Structure and Function of the Kidney in Multiple Myeloma

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Summary. Morphological examinations of the kidneys of 146 plasmocytoma patients revealed the typical pathological-anatomical picture of myeloma kidney in only a third. In 23%, histological changes characteristic of acute renal failure were present and in a further 17% only evidences of acute renal failure were detected. In 8% the picture was dominated by severe pyelonephritis; nearly a third of all cases showed no morphological peculiarities. When correlated with clinical data it was noted that in renal insufficiency there was pathological evidence in 48% of myeloma kidney, in 36% evidence of acute renal failure. In about a third of all kidneys of plasmocytoma patients with renal insufficiency there were signs of acute renal failure. In only two patients could contracted kidneys be implicated as the cause of renal dysfunction.

In none of the simultaneously-examined seven cases with Waldenström's macroglobulinaemia were changes found corresponding to those of myeloma nephrosis. In three, however, the histological picture of acute renal failure was evident. In the discussion of the relationships between renal structure and function, the unusually frequent picture of acute renal failure must be taken into account when considering therapy.


The frequent occurrence of renal insufficiency and the evidence of characteristic morphological renal alterations through multiple myeloma, with in the total conception of “myeloma kidney”, lead one to the opinion that the malfunctioning disturbances can always be lead back to particular pathological anatomical conditions. However, there is often a notable discrepancy between terminal uraemia and relatively sparing morphological changes of kidneys, which caused Nonnenbruch as early as 1942, 1949 to recognise this clinical picture as a special form of the “Extra renal Syndrome”. Even today it has not yet been possible to correlate
the structure and functional disturbances of the kidneys through this disease in a satisfactory way. Since a further discussion of the functional value of morphological conditions promises little success, as long as we are not in the possession of more precise information about the amount and frequency of the various structural changes, we have set ourselves the exercise of registering over a large number of patients cases, the frequency of the isolated morphological changes in myeloma nephrosis and to compare this information with available clinical data, in order to establish the morphological basis for experiments to explore renal functional disturbances through plasmocytoma.

**Material and Methods**

From a total of 162 patients with multiple myeloma, the kidneys of 146 cases could be histologically examined. In 139 cases post mortem renal tissue was available and in 7 cases biopically obtained tissue. 49 of these specimens were obtained through post mortems at the Pathological Institute of Tübingen University, or sent from elsewhere for examination; 93 specimens came from post mortems at the Pathological Institute of Kiel University, or were given us from the collection of Prof. Dr. Lennert. Histological sections from 20 further plasmocytomas were made available to us from the collection of Prof. Dr. Randerath.

Firstly, without reference to the clinical data, we noticed in this material the frequency of the single histological features. In the same way, as in earlier studies (Schubert, 1968), the changes signifying the morphological indications of acute renal failure were established. After that we established how many kidneys could be formulated into particular clinical pictures through the use of morphological criteria.

In addition to this, as a comparison, the kidneys of 7 patients were examined, who had died as a result of Macroglobulinaemia Waldenström.

As pathological anatomical factors for "myeloma kidney" we took: (Allen, 1953; Zollinger, 1966).

1. Profuse hyaline or lamellated casts.
2. The syncytium of epithelial cells about the casts.
3. Strong accumulation of hyaline proteindrops in the tubular cells.
4. Severe interstitial fibrosis and tubulus atrophy.
5. Nephrocalcinosis.

A kidney was then classified as a "typical myeloma kidney", when amongst a large number of casts, at least 3 of the 4 other features were apparent.

The picture of acute renal failure was established, when the following histological features were apparent (Randerath and Bohle, 1959; Bohle, Jahnecke and Rauscher, 1964; Bohle, 1965; Schubert, 1968):

1. Wide tubular lumina, particularly of the proximal convolutions without evidence of blocked drainage.
2. Focal tubular necrosis.
3. Localised round cell reactions of the interstitium in the external areas of the medulla, partly with interstitial edema (so-called tubulo interstitial nephritis by Brun, 1954) and/or granuloma—like reactions round localised lesions of distal tubules (as a feature of "lower nephron nephrosis" Lucké, 1946).
5. Large quantities of oxalate crystals, particularly in the distal renal tubular lumina.

The microscopic evaluation ensued on paraffin sections in the following respective stainings: Haematoxylin-Eosin, Goldner Trichrom, Ladewig, van Gieson, PAS, Fibrin-staining and Congo red. In some of the older cases, there were only Haematoxylin-Eosin and PAS stained preparations available. The kidneys of 40 patients could, in addition, be examined under 0.5 μ thick methachrylate embedded Movat silvered semithin sections.

1 Prof. Dr. W. Doerr, Head of the Pathological Institute of Heidelberg University very kindly gave us permission to view the autopsy reports of these 20 cases.