

## The Classification of Glomerulonephritis in Systemic Lupus Erythematosus Revisited

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The morphologic changes in a renal biopsy from a patient with systemic lupus erythematosus (SLE) comprise a spectrum of vascular, glomerular, and tubulointerstitial lesions.

The current classification, which was advanced in 1982 (1) and revised in 1995 (2), reflects our understanding of the pathogenesis of the various forms of renal injury in SLE nephritis. However, subsequent clinico-pathologic studies have revealed the need for clarification of the different categories and the diagnostic terminology.

A group of renal pathologists, nephrologists, and rheumatologists convened to formulate a revised classification of lupus nephritis during a 3-day consensus conference held at Columbia University, New York in May 2002, published in February 2004 both in *Kidney International* and *JASN* (3-4) (Tab. 1).

**Table 1.** International Society of Nephrology/Renal Pathology Society (ISN/RPS) classification of lupus nephritis (2003).

Class I	Minimal mesangial lupus nephritis
Class II	Mesangial proliferative lupus nephritis
Class III	Focal lupus nephritis <sup>a</sup>
Class IV	Diffuse segmental (IV-S) or global (IV-G) lupus nephritis <sup>b</sup>
Class V	Membranous lupus nephritis <sup>c</sup>
Class VI	Advanced sclerosing lupus nephritis

### Class I

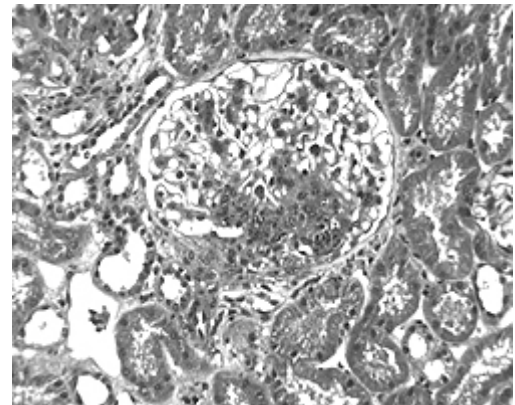
Class I is defined as minimal mesangial lupus nephritis with mesangial accumulation of immune complexes identified by immunofluorescence, or by immunofluorescence and electron microscopy, without concomitant light microscopic alterations.

### Class II

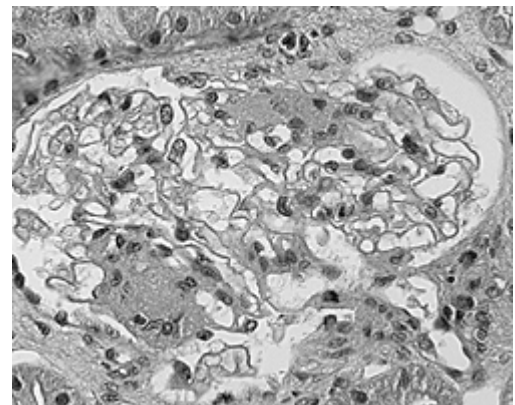
Class II is defined as mesangial proliferative lupus nephritis characterized by any degree of mesangial hypercellularity (defined as three or more mesangial cells per mesangial area in a 3 micron thick section) in association with mesangial immune deposits.

### Class III

Class III is defined as focal lupus nephritis involving less than 50% of all glomeruli. Affected glomeruli usually display segmental endocapillary proliferative lesions or inactive glomerular scars, with or without capillary wall necrosis and crescents (Fig. 1-2).



**Figure 1.** Focal Lupus Nephritis (Class III – Active): segmental endocapillary proliferation in less than 50% of glomeruli. The remaining part of the tuft is quite normal (Thricome x 250).

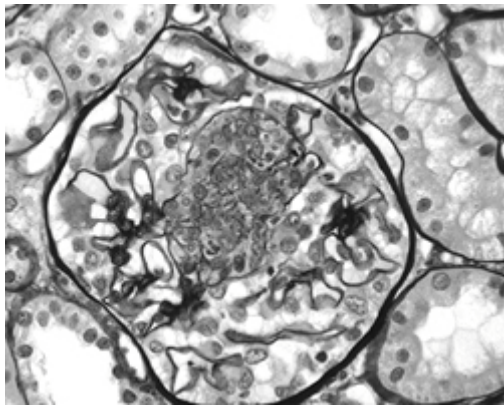


Focal Lupus Nephritis (Class III – Sclerosing): segmental and well delineated areas of glomerular sclerosis (H e H x 400).

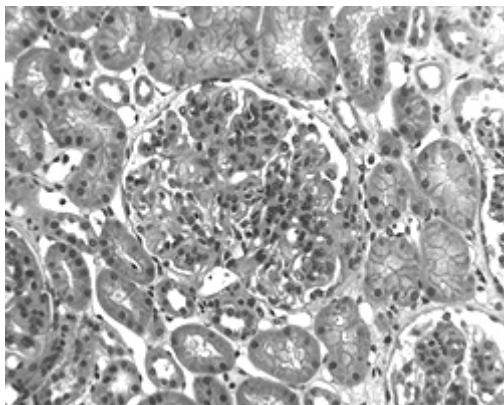
### Class IV

Class IV is defined as diffuse lupus nephritis involving 50% or more of glomeruli in the biopsy. In the affected glomeruli, the lesions may be segmental, defined as sparing at least half of the glomerular tuft, or global, defined as involving more than half of the glomerular tuft. This class is subdivided into diffuse segmental lupus nephritis (class IV-S) when >50% of the involved glomeruli have segmental lesions, and diffuse global lupus nephritis (class IV-G) when >50% of the involved glomeruli have global lesions. Class IV-S typically shows segmental endocapillary proliferative encroaching upon capillary lumina with or without necrosis (Fig. 3), and may be superimposed upon similarly distributed glomerular scars. Class IV-G is characterized by diffuse and global

endocapillary, extracapillary, or mesangiocapillary proliferation or widespread wireloops (Fig. 4).



**Figure 4.** Diffuse Lupus Nephritis (Class IV – S): segmental endocapillary proliferation with capillary wall necrosis in more than 50% of glomeruli. The remaining part of the tuft is normal (Silver stain x 400).



**Figure 5.** Diffuse Lupus Nephritis (Class IV – G): diffuse and global mesangial proliferation, endocapillary proliferation with thickening of capillary walls (Trichrome x 250).

#### Class V

Class V is defined as membranous lupus nephritis with global or segmental continuous granular subepithelial

immune deposits, often with concomitant mesangial immune deposits. Any degree of mesangial hypercellularity may occur in class V. Scattered subendothelial immune deposits may be identified by immunofluorescence or electron microscopy.

#### Class VI

Class VI (advanced-stage lupus nephritis) designates those biopsies with  $\geq 90\%$  global glomerulosclerosis and in which there is clinical or pathologic evidence that the sclerosis is attributable to lupus nephritis.

A detailed description (quantitative and qualitative) of all the findings by light microscopy, electron microscopy, and immunofluorescence should be followed by a diagnostic segment summarizing and including the class of lupus nephritis (sometimes more than one class), percentage of glomeruli with severe active lesions (fibrinoid necrosis, crescents), and of glomeruli with other active and chronic lesions. The extent, severity, and type of tubulointerstitial (tubular atrophy, interstitial inflammation, and fibrosis) and vascular disease (vascular deposits, thrombi, vasculitis, sclerosis) should also be documented and graded (mild, moderate, severe) in the diagnostic line.

#### References

1. Churg J, Sobin LH: Renal Disease: Classification and Atlas of Glomerular Disease, Tokyo, Igaku-Shoin, 1982
2. Churg J, Bernstein J, Glassock RJ: Classification and Atlas of Glomerular Diseases, 2nd ed., New York, Tokyo, Igaku-Shoin, 1995
3. Weening JJ, D'Agati VD, Schwartz MM, et al.: Classification of glomerulonephritis in systemic lupus erythematosus revisited, *J Am Soc Nephrol.* 2004; 15(2):241-250
4. Weening JJ, D'Agati VD, Schwartz MM, et al.: The classification of glomerulonephritis in systemic lupus erythematosus revisited. *Kidney Int.* 2004;65(2):521-530. Review.