# Infection-Associated Glomerulopathies

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Many glomerular diseases may be associated with acute and chronic infectious diseases of bacterial, viral, fungal, or parasitic origin. In many instances, the glomerular activators are transient and of little clinical consequence. In other instances, distinct clinical syndromes such as acute nephritis or nephrotic syndrome may be provoked. Some of the more important infection-related glomerular diseases are illustrated here. Others diseases, including human immunodeficiency virus and hepatitis, are also discussed in Volume IV.

CHAPTER

4

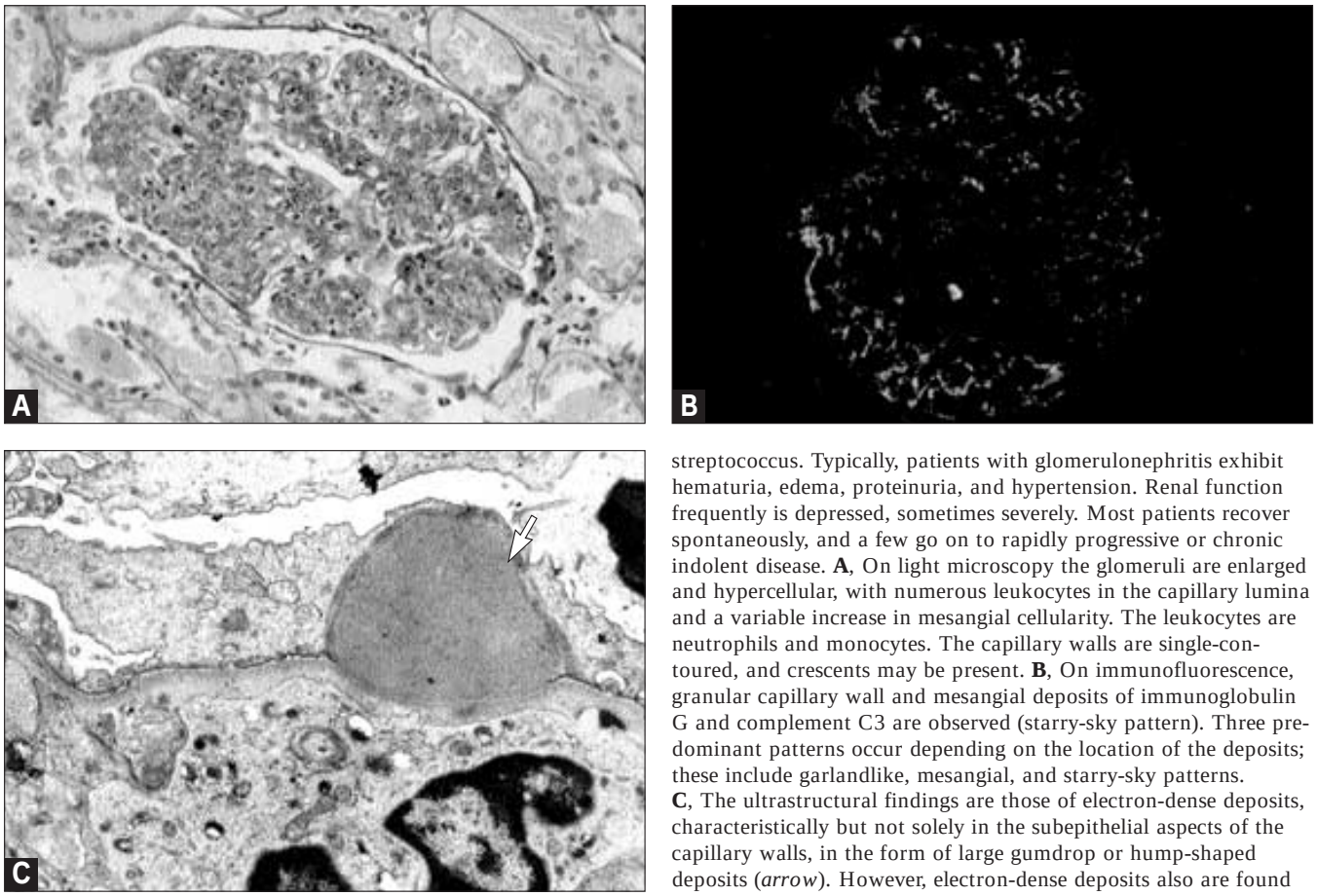


**FIGURE 4-1** (*see* Color Plate)

Light, immunofluorescent, and electron microscopy of poststreptococcal (postinfectious) glomerulonephritis. Glomerulonephritis may follow in the wake of cutaneous or pharyngeal infection with a limited number of "nephritogenic" serotypes of group A β-hemolytic streptococcus. Typically, patients with glomerulonephritis exhibit hematuria, edema, proteinuria, and hypertension. Renal function frequently is depressed, sometimes severely. Most patients recover spontaneously, and a few go on to rapidly progressive or chronic indolent disease. **A**, On light microscopy the glomeruli are enlarged and hypercellular, with numerous leukocytes in the capillary lumina and a variable increase in mesangial cellularity. The leukocytes are neutrophils and monocytes. The capillary walls are single-contoured, and crescents may be present. **B**, On immunofluorescence, granular capillary wall and mesangial deposits of immunoglobulin G and complement C3 are observed (starry-sky pattern). Three predominant patterns occur depending on the location of the deposits; these include garlandlike, mesangial, and starry-sky patterns. **C**, The ultrastructural findings are those of electron-dense deposits, characteristically but not solely in the subepithelial aspects of the capillary walls, in the form of large gumdrop or hump-shaped deposits (*arrow*). However, electron-dense deposits also are found in the mesangial regions and occasionally subendothelial locations. Endothelial cells often are swollen, and leukocytes are not only found in the capillary lumina but occasionally in direct contact with basement membranes in capillary walls with deposits. Similar findings may be observed in glomerulonephritis after infectious diseases other than certain strains of *Streptococci*.

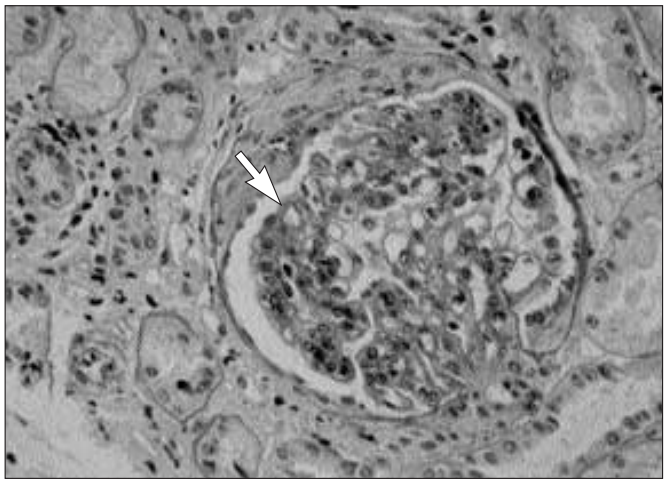

**FIGURE 4-2**

Infective endocarditis and shunt nephritis. The glomerulonephritis accompanying infective endocarditis or infected ventriculoatrial shunts or other indwelling devices is that of a postinfectious glomerulonephritis or membranoproliferative glomerulonephritis type I pattern, or both (*see* Fig. 2-18). In reality, the changes often are a combination of both. As shown here, this glomerulopathy is characterized by increased mesangial cellularity, with slight lobular architecture; occasionally thickened capillary walls, with double contours (*arrow*); and leukocytes in some capillary lumina. This glomerulus also has a small crescent.

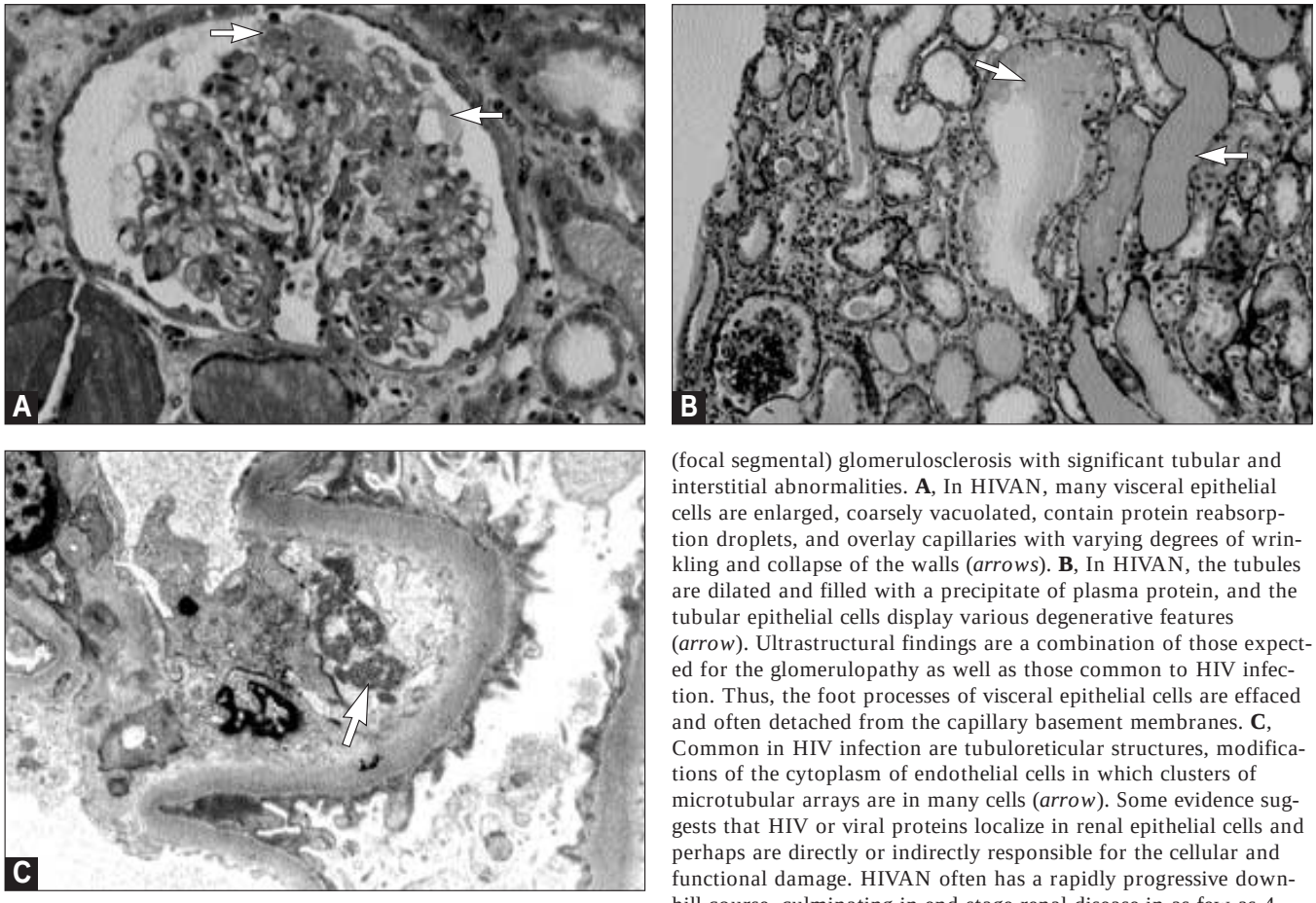


**FIGURE 4-3** (*see* Color Plate)

Human immunodeficiency virus (HIV) infection. Many forms of renal disease have been described in patients infected with HIV. Various immune complex–mediated glomerulonephritides associated with complicating infections are known; however, several disorders appear to be directly or indirectly related to HIV itself. Perhaps the more common of these is known as HIV-associated nephropathy (HIVAN). This disease is a form of the collapsing (focal segmental) glomerulosclerosis with significant tubular and interstitial abnormalities. **A**, In HIVAN, many visceral epithelial cells are enlarged, coarsely vacuolated, contain protein reabsorption droplets, and overlay capillaries with varying degrees of wrinkling and collapse of the walls (*arrows*). **B**, In HIVAN, the tubules are dilated and filled with a precipitate of plasma protein, and the tubular epithelial cells display various degenerative features (*arrow*). Ultrastructural findings are a combination of those expected for the glomerulopathy as well as those common to HIV infection. Thus, the foot processes of visceral epithelial cells are effaced and often detached from the capillary basement membranes. **C**, Common in HIV infection are tubuloreticular structures, modifications of the cytoplasm of endothelial cells in which clusters of microtubular arrays are in many cells (*arrow*). Some evidence suggests that HIV or viral proteins localize in renal epithelial cells and perhaps are directly or indirectly responsible for the cellular and functional damage. HIVAN often has a rapidly progressive downhill course, culminating in end-stage renal disease in as few as 4 months. HIVAN has a striking racial predilection; over 90% of patients are black.

The other glomerulopathy that may be an integral feature of HIV infection is immunoglobulin A nephropathy. In this setting, HIV antigen may be part of the glomerular immune complexes and circulating immune complexes. The morphology and clinical course generally are the same as in immunoglobulin A nephropathy occurring in the non-HIV setting.

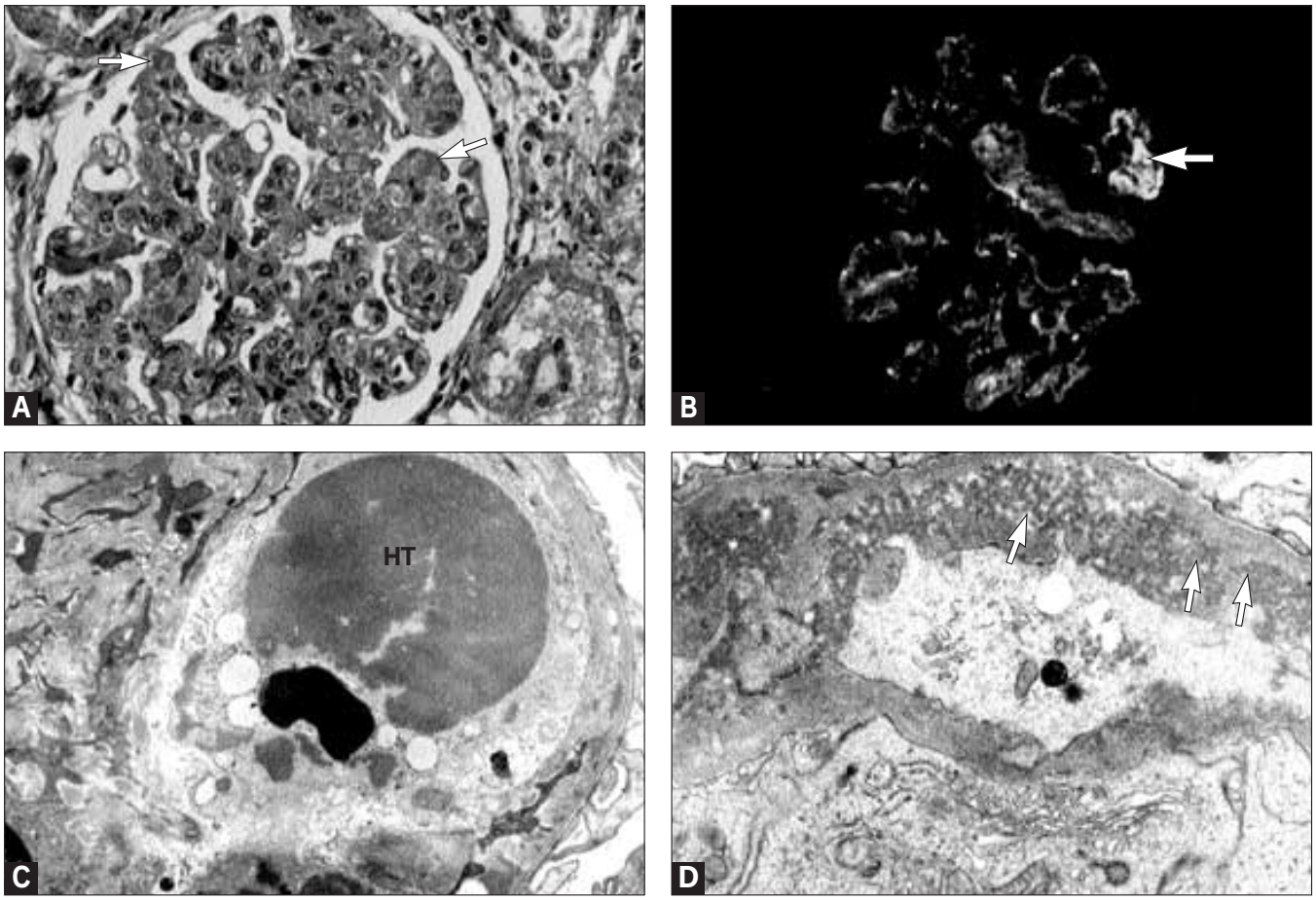


**FIGURE 4-4** (*see* Color Plate)

Hepatitis C virus infection. The most common glomerulonephritis in patients infected with the hepatitis C virus is membranoproliferative glomerulonephritis with, in some instances, cryoglobulinemia and cryoglobulin precipitates in glomerular capillaries. Thus, the morphology is basically the same as in membranoproliferative glomerulonephritis type I (Fig. 2-18*A–C*). **A**, With cryoglobulins, precipitates of protein representing cryoglobulin in the capillary lumina and appearing as hyaline thrombi (HT)are observed (*arrows*), often with numerous monocytes in most capillaries. **B**, Immunofluorescence microscopy discloses peripheral granular to confluent granular capillary wall deposits of immunoglobulin M (IgM) and complement C3; the same immune proteins are in the luminal masses corresponding to hyaline thrombi (*arrow*). **C**, Electron microscopy indicates the luminal masses (HT). **D**, On electron microscopy the deposits also appear to be composed of curvilinear or annular structures (*arrows*). Hepatitis C viral antigen has been documented in the circulating cryoglobulins. Membranous glomerulonephritis with a mesangial component also has been infrequently described in patients infected with the hepatitis C virus.

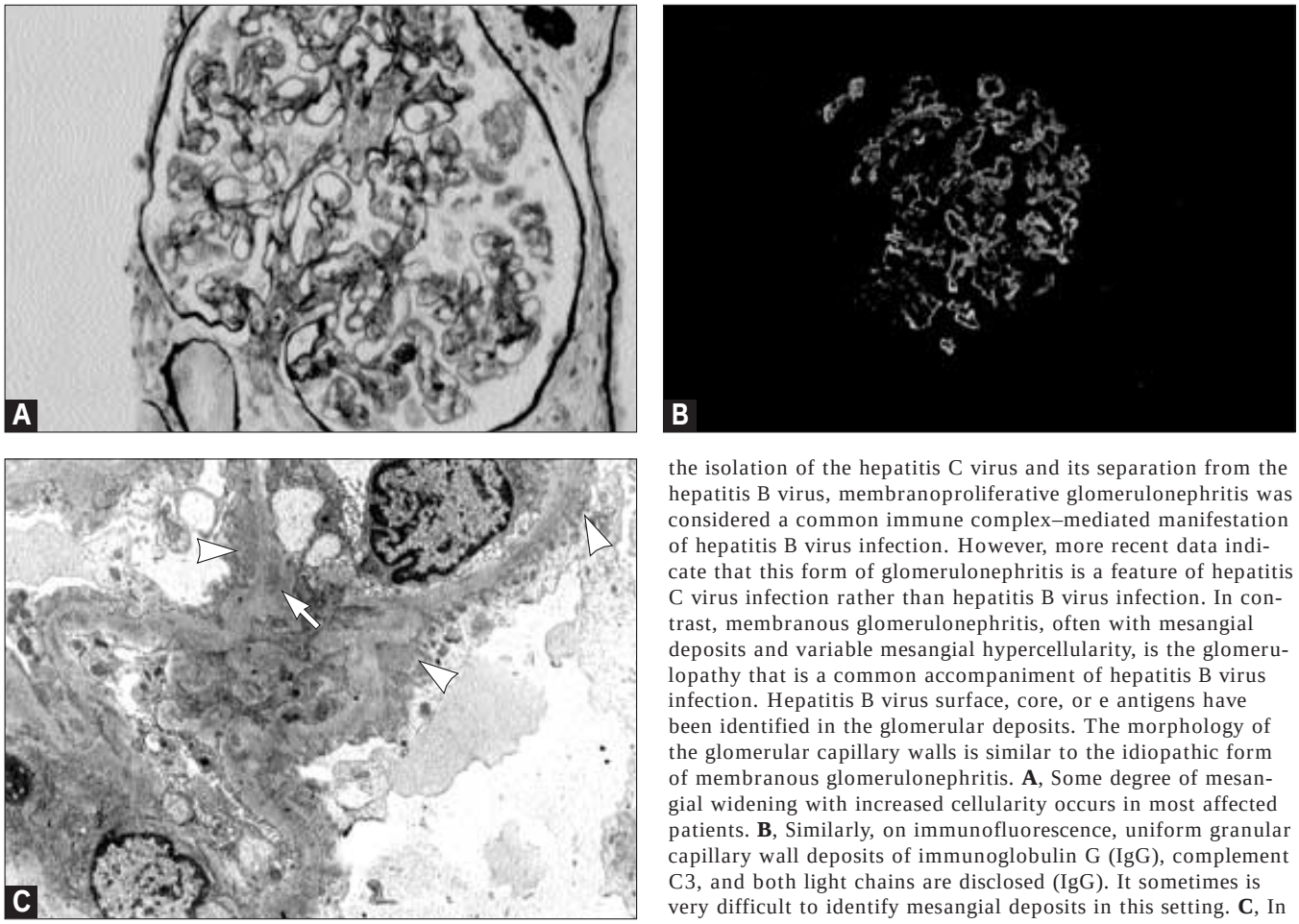


**FIGURE 4-5** (*see* Color Plate)

Hepatitis B virus infection. Several glomerulopathies have been described in association with hepatitis B viral infection. Until the isolation of the hepatitis C virus and its separation from the hepatitis B virus, membranoproliferative glomerulonephritis was considered a common immune complex–mediated manifestation of hepatitis B virus infection. However, more recent data indicate that this form of glomerulonephritis is a feature of hepatitis C virus infection rather than hepatitis B virus infection. In contrast, membranous glomerulonephritis, often with mesangial deposits and variable mesangial hypercellularity, is the glomerulopathy that is a common accompaniment of hepatitis B virus infection. Hepatitis B virus surface, core, or e antigens have been identified in the glomerular deposits. The morphology of the glomerular capillary walls is similar to the idiopathic form of membranous glomerulonephritis. **A**, Some degree of mesangial widening with increased cellularity occurs in most affected patients. **B**, Similarly, on immunofluorescence, uniform granular capillary wall deposits of immunoglobulin G (IgG), complement C3, and both light chains are disclosed (IgG). It sometimes is very difficult to identify mesangial deposits in this setting. **C**, In addition to the expected capillary wall changes, electron microscopy discloses deposits in mesangial regions of many lobules (the *arrow* indicates mesangial deposits; the *arrowheads* indicate subepithelial deposits).