Letter to the Editor

EXCHANGE TRANSFUSION OF HARDENED RED CELLS INCREASES PLASMA RENIN ACTIVITY

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In maintenance of tissue perfusion, rheological properties of blood as well as vascular geometry and properties of the heart have important roles. Erythrocyte deformability is one of the main determinants of the rheologic behaviour of blood, especially in the microcirculation (2). Changes in the rheological properties of blood may influence renal functions. We therefore decided to investigate the effects of impaired red cell deformability on renal blood flow, renal vascular resistance, glomerular filtration rate, and the plasma renin activity.

Dogs were used as experimental animals. Renal blood flow was assessed by measuring renal artery blood flow, with an electromagnetic flowmeter. A catheter was positioned in the abdominal aorta at the level of renal artery root through which the renal artery perfusion pressure was measured using a pressure transducer. Renal artery vascular resistance was calculated by dividing mean arterial pressure with mean renal artery blood flow. Glomerular filtration rate was determined by calculating exogenous creatinine clearance.

Red cells were obtained from the animals before the experiments. To make them partly rigid (3) these red cells were incubated for 30 minutes in isotonic solutions containing highly diluted glutaraldehyde (0.025%). After the incubation period red cells were washed with an isotonic buffer to eliminate the excess glutaraldehyde.

Red cells thus prepared, were given to the animals by autologous exchange transfusions. Total blood volumes of the animals were calculated according to their body weights and only 15% of total blood volume was exchanged. Hematocrit values were controlled so no changes in blood volume were allowed. Renal artery resistance and glomerular filtration rate were measured before and after the exchange transfusions after which no changes in renal blood flow, renal vascular resistance and glomerular filtration rate were observed. Plasma renin activity increased significantly ($p<0.05$) from 5.25 ± 1.66 ng/ml hour to 9.78 ± 4.08 ng/ml hour. It is interesting to note that experimental reduction of red cell deformability caused an increase in plasma renin activity despite the stability of renal blood flow and renal arterial pressure. Previously Sumpio *et al.* have shown that in isolated perfused rat kidney, renal perfusate flow and glomerular filtration rates are decreased when perfused with hardened red cells (4). In our experiments renal autoregulation of blood flow could presumably overcome the increased flow resistance so no changes in renal blood flow and glomerular filtration rates were observed.

It was shown that the rheological properties of blood, in this case altered red cell deformability, may influence organ function even if it does not affect vascular resistance. It is hard to explain the reason for increased renin release, but whatever the mechanism is, increased renin release might affect the pathogenesis of some diseases. To give an example, it is known that in essential hypertension blood rheology is altered. Many studies have shown that red cell deformability is impaired in a large group of hypertensives. In high reninemic hypertensives blood viscosity is found to be increased due to impaired red cell deformability (1).

Further studies should be carried on in both clinical and experimental grounds in order to understand the influence of rheological properties of blood on renal functions.

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