Renal morphology in essential hypertension: Analysis of 1177 unselected cases

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Renal morphology in essential hypertension: Analysis of 1177 unselected cases. Morphological and clinical analysis of 1177 renal biopsies from nonselected patients with essential hypertension revealed compensated benign nephrosclerosis in 775 cases. Decompensated benign nephrosclerosis was found in 251 cases, and secondary malignant nephrosclerosis was found in 151 cases. This article describes the morphological and clinical features of decompensated benign nephrosclerosis, which has received little recognition until now. The morphological and clinical features of secondary malignant nephrosclerosis, which is induced by hypertension, are also considered. There is also a discussion of the differentiation of the latter from primary malignant nephrosclerosis, in which stenosis of the preglomerular vessels develops in the presence of normal blood pressure and leads secondarily to renal hypertension.

A morphological and clinical analysis of 1177 renal biopsies from nonselected patients with essential hypertension yielded the following results.

In most cases (N = 775), kidneys showed only the changes of compensated benign nephrosclerosis (BN), with varying degrees of segmental arteriolar hyalinosis, sometimes associated with ischemic glomerulopathy. These cases had a mean blood pressure (BP) of 181/109 ± 38/22 mm Hg (systolic/diastolic ± sd). The mean serum creatinine concentration was 1.3 ± 0.6 mg%. This value was too high, considering that in an unknown number of these patients with essential hypertension, mild acute renal failure developed with serum creatinine values up to 2.8 mg% [1] as a consequence of BP reduction before the diagnostic biopsy. The area of the juxtaglomerular apparatus (JGA) as the location for renin production was, as shown by morphometric investigations [2], equivalent to kidneys in patients with normal BP.

Decompensated benign nephrosclerosis (DBN) was observed in 251 cases. Fahr first described this condition in 1925 [3] and 1934 [4], and we later rediscovered it [5]. According to our investigations, DBN leads, in contrast to the compensated form, to chronic renal failure within a few years (five-year renal survival rate 35.9%, 10-year renal survival rate 23.6% [6]). The preglomerular arterioles showed a lesser degree of hyalinosis and sclerosis in morphometric investigations [7], although average BP of 198/116 ± 32/18 mm Hg was significantly higher than in the compensated form. The mean serum creatinine concentration (3.8 ± 3.1 mg%) was significantly higher in DBN than in the compensated form. In addition, there was proteinuria of 2.6 ± 2.5 g/day. The JGA was clearly atrophic in DBN. DBN afflicted mainly males. The male to female ratio was 5.5:1. The compensated form occurred slightly more frequently in men than in women with a male to female ratio of 1.6:1. Patients with BN and DBN were approximately the same age, that is, 43 ± 12 and 46 ± 13 years, respectively.

We believe that DBN is thus a separate disease entity with its own characteristic clinical picture and that it is incorrectly included under focal sclerosing glomerulonephritis in the literature [8] and thus has not been recognized. DBN differed histologically from the compensated form by the occurrence of focal and segmental glomerulosclerosis with subendothelial hyalinosis. This corresponded in detail to the so-called hyperperfusion lesions in the rat described by Nagata et al and Kriz et al [9, 10]. In addition, DBN was characterized by the development of a variable degree of interstitial fibrosis with obliteration of the postglomerular capillaries. Changes in DBN began in the juxtamedullary glomeruli, which did not autoregulate, and proceeded from there to the cortex. DBN is almost unknown because it is confused with focal sclerosing glomerulonephritis, which is in our opinion a complication of minimal change disease. In cases of focal sclerosing glomerulonephritis, 30% of which were associated with moderate hypertension (mean BP of 143/87 mm Hg [11]), the podocyte foot processes were always effaced, but in DBN, they were intact, even in the rare cases in which severe proteinuria with incomplete nephrotic syndrome occurs.

Secondary malignant nephrosclerosis (SMN) was found...
in 151 cases [12]. The interlobular arteries exhibited subendothelial edema in the early stages of this condition and subendothelial fibrosis in advanced disease. The stenotic lesions developed secondary to malignant hypertension (mean BP 228/132 mm Hg) with consecutive overstretching of the vascular walls and development of gaps between the endothelial cells. The serum creatinine concentration was highest in this condition (mean 6.6 ± 5.4 mg%) and proteinuria moderate (mean 2.1 ± 2.3 g/day). The male to female ratio was 2.5:1, and the mean age at time of renal biopsy was 40 ± 11 years.

The JGA was enlarged in SMN compared with normal kidneys [2]; this was associated with an increased renin production during the course of this disease: the original “red hypertension,” as described by Volhard, turned to “white hypertension.”

Secondary malignant nephrosclerosis, as a consequence of severe hypertension, must be distinguished from primary malignant nephrosclerosis [13] in which the stenotic lesions develop in the presence of normal BP as a result of toxic endothelial cell damage in hemolytic-uremic syndrome.

The discrepancy with regard to the prognosis of essential hypertension between our findings (34.1%) and those in the American literature (10% to 28%) [14] may be explained by the fact that patients with essential hypertension without vascular disease are not available in our material. On the other hand, the Anglo-American literature [15] characterizes DBN as focal sclerosing glomerulonephritis and therefore not as a consequence of hypertension.

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Sadly, Professor Bohle died suddenly and unexpectedly on May 8, 1998, at the age of 76. Most notable amongst his extensive research work was his discovery of the influence of tubulointerstitial changes on renal function. With him, the scientific world has lost a great nephropathologist, whose keen interest in and enthusiasm for his subject remained undiminished throughout his retirement.

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REFERENCES