Membranoproliferative Glomerulonephritis



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Membranoproliferative glomerulonephritis (MPGN) is a type of nephritic-nephrotic kidney disorder characterized by alterations in the glomerular basement membrane, proliferation of glomerular cells, and leukocyte infiltration. MPGN accounts for approximately 10 to 20% of cases of nephrotic syndrome in both children and young adults and is divided into two major categories on the basis of distinct immunofluorescent and pathologic differences called type I and type II MPGN. In type I MPGN, there is evidence of immune complex deposition in the glomerulus with activation of both the classical and alternative complement pathways. In many cases, the antigens involved in MPGN are thought to be derived from infectious agents such as hepatitis C and hepatitis B viruses. By light microscopy, both types of MPGN demonstrate enlarged hypercellular glomerular caused by proliferation of cells in the mesangium. Electron microscopy shows a glomerular basement membrane that is thickened and the glomerular capillary wall often shows a tram-track appearance caused by duplication, commonly called splitting, of the basement membrane by ingrowth of the mesangium. Specifically, type I MPGN is characterized by the presence of discrete subendothelial immune complexes. Immunofluorescence demonstrates a granular pattern of C3 deposition. Type II MPGN, also called dense deposit disease, has abnormalities that suggest activation of the alternative pathway. More than 70% of patients have a circulating antibody called C3 nephritic factor, which is an autoantibody that binds to the C3 convertase in the alternative pathway. C3 nephritic factor binding causes stabilization of the convertase, protecting it from enzymatic degradation and therefore favors persistent C3 activation and hypocomplementemia. It is called dense deposit disease due to deposition of dense material of unknown composition in the glomerular basement membrane.

Nephritic-Nephrotic Syndrome
Nerd-cricket Nerd-frog
Membranoproliferative glomerulonephritis is a mixed nephritic-nephrotic syndrome. Patients develop severe nephritic syndrome with profound glomerular basement membrane damage that damages the glomerular filtration charge barrier. This leads to nephrotic-range proteinuria, along with symptoms of nephrotic syndrome.

Type I
Side (1) Wand
Membranoproliferative glomerulonephritis (MPGN) is a type of nephritic-nephrotic kidney disorder characterized by alterations in the glomerular basement membrane, proliferation of glomerular cells, and leukocyte infiltration. In most cases of type I MPGN, there is evidence of immune complex deposition in the glomerulus with activation of both the classical and alternative complement pathways.

Subendothelial Immune Complexes
Sub-in-donut
Specifically, type I MPGN is characterized by the presence of discrete subendothelial immune complexes.

Hepatitis C Virus
Happy-tie (C)-Cat Liver
In many cases, the antigens involved in MPGN are thought to be derived from infectious agents such as hepatitis C and hepatitis B viruses. Although both hepatitis C and hepatitis B are associated with MPGN, the associations with hepatitis C are stronger while hepatitis B is more closely associated with membranous glomerulonephritis.

Granular IF
Grains with Fluorescence
Immunofluorescence demonstrates a granular pattern of C3 deposition.

Tram Tracks Caused by Splitting of the GBM
Train Tracks Split with Basement Membrane
A glomerular basement membrane that is thickened and the glomerular capillary wall often shows a tram-track appearance caused by duplication, commonly called splitting, of the basement membrane by ingrowth of the mesangium. This can be seen on light microscopy, through silver stain or H&E stain, as well as looking for mesangial deposits on electron microscopy.

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Ingrowth of Mesangium

Maze-angels Splitting train tracks

Electron microscopy shows a glomerular basement membrane that is thickened and the glomerular capillary wall often shows a tram-track appearance caused by duplication, commonly called splitting, of the basement membrane by ingrowth of the mesangium.

Type II

Side (2) Tutu

Type II MPGN, also called dense deposit disease, has abnormalities that suggest activation of the alternative pathway.

Dense Deposit Disease

Deposits of Dense-bowling-balls

Type II MPGN, also called dense deposit disease, has abnormalities that suggest activation of the alternative pathway. It is called dense deposit disease due to deposition of dense material of unknown composition in the glomerular basement membrane.

C3 Nephritic Factor

Computer (3) Tree kidney

More than 70% of patients have a circulating antibody called C3 nephritic factor, which is an autoantibody that binds to the C3 convertase in the alternative pathway. C3 nephritic factor binding causes stabilization of the convertase, protecting it from enzymatic degradation and therefore favors persistent C3 activation and hypocomplementemia.

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