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Ultrastructural changes in renal parenchyma with renal cell carcinoma

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Abstract

In recent years, there has been a significant increase in incidence of the renal cell carcinoma (RCC). In the structure of cancer, this pathology is on 10th place. The surgical treatment is the most radical and most effective method of management of this disease. Currently renal resection has become a desirable alternative to radical nephrectomy for tumors of the T_1 stage [6, 7, 8, 9]. Nephron-sparing interventions, compared to radical nephrectomy, showed an equivalent cancer outcome in tumors < 4 cm in diameter [1, 10]. However, there is an opinion [2] that in the intact part of the organ due to an increased functional load various pathomorphological changes may occur [3, 4 ,7]. Although, it is believed that in this cohort of patients there are no pathomorphological changes and only in rare cases, distant functional changes can be observed [5, 2].

Key words: renal cell carcinoma, nephron, nephrectomy, nephron-sparing surgery

Resume:

In all cases we observed minor pathological changes of the renal parenchyma unaffected by the tumor. Pathological changes of different nature in proximal tubules and / or in the capsule of Shumlyansky-Bowman, which in turn is a prerequisite for the possible development of chronic kidney disease.

Kidney damage begins with the occurrence of pathological changes in the glomeruli of the cortical zone of the kidney and proximal vorticular tubules of the nephron.

The aim of the study: To identify the changes in the ultrastructure of the nephrons of intact by the neoplastic process renal parenchyma in patients with clear-cell RCC.

Materials and methods: the study enrolled 15 patients with diagnosed and pathologically confirmed clear-cell subtype of RCC.

All patients were undergoing in-patient treatment at the clinical basis of the Department of Urology, which is located in the urological department of the Lviv Regional Clinical Hospital. The age of patients ranged from 58 to 68 years. All patients were treated surgically by means of radical nephrectomy. Postoperative biopsy specimens of the intact renal parenchyma of the removed kidney were used for further investigation. The undamaged portion of the renal parenchyma was picked over immediately after removal of the kidney affected with the tumor, with following fixation in a 10% neutral solution of formalin. Paraffin sections were colored with hematoxylin-eosin according to the traditional histological method.

Research results

In a result of the pathomorphological analysis of the intact renal parenchyma of the surgically removed kidney, a typical cortico-medullar differentiation was observed. The cortical substance contained Shumlansky-Bowman's capsules and the proximal tubules of the nephron. In the medulla substance – distal tubules were located. In all patients pathomorphological changes of varying degrees were found. Thus, in 12 (80%) patients, abnormalities of the protein metabolism were observed: granular dystrophy in proximal tubule cells, the presence of cylinders in the lumen of the tubules, and 6 (40%) patients had noticeable cystic enlargement of the proximal tubules with epitheliocytic atrophy. Figure 1

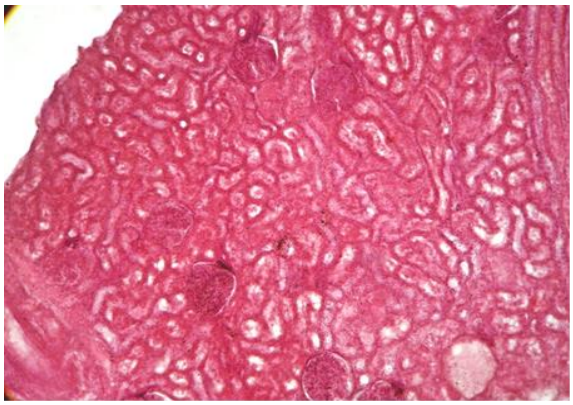

Figure 1. Cystic enlargement of the proximal tubules with epitheliocytic atrophy
Hematoxylin-eosin. Magnification x 400

In 2 (13.3%) patients, a thyroid-like kidney was detected (pathologically enlarged tubules with complete filling of the lumen with protein content) Figures 2 and 3

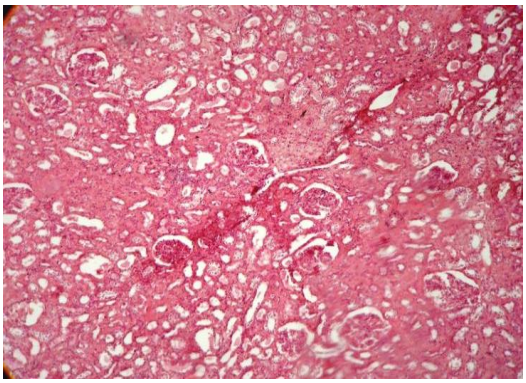

Figure 2. Enlarged tubules with complete filling of the lumen with protein content
Hematoxylin-eosin. Magnification x 100

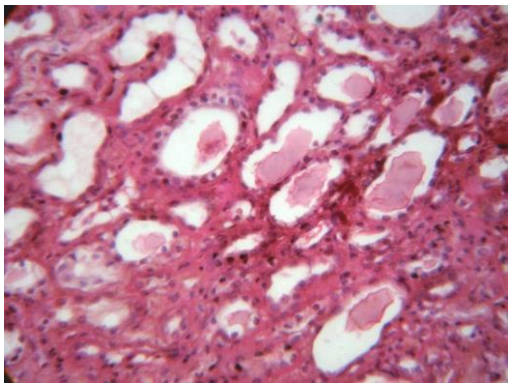

Figure 3. Enlarged tubules with complete filling of the lumen with protein content
Hematoxylin-eosin. Magnification x 400

It worth mentioning that pathological changes to a greater extent have involved proximal tubules than distal ones. In 3 (20%) patients violations of Shumlansky-Bowman's capsule structure were observed, which was indicative of reabsorption impairment. Microscopically the lumen of such capsules was narrowed, glomerulus filled almost all the space of the capsule, the lymphocytic infiltrate often was detected. Besides this, 3 (20%) patients experienced significant swelling of the tubules with complete narrowing of the lumen, indicating an contravention of water exchange. In 2 (13.3%) patients noticeable hemorrhage in to the renal parenchyma was observed, as well as stagnant phenomena in the blood vessels. In 8 (53.3%) patients lymphocytic infiltration was detected, which in turn indicated an inflammatory process. In 5 (33.3%) patients, vascular and glomerulus hyalinosis was revealed (Figures 4-6)

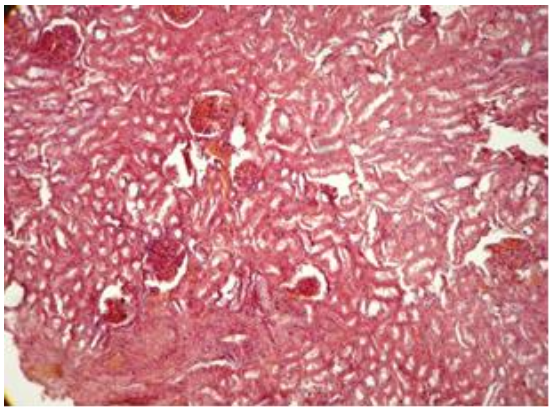

Figure 4. Lymphocytic infiltration, vascular and glomerulus hyalinosis of the intact renal parenchyma

Hematoxylin-eosin. Magnification x 100

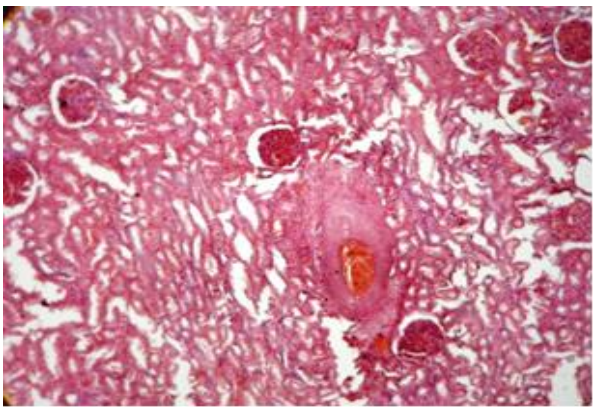

Figure 5. Lymphocytic infiltration, vascular and glomerulus hyalinosis of the intact renal parenchyma

Hematoxylin-eosin. Magnification x 100

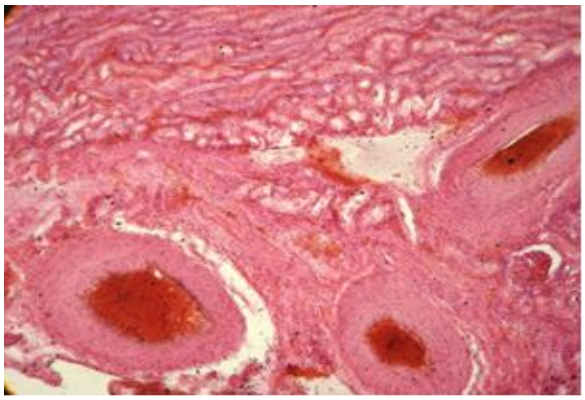

Figure 6. Lymphocytic infiltration, vascular and glomerulus hyalinosis of the intact renal parenchyma

Hematoxylin-eosin. Magnification x 400

Conclusions:

The pathomorphological analysis of the intact renal parenchyma in patients with clear-cell RCC revealed the presence of pathological changes of different nature - in the convoluted tubules or in the capsules of Shumlansky-Bowman's, which is a prerequisite for the possible development of chronic kidney disease after kidney tumors removal. All at once, the obtained data suggests that kidney damage begins with tubal involvement, especially proximal.

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