

Efficiency of Enucleation, Enucleoresection and Resection of Tumors Located in the Hilum of Kidney

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Abstract

The purpose of the research was a comparative analysis of various surgeries on tumors located in the hilum of kidney. The study included 55 patients aged 28 to 74 years with tumors located in the hilum of kidney (intraventricular neoplasms of kidneys). In 82% of cases, the tumors were in phase T1 (a-b). Distant metastases were not detected. The most common histological variant was clear-cell carcinoma (73%). The research involved analysis of 2 methods of surgical treatment: 1) organ-sparing enucleation and enucleoresection (n=28); 2) resection (n=27). On the average, the duration of thermal ischemia in the group of enucleations and enucleoresections was 11.5 minutes; ischemia lasted less than 10 minutes in 39.3% of patients; in the group of resections, it was 13 minutes, and only in 11% of patients ischemia lasted less than 10 minutes. Ischemia lasted longer than 20 minutes in the group of resections 1.5 times more frequently than in the group of enucleations and enucleoresections (25.9% vs. 17.9%; $p < 0.05$). In the conditions of Zero ischemia, enucleation was performed 5 times more frequently than resection ($p < 0.05$). Intraparenchymal clipping of branches of segmental vessels was made 3 times more frequently in organ sparing surgery; it allowed reducing the number of significant blood loss cases (over 200 ml) by 20%. Intraoperative complications in the group of resections were detected in 11.1% of cases, in the group of enucleations and enucleoresections – in 0% of cases. Complications during the post-surgery period (bleeding in the urinary tract, prolonged fever above 38°C; fistula resulting in ureteral stenting, nephrectomy) were noted in 3.6% of patients in the group of enucleation and enucleoresection, and in 22.2% of resection cases. Complications correlated with the size, phase of tumor, and regression of glomerular filtration rate.

Keywords: enucleation, enucleoresection, kidney tumor, organ-sparing surgery, resection.

INTRODUCTION

Over 200 thousand new cases of renal cell carcinoma are registered annually in the world, which, according to various authors, accounts for 2% to 5% of all cases of malignant neoplasms in adults, and for over 90% of kidney tumors (<http://oncology-association.ru/docs/clinical-recomend-rak-pochki.pdf>) [1-4]. It has been reported that 5-year survival rate is 71%; due to incomplete clinical evidence, one third of patients with diagnosed kidney cancer already have remote metastases, which worsen the prognosis [5, 6]. Surgery remains the only method of kidney cancer treatment, due to its resistance to traditional chemotherapy and radiotherapy. With the increasing use of laparoscopy, conservative surgery of kidney tumors has become the most important task of urologists, along with improvement of remote oncologic and functional results [7, 8]. However, tumors located in the hilum of kidney, or completely intrarenally, due to the proximity of great vessels, and potential deterioration of surgery results due to the long period of heat ischemia, are traditionally considered a relative contraindication to organ sparing surgery. This includes intraventricular formations in kidneys, the occurrence rate of which is about 6% to 7% [9, 10]. At the same time, partial nephrectomy - enucleation and enucleoresection - remains the standard for kidney formations' treatment; its efficiency in most cases is considered to be equivalent to resection and radical nephrectomy. [11].

In this regard, **the aim of this research** was a comparative analysis of efficiency of enucleation, enucleoresection and resection of kidney intraventricular tumors.

MATERIALS AND METHODS

During the period from 2013 to 2017, 996 kidney tumor surgeries were made at the urology clinic of the First MSMU n.a. I.M. Sechenov, including 602 (60.4%) organ sparing surgeries. In 55 patients (5.5% of all surgeries and 9.1% of all patients that had organ sparing surgery), intraventricular tumors were diagnosed.

Patients with intraventricular tumors of kidneys were aged 28 to 74 years (54.0 ± 11.6 ; Me = 54 years), including 36 (65.5%) men and 19 (34.5%) women of comparable age. In 57% of patients the tumor was localized in the left kidney, in 36% - in

the right kidney; in 7% of cases the tumors were on 2 sides, or the only kidney was affected.

In 44% of cases, the tumors were in phase T1a, in 38% of cases – T1b, in 14% of cases – T2, and in 4% of cases – T3. The most frequent histological variant of the tumor found after surgery was clear-cell carcinoma (73%), other variants (chromophobe, papillary, mixed cancer, oncocytoma, angiomyolipoma) were diagnosed in 27% of cases.

The research involved a comparative analysis of the two main methods of surgical treatment: 1) organ-sparing enucleation and enucleoresection (n=28), 2) resection (n=27). The absolute indications for organ sparing surgery (an only kidney, synchronous tumors) were in 7% of patients, relative indications (kidney stone disease, cysts, etc.) – in 20%, in other cases there were elective indications.

Both groups were statistically indistinguishable in terms of gender, age, localization and size of tumor, clinical evidence, and the background level of glomerular filtration rate (GFR), C-index and R.E.N.A.L., P.A.D.U.A scales (Table 1).

Dynamic assessment included clinical evidence (complaints, anamnesis, performance status, including blood pressure, heart rate, temperature); evaluation by scales R.E.N.A.L., P.A.D.U.A., C-index; the results of instrumental examination (ultrasound, CT/MRI); laboratory examination (general and biochemical blood analysis, calculation of GFR); and histological studies.

Statistical processing of the data was performed in SPSS 20.0 software with the use of parametric and nonparametric criteria for assessing statistical significance. The differences were considered veracious with $p < 0.05$. Descriptive statistics of the quality parameters were shown as frequencies (absolute, %), quantitative - median (Me), lower (25%) and upper (75%) quartile in cases where the parameter had a distribution function far from normal. For comparing two independent nonparametric samples, the Mann-Whitney test was used; for comparing two related nonparametric samples, the Wilcoxon test was used. Qualitative variables were compared using the χ^2 test (Pearson's chi-squared test, analysis of contingency tables). The correlation analysis was performed according to the Pearson and Spearman method.

Table 1. Characteristics of groups of patients separated according to the methods of surgical treatment of intraventricular kidney tumors

	Enucleation (n=28)	Resection (n=27)	p
Gender:			
male	21 (75.0%)	15 (55.6%)	0.133
female	7 (25.0%)	12 (44.4%)	
Age, years	55 [46 : 64]	57 [43 : 61]	0.637
Phase, TNM:			
T1a	6 (21.4%)	3 (11.1%)	0.426
T1b	4 (14.3%)	5 (18.5%)	
T2	1 (3.6%)	0	
T3	17 (60.7%)	19 (70.4%)	
Pain:			
absent	23 (82.1%)	24 (88.9%)	0.374
present	5 (17.9%)	3 (11.1%)	
Erythrocyturia: absent	26 (92.9%)	25 (92.6%)	0.681
present	2 (7.1%)	2 (7.4%)	
GFR upon admission	91.5 [67.5 : 105]	83.0 [63 : 105]	0.893
Tumor volume, cm ³	26.5 [15.7 : 52.8]	30.9 [17.2 : 53.5]	0.602
C-index	1.33 [1.22 : 1.56]	1.50 [1.17 : 1.82]	0.483
R.E.N.A.L	10 [8 : 10]	10 [8 : 10]	0.606
P.A.D.U.A.	11 [10 : 12]	11 [10 : 12]	0.701

Notes: the data are shown as absolute values (%) and medians [25% quartile; 75% quartile].

RESULTS AND DISCUSSION

During the research it has been found that the average time of thermal ischemia (Me) in case of enucleation and enucleoresection was 11.5 min with the interquartile interval of [0; 18] minutes; in the group of resections - 13 min [12; 20] min., which was longer by 13% on the average. Less than 10 minutes long ischemia occurred in case of enucleations and enucleoresections 3.5 times more frequently, while more than 20 minutes long ischemia occurred in the group of resections 1.5 times more frequently (Fig. 1).

It is important to note that in the conditions of Zero ischemia (without blocking the blood flow), enucleation was made 5.3 times more frequently than resection (39.9% versus 7.4%; $p < 0.05$). The differences are statistically veracious, and show the advantages of organ sparing surgery in relation to the duration of the organ heat ischemia.

Intraparenchymal clipping of segmental vessels' branches, especially arterial branches, was performed statistically veraciously 3 times more often in case of enucleations and enucleoresections than in case of resections (71.4% vs 22.2%; $p < 0.05$). This fact is due to better visualization of vessels that supply blood to the tumor in the nonvascular zone along the tumor pseudocapsule. The distribution of the number of clipped segmental branches in case of enucleations and enucleoresections was 1 – 53.6%, 2 – 3.6%, 3 and over – 10.7%, and, when in case of resections, - 14.8%, 7.4%, and 3.7%, respectively.

The amount of blood loss during surgery was statistically comparable in both groups, and averaged 200 ml, the maximum blood loss in the group of enucleations and enucleoresections was 500 ml, and in the group of resections - 1,600 ml. At the same time, over 350 ml of blood loss was observed in 28.6% of cases in the group of enucleations and enucleoresections, and in 11.1% of cases in the group of resections ($p > 0.05$).

The tendency to reducing the blood loss was observed during intraparenchymal clipping of segmental vessels. Thus, clipping of segmental branches in case of enucleations allowed to reduce by 15% the number of cases with significant (200 ml) blood loss (from 75% down to 60%), and in case of resections - by 12% (from 55% down to 43%).

Organ sparing surgery positively influenced reduction of various complications. Thus, intraoperative complications during enucleations and enucleoresections were not noted at all, in the group of resections they were noted in 11% of cases. A variety of complications in the post-surgery period (bleeding into the urinary

tract, urinary fistula that resulted in ureteral stenting or nephrectomy) was registered in 1 (3.6%) patient in the group of enucleations, and in 6 (22.2%) patients in the group of resections. The total number of complications was 3.6% ($n=1$) in case of organ sparing surgery, and 29.6% ($n=8$) - in the group of resections.

Correlation analysis has shown that complications are directly related to the tumor size ($r = 0.271$; $p < 0.05$), pTNM phase ($r = 0.255$; $p < 0.05$), and inversely related to the measure of GFR indicator ($r = -0.253$; $p < 0.05$).

The GFR had veraciously regressing dynamics in both groups, which indicated the growing chronic renal dysfunction. On the average, GFR after surgery decreased by 14%, and in 6 months - by 21%. In 40% of the operated patients, GFR after 6 months was below 60 ml/min. On the average, GFR in the group of enucleations and enucleoresections upon admission, one day after surgery, and 6 months after surgery was 91, 76 and 70 ml/min (6-month regression was 1.3 times; $p < 0.05$;) and in the group of resections - 83, 74, 69 ml/min ($p < 0.05$). No differences were found for this indicator between the groups in all points of study.

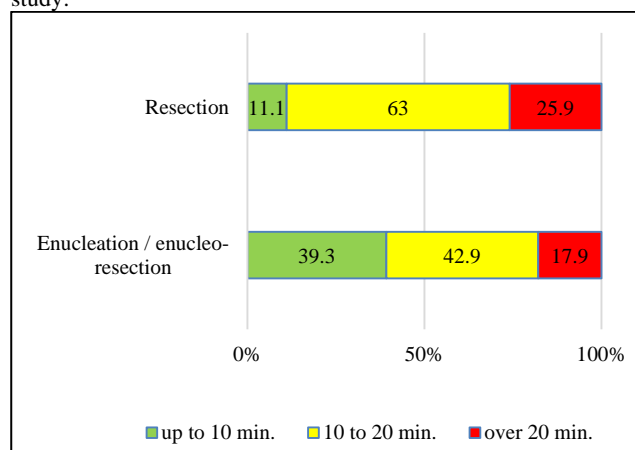


Fig. 1. Duration of heat ischemia during surgery ($p < 0.05$; χ^2 criterion)

CONCLUSIONS

The results of the study showed that enucleation and enucleoresection, unlike resection, are associated with shorter heat ischemia, which allows surgery in the conditions of Zero ischemia. This is accompanied by a decreased number of

intraoperative and post-surgery complications. Therefore, organ sparing surgery is the preferred method of surgical treatment of intraventricular tumors of kidneys. At the same time, it has been found that complications correlate with the size and the phase of the tumor with increasing renal dysfunction, which should be borne in mind in making the choice of the surgery method.

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