THE ROLE OF TRIPLEX ECHOGRAPHY IN THE DIAGNOSIS OF MALIGNANT KIDNEY FORMATIONS

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Abstract. *Diagnosis of kidney neoplasms remains an urgent problem. The aim of the study was to improve the diagnosis of malignant kidney tumors using modern methods of triplex echography. Materials and methods of research. The work is based on the data of a comprehensive study of 70 patients aged 29 to 77 years who were examined on the basis of the Tashkent Pediatric Medical Institute in the Republican Specialized Scientific and Practical Center of Oncology and Radiology in 2014-2022. The light-cell type of renal cell carcinoma was the most common. Much less often there was a granular cell type of renal cell carcinoma, as well as a spindle cell or sarcoma-like type of renal cell carcinoma. Epithelial tumors of the renal pelvis accounted for only 4.3% of the total number of malignant neoplasms.*

Keywords: *malignant kidney tumors, diagnostics, modern methods of triplex echography, complex method of ultrasound diagnostics, Dopplerography.*

Relevance. Diagnosis of kidney neoplasms remains an urgent problem. In the structure of all oncological diseases, malignant neoplasms of the kidneys occupy more than 3% (Siegel RL, Miller KD, Jemal A. Cancer statistics, 2017). Clinical signs of a tumor lesion of the kidney do not have sufficient specificity, and patients often seek specialized medical care a few months after the appearance of the first symptoms of the disease (Axel E.M., Matveev V.B., 2019).

Despite significant progress in the development of medical technology and radiation research methods, the diagnosis of kidney cancer, especially in the early stages, remains unsatisfactory. Despite the fact that the use of a complex of the latest research methods, such as multilayer spiral computed tomography, dynamic contrast magnetic resonance imaging and positron emission tomography, has an obvious advantage in the accuracy of diagnosis, the ultrasound method of investigation has become the most widespread in wide clinical practice, which has recently been enriched with new unique techniques (Koln A.A., Schmidt S.S., Kupchin A.V., Berdichevsky B.A., 2020).

The introduction of new ultrasound systems into clinical practice, such as Dopplerography, has significantly expanded the possibilities of ultrasound diagnostics in obtaining objective data on the state of the kidneys in their various diseases. The use of ultrasound examination (ultrasound) for the diagnosis of kidney neoplasms distinguishes it favorably from other radiation research methods by the possibility of obtaining a real-time, virtual image with the determination of its volume and structure. The use of Dopplerography techniques allows in one study to accurately assess the degree of blood supply to the neoplasm and impaired blood flow through the main vessels of the kidney (Zarzour JG, Porter KK, Tchelepi H, Robbin ML., 2018).

At the same time, the possibilities of using the latest ultrasound technologies in the diagnosis of kidney neoplasms have not been sufficiently studied.

The aim of the study was to improve the diagnosis of malignant kidney tumors using modern methods of triplex echography.

Materials and methods of research. The work is based on the data of a comprehensive study of 70 patients aged 29 to 77 years (average age 51.5 ± 1.6 years) who were examined at the Tashkent Pediatric Medical Institute in the Republican Specialized Scientific and Practical Center of Oncology and Radiology in 2014-2022. All examined patients underwent complex echography.

The most important thing when conducting a kidney examination and for visualization of renal vessels, especially the main trunks, is the choice of the optimal scanning window. Since visualization of the kidneys and renal arteries is most hindered by intestinal loops, it is necessary to look for the optimal scanning angle by moving the sensor. The study of the kidneys was carried out polypositionally and to visualize the kidneys, we used a lateral position, when the patient lies on the left or, respectively, right side and the sensor is located on the lumbar region. By applying compression and adjusting the depth of inhalation and exhalation, you can achieve good visualization of the kidneys. The CD made it possible to visualize segmental arteries (the area of the central echo complex of the kidney), interlobular (pass in the medulla along the pyramids) and arc (bend around the bases of the pyramids at the border of the cortical and medulla) arteries of the kidney.

70 patients with malignant kidney tumors were examined, in whom the diagnosis of kidney cancer was verified morphologically in 67 (95.7%), of them were operated on with subsequent histological examination of the neoplasm in the removed kidney, in 3 patients (4.35%) the diagnosis was confirmed at autopsy.

The results of the study. The light-cell type of renal cell carcinoma was the most common (71.4%). Granular cell type of renal cell carcinoma was much less common (15.7%), as well as spindle cell or sarcoma-like type of renal cell carcinoma (8.6%). Epithelial tumors of the renal pelvis accounted for only 4.3% of the total number of malignant neoplasms. Among all cases of renal cell carcinoma (67), 65 had nodular forms and 5 had infiltrative forms by the nature of growth. In the B-mode, nodular forms of renal cell carcinoma most often represented an exophytic (95.7%) node, always rounded or polycyclic in shape with clear (94.9%) boundaries. In the infiltrative, sarcoma-like variant of renal cell carcinoma, the tumor in all cases did not have a definite shape, its boundaries were vague, the kidney was enlarged in size, but its bean-shaped shape remained (90.9%). In the B-mode, the tumor was difficult to differentiate, its presence could be judged by the thickening of the parenchyma, in which there was no differentiation into cortical and cerebral matter.

The dependence of the structure of nodular renal cell carcinoma (62 observations) on its size was found. Tumors of less than 3 cm in size (17 patients) were homogeneous, mainly hyperechogenic (76.4%) and iso-echogenic (23.6%), a hypoechoic rim was visualized around the node in almost half of the observations, in all cases the acoustic effect of dorsal sound amplification with marginal attenuation was revealed. Small tumors in 100% of cases had a homogeneous echo structure. Tumors larger than 3 cm (45 patients) in most cases were acoustically heterogeneous, with alternating sites of different echogenicity.

Among them, 34 revealed isoechoic tissue with hypoechoic sites and 28 - hyperechoic tissue with isoechoic sites. In some patients, the tumor was homogeneous: hypoechoic - in 11.3% of cases (7 patients) or isoechoic - in 14.5% (9 patients). Small calcifications were sometimes detected inside the neoplasms (7.2%). Renal cell carcinoma often has a glandular structure. Such tumors consisted of acinar, tubular, cystic and papillary structures of various sizes and shapes. It

should be noted that in all 11 patients with the infiltrative form of renal cell carcinoma, the tumor also had a size larger than 3 cm, in 9 (81.8%) it was hypoechoic on echograms, in 2 - isoechoic.

Studies using Doppler techniques in patients with renal cell carcinoma revealed significant changes in the intrarenal angioarchitectonics and hemodynamics of the organ. In all patients of the examined group, we noted the displacement of the renal vascular network by the tumor and the rupture of the lobular and segmental arteries at the border with the tumor.

If in a normal kidney uniform vascularization and abundant microcirculatory bed are manifested in CD by continuous diffuse staining of the cortical substance of the kidney, then a defect of continuous staining occurs at the site of tumor localization due to the absence of a functioning microcirculatory bed. Against the background of this defect, only the newly formed pathological vascular network is visualized.

In our studies using Dopplerography, regardless of the size of the tumor, the phenomenon of diffuse parenchymal staining defect has always been present. Visualization of the vascular network was significantly improved with targeted examination in magnification mode.

To assess the features of vascularization of neoplasms, we divided all observations with nodular forms of renal cell carcinoma into 3 groups.

The first group included 42 patients in whom, with CD and ED, the color signals of blood flow inside the tumor merged during the study and formed a picture of the newly formed pathological tumor vascular network, the second group included patients who had multiple isolated color signals of arterial and venous blood flow, the third group included patients who had color signals inside the tumor there was no blood flow. Branched vascular network, according to the CD, was detected by us in 79.1% of patients, with ED - in 91.0% (the first group).

Less pronounced vascular structure in the form of multiple color signals of blood flow was in 11.9% of patients with CD and only 6.0% of patients with ED (the second group - 8). We found a complete absence of color signals from tumor vessels in 9.0% of patients with renal cell carcinoma with the help of CD and in 3.0% with ED (the third group).

The features of vascularization of infiltrative forms of renal cell carcinoma (11 patients) are: the presence of the phenomenon of displacement and dilation of vessels (100% of observations), rupture of one or more renal vessels inside healthy tissue lying to the tumor (81.8% of cases). In ED, a defect in the staining of the cortical layer is detected in the area of localization of the neoplasm. Pathological intra-tumor vascularization in CD and ED was not detected in any patient. In the majority (72.7%) of patients with sarcoma-like cancer, we also noted a characteristic diagnostic sign: in the area of the affected segment, one or two segmental arteries with CD gave a brighter staining. Analysis of the spectrum of blood flow curves in segmental arteries showed that its maximum systolic blood flow velocity in the arteries supplying the affected segment significantly exceeded the maximum systolic velocity in the segmental arteries feeding the intact parts of the kidney.

The use of pulsed-wave Dopplerography in renal cell carcinoma made it possible to clarify changes in intrarenal hemodynamics. For the majority of patients, the predominance of changes in the peripheral vascular bed of the kidneys was characteristic. Hemodynamics in the main renal arteries suffered in a small number of patients. While 79.7% showed an increase in the diameter of the renal artery, only 29.7% showed a slight increase in the maximum systolic blood flow rate by no more than 20%.

Intracellular hemodynamics was studied in 46 out of 67 patients with renal cell carcinoma. The group under consideration did not include 11 patients with infiltrative tumors and 10 patients with nodular renal cell carcinoma, in whom intracellular vessels were not detected during CD. The analysis of vascular architectonics and velocity distribution is carried out. In 33 patients (71.7%), large intra-tumor vessels with high-speed flows were detected. Since the blood supply to the tumor in the kidney is mainly due to the segmental level arteries, we compared the maximum systolic blood flow rate in the main vessels of the tumor with its level in normal renal segmental arteries.

In the vessels “feeding” the tumor, the maximum systolic blood flow rate was 1.5-2 times higher than in the neighboring segmental artery in 46.7% of cases, in 26.2% the excess was 2.1-3 times. It turned out that a large “feeding” vessel with a high blood flow rate was found with the same and rather high frequency both in patients with infiltrative forms of cancer (8 patients - 72.7%) and in nodular forms of renal cell carcinoma (49 patients - 73.1%).

Peripheral intracellular circulation was studied by us in patients in whom multiple color signals of blood flow, or a branched vascular network, were detected in ED, since the latter technique has a higher sensitivity to blood flow with lower speeds.

We compared the hemodynamic parameters of tumors larger than 3 cm (50 cases) and not exceeding 3 cm (17 observations). A pronounced variety of blood flow rates in small intracellular vessels was noted.

In the majority of patients (68.0%) with large tumors in the intracellular arteries, maximum systolic blood flow rates were recorded, comparable to those in both the arcuate, lobar, and segmental arteries of the intact part of the kidney. In 30.0% of cases of large tumors, as in all other observations, the maximum systolic blood flow rates were comparable to those in the lobular and arquatic arteries.

In addition to patients with renal cell carcinoma, 3 people with epithelial cancer of the renal pelvis were included in the group of patients with histologically verified kidney cancer. All patients were male aged 50 to 65 years. In 2 observations, the echographic pattern did not have tumor-specific features. In another 1 patient, papillary cancer had a focal form and was localized in the cups of the kidney.

During B-mode echography, a rounded area with a structure of lower echogenicity than parenchyma was visualized inside the kidney. Behind him, the effect of acoustic amplification was noted. The formation had a homogeneous structure, was surrounded by a calyx wall of increased echogenicity, a thinned layer of parenchyma was traced around. The use of Doppler methods did not reveal color signals of blood flow inside the described formations. Vascular architectonics of the kidney was slightly changed due to the dilation of the vessels of the affected segment.

Thus, based on the data obtained, it was found that in patients with a light-cell histological variant of renal cell carcinoma, the tumor has a rounded or polycyclic shape, clear boundaries, and non-organ growth prevails.

Malignant tumors smaller than 3 cm had a homogeneous structure, more often they are hyperechoic, in half of the cases - with a hypoechoic outer rim. The use of Doppler methods makes it possible to detect a pronounced intracellular vascular network in almost all patients with nodular forms of renal cell carcinoma (97.4%).

In 72.8% of cases of nodular renal cell carcinoma, the use of Doppler techniques makes it possible to identify the vessels feeding the tumor; the maximum systolic blood flow rate in them is 1.5-3 times higher than this indicator in segmental arteries. Renal cell carcinoma is characterized

by a variety of maximum systolic blood flow rates in intracellular vessels and the absence of a regular decrease in IR from larger vessels to smaller ones.

For patients with a spindle-cell (sarcoma-like) variant of renal cell carcinoma, the infiltrative nature of growth is characteristic, the tumor does not have a definite shape, its boundaries are vague, the kidney is enlarged in size, but its bean-shaped form is preserved, the echogenicity of the tumor is more often reduced. Kidney vascularization in these tumors has features: blood flow is not registered in the tumor itself, although a parenchymal staining defect is detected in ED, the main vessels of the kidney are displaced, in most cases (81.8%) their rupture is detected, quite often (72.7%) a vessel “feeding” the tumor with a high blood flow rate is detected.

The main ultrasound signs of localized kidney cancer in the B-scan mode can be considered: the presence of focal isoechogenic heterogeneous pathological parenchyma formation characterized by exo- or endophytic growth.

Whereas the Dopplerographic picture of kidney cancer is characterized by pathological vascularization of the tumor focus, which in our observations in 75% of patients was hypervascular in nature, with the presence of a characteristic network of pathological vessels.

Conclusions. Thus, the complex method of ultrasound diagnostics makes it possible to visualize segmental arteries (the area of the central echocomplex of the kidney), interlobular (pass in the medulla along the pyramids) and arc (bend around the bases of the pyramids at the border of the cortical and medulla) arteries of the kidney. Pathognomonic ultrasound symptoms of kidney neoplasm are the presence of an uneven external contour, as well as a focal formation penetrating to different depths into the renal parenchyma.

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