renal transplantation.

* $p < 0.05$ for comparison of patients with and without rejection.

1.60

1.50

1.40

10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 Days following transplantation

ference being significant ($p < 0.05$) on 3 occasions during the study (fig. 1).

sions during the study (fig. 1).

We conclude that plasma viscosity may rise as a result of acute renal transplant rejection, but that the increase is not specific to the rejection process, as the test is also influenced by systemic responses to other stimuli. Notwithstanding these limitations, plasma viscosity, like blood cell rheology, may provide the nephrologist with a indication of an underlying disease process that requires specific investi-

Measurement of plasma viscosity has the advantage of being more rapid and precise compared with an assessment of blood cell rheology.

References

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