Suppression of Complement Activation in Hemodialysis Patients

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Dear Sir,

It is known that the dialysis membrane activates the alternative pathway of the complement system, causing various effects. It is also known that when complement activation is examined during dialysis in hemodialyzed patients, the C3a concentration increases after 15–20 min but is undetectable upon completion of dialysis [1,2]. It is considered that this is because the complement activation site of the surface membrane is being masked by the C3b-derived fragment. Antigen-antibody crossed immuno-electrophoresis revealed no C3 conversion in EDTA plasma collected before and immediately after dialysis performed using cuprophane and cellulose acetate membranes. Furthermore, we assessed the C3 conversion of these sera (before and immediately after dialysis) after 30 min of reaction after addition of inulin (20 mg/ml), an activator of the alternative pathway, or aggregate IgG, an activator of the classical pathway. As a result, C3 activation was markedly suppressed immediately after dialysis compared to predialysis activity (fig. 1). When the same procedure was performed for 21 hemodialysis patients, percent C3 conversion (expressed as ratio of total surface area) decreased significantly ($p < 0.001$) immediately after dialysis compared to predialysis conversion (fig. 2).

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$p < 0.001$
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Before

Fig. 1. C3 conversion in sera collected before and immediately after dialysis after reaction (37 °C, 30 min) upon addition of inulin (20 mg/min) determined by antigen antibody immunoelectrophoresis. Conversion to C3c in serum immediately after dialysis has decreased when compared to that of before dialysis.

After
Before

Fig. 2. C3 conversion in the patients' sera by inulin (n = 21). C3 conversion of 21 patients' sera before and after dialysis determined by antigen-antibody crossed immunoelectrophoresis after reaction with inulin. Conversion to C3c was calculated by surface area $C3c/native\ C3 + C3c \times 100\ (%)$, and expressed as percent C3 conversion. Percent C3 conversion decreased significantly in sera after dialysis when compared to sera before dialysis. Before $55 \pm 12\%$. After $41 \pm 12\%$ (mean $\pm$ SD). Asterisks represent patients with non-heparin dialysis.

270

Ohi/Hatano

This phenomenon is also observed in nonheparinized patients (heparin is not used during dialysis). Similarly, C3 conversion was significantly ($p < 0.001$) suppressed for aggregate IgG. From the above, it is probable that there are factors which suppress complement activation in our bodies besides the present suggestions that complement activation appears transiently during dialysis and disappears upon completion of dialysis. It may also be due to the effect of control protein or regulation by complexes and products of complement proteolysis resulting from complement activation. Such periodic and long-term treatment is considered to create a condition in which the complement system is different from that of healthy people and to influence the host defense system.

References

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