Podocalyxin on the Glomerular Epithelial Cells Is Preserved Well in Various Glomerular Diseases

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Table 1. Findings of podocalyxin and C3b receptor in various renal diseases (50 cases)

Podocalyxin C3b receptor

Glomerular staining

Area of crescent Segmental sclerosis

Unchanged Diminished in 6 cases (2 cases of lupus nephritis.

3 cases of MPGN, 1 case of HSP nephritis) Not stained Not stained Stained Diminished or not stained

Obsolescent glomerulus Fairly stained Not stained

Dear Sir,

The glomerular epithelial cells (GEC) of the kidney, also known as podocyte, play an important role in the pathophysiology of the glomerular filtration. A specific marker for GECs produces a potential value in the investigation of the contribution of GEC injury to the alteration of glomerular filtration. Podocalyxin is a major sialoprotein of the GEC which exists in the glycocalyx and forms an anionic charge of the cell surface of GECs [1, 2]. Immunohistochemical alterations of this antigen in various renal diseases have not yet been reported. In the present study the presence of the podocalyxin in kidneys with various renal diseases was studied using monoclonal antibodies to human podocalyxin, compared with that to the C3b receptor which is also used as a marker for human GEC [3].

Fifty kidney specimens were obtained from 19 male and 31 female (aged from 6 to 23 years) with various renal diseases: 19 cases of IgA nephropathy, 4 cases of Henoch-Schönlein purpura (HSP) nephritis, 2 cases of minimal change nephrotic syndrome (at relapse), 2 cases of focal segmental glomerulosclerosis, 8 cases of membranoproliferative glomerulonephritis (MPGN), 2 cases of membranous nephropathy, 3 cases of hemolytic uremic syndrome, 5 cases of lupus nephritis, 2 cases of chronic rejection of renal transplantation, 1 case each of acute renal failure,

Alport's syndrome and end stage kidney. The kidney specimens surgically removed at nephrectomy and biopsied specimens with minimal glomerular alterations were used as controls. Cryostat sections of renal tissues were stained with two kinds of monoclonal antibodies, antihuman podocalyxin (PHM5, Australian monoclonal development) and antihuman C3b receptor

(Dako) at 1:200 by indirect immunofluorescence. FITC-labelled F(ab')₂ fragments of affinity-purified antibodies antimouse IgG (Cappel) was used as the second antibody. In some cases sections were also stained with antilaminin rat monoclonal antibody (Cap-pel) and rhodamine-labelled antirat IgG (Cappel) for double immunofluorescence.

Immunofluorescent findings are summarized in table 1. Glomerular epithelial staining of podocalyxin was preserved in various renal diseases (fig. 1a, c), even in obsolescent glomeruli. The GECs on sclerosed lesions were found to preserve the antigenicity of podocalyxin but the cells in crescents were negative. Staining for the C3b receptor on the GEC was diminished in 2 cases of lupus nephritis, 3 cases of MPGN and 1 case of HSP nephritis (fig. 1b, d). The histology of all these cases revealed types of severe proliferative glomerulonephritis and urinalysis showed moderate or marked proteinuria. The staining for the C3b receptor was negative on the cells in crescents and obsolescent glomeruli, and markedly diminished or negative on the GEC in segmental sclerosed lesions.

The present study showed that podocalyxin on the GEC was not altered in various renal diseases, even in the sclerosed area or obsolescent glomeruli. These findings suggest that the antigenicity of podocalyxin is preserved well and not affected by various inflammatory conditions. On the other hand, diminished or negative antigenicity for the C3b receptor was observed in some glomerulonephritides including end-stage kidney diseases in which the glomerular capillary architectures were collapsed. It is suggested that there is an alteration in the biosynthesis or turnover of the C3b receptor by the GEC by various inflammatory stimuli. Thus, it is presumed that the C3b receptor might be a marker for GEC injuries, while podocalyxin is a good marker for the GEC due to its long-lasting antigenicity which is not affected by various glomerular injuries.

It is interesting that the reaction of podocalyxin was not reduced in the cases with minimal change nephrotic syndrome and focal segmental glomerulosclerosis with marked proteinuria. The histochemical staining for glomerular sialic acid is reduced or lost

Fig. 1. Staining pattern of podocalyxin (a) and C3b receptor(b) on normal kidney sections. Intensity of immunofluorescence for podocalyxin is not reduced in the case of Henoch-Schönlein purpura nephritis (c). A marked reduction for C3b receptor is found in the same case (d).

in human minimal change nephrotic syndrome [4], and in the corresponding experimental rat model of puromycin-amino-nucleoside nephrosis [5]. Kerjaschki et al. [6] demonstrated reduced glomerular sialic acid content of podocalyxin in puromycin-amino-nucleoside nephrosis rats, whereas that of podocalyxin on the epithelial cell surface was not changed. Human podocalyxin shows several similarities with that of rat GECs, such as its staining property in gels, sialic acid-mediated lectin binding and structural distribution. In the present study, it has been shown that the staining properties of human podocalyxin in the proteinuric state are also similar to those of rat podocalyxin.

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