Mechanism of Urinary Erythrocyte Deformity in Patients with Glomerular Disease

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Dear Sir,

Birch and Fairley [1,2] and Birch et al. [3] described glomerular bleeding giving rise to a wide range of morphological alterations in red cells such as dysmorphic red cells. In these alterations, we suspect that the doughnut type of deformity is the most characteristic (fig. 1).

The mechanism of urinary erythrocyte deformity in patients with glomerular disease is considered to be the result of continuous changes in osmotic pressure and urinary pH in tubuli [2, 3]. However, in our experiments no doughnut-type erythrocytes were seen under osmotic pressure changes and there were no differences in urinary pH between the dysmorphic group (48 cases) and isomorphous group (35 cases).

In glomerular hematuria, another important factor was the passage of erythrocytes through the glomerular capillary wall composed of endothelium, basement membrane and foot process of epithelium [4, 5]. In view of the important finding that erythrocytes were distorted by passage through the ruptured glomerular capillary wall, we carried out further experiments as follows.

1 ml venous blood in 100 ml saline was incubated at 38 °C for 30 min. About 50 mm Hg pressure was applied to the suspended erythrocytes filtered by 3 kinds of membrane filters (pore size: 5 and 3 µm, fibrin-coated 5-µm narrowing in size). The filtrates were examined by phase-contrast microscopy and scanning electron microscopy.

In this experiment, doughnut-type erythrocytes were seen in the fibrin-coated 5-µm membrane filter group and

Fig. 1. Doughnut type of deformity in urinary red cells in a patient with chronic glomerulonephritis.

Fig. 2. Doughnut-type erythrocytes in our experiments.

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the nontreated 3- μ m group (fig. 2). In the nontreated 5- μ m group, there were only normal-shaped erythrocytes.

It may be suggested that the doughnut type of deformity in urinary erythrocytes in patients with glomerular disease is due to the ruptured glomerular capillary walls.

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