

LAPAROSCOPIC INTERVENTIONS FOR CYSTIC KIDNEY TUMORS

Abdurakhmanov D.Sh., scientific director .

Ergashev A.Sh., Ablyatifov A.B., Master of the Department of Urology.

Samarkand State Medical University.

Republic of Uzbekistan, Samarkand

Abstract. *Laparoscopic interventions for cystic kidney neoplasms are a modern and minimally invasive treatment method that significantly reduces the risk of complications and accelerates the recovery of patients compared with traditional open surgery. Cystic neoplasms of the kidneys can range from simple cysts to complex tumors with multiple septa, which requires an individual approach in choosing a treatment method. Laparoscopy allows for resection or nephrectomy with minimal injury, which makes this method preferable for the treatment of both benign and suspected malignancies. The use of a laparoscopic approach in cystic kidney disease has several distinct advantages: reduced blood loss, shorter hospital stay, rapid rehabilitation , and lower risk of infections .*

Key words: *Laparoscopic, kidney cysts, laparoscopic surgery.*

Introduction. Among benign cystic formations, the most common are simple renal cysts, which occur in 3% of urological patients. Kidney cancer ranks tenth in terms of frequency of development in the structure of all malignant neoplasms (Znaor A , 2015). In 90% of cases, renal cell cancer is diagnosed. Thanks to the development of imaging methods, the detection of kidney tumors at an early stage increases. Mortality (5-6%) in this pathology tends to decrease (Kaprin A.D., 2015; Siegel R. L. , 2016). According to modern domestic and foreign recommendations, the main method of treating various volumetric kidney lesions is surgical .

Relevance. Progressive development of surgical techniques using laparoscopic access to the kidney over thirty years has reduced the number of traditional open surgeries to a minimum. The technique of this approach is well studied and many aspects are standardized. The patient is usually positioned on the

operating table in a lateral position on the healthy side. Many surgeons in this position prefer to install the first optical port pararectally along the midclavicular line at the level of or above the navel so that the angle between the optical axis of the laparoscope and the plane of the surgical action is 90 °, the working ports are installed according to the triangulation principle (Patela V.R., 2011). In order to reduce the incidence of complications, reduce the time of surgical intervention and improve the ergonomics of the surgeon's work, various methods of preoperative planning have been developed. In most cases, they are based on modern methods of visualizing diagnostics, such as multispiral computed tomography (MSCT) and magnetic resonance imaging (MRI). However, the standard use of such methods of surgical planning does not take into account the displacement of abdominal organs and retroperitoneal space, which occurs when the patient is in the lateral surgical position.

Laparoscopic renal cystectomy is currently a routine operation, the technique of which has been worked out to the smallest detail. Based on this, no significant reliable differences in the volume of blood loss of intra- and postoperative complications were identified. A traumatic intraoperative complication was recorded in one patient in the SP group in the form of a spleen injury during cyst isolation, which was eliminated by spray coagulation. No injuries to large vessels or other organs were detected. In the postoperative period, there was 1 complication in the form of bleeding from the cyst resection area, which required relaparoscopy with coagulation and suturing of the bleeding site. Other early postoperative complications were not identified. This is due to the fact that at the preoperative stage, the surgeon already knows where the formation is located, where to place the ports, which improves the ergonomics and quality of his work.

Material and methods. Currently, the Bosniak classification of renal cysts is used, which determines the histopathological features of the cyst structure. Bosniak stage I cysts are the most common in the population, compared to other stages. The results of many studies speak for themselves: laparoscopic treatment of solitary cysts, if indicated, is one of the most effective methods of treatment and prevention

of relapses and cyst growth, in case of successful intervention. Usually, the use of transperitoneal access is recommended for anterior and parapelvic cysts, while retroperitoneal access is for posterior cysts. Laparoscopic decortication of simple renal cysts is an effective and safe method for treating cysts with exacerbation of the clinical picture (disappearance of symptoms in 95% of patients, the incidence of postoperative complications was only 1.4%). Key words: renal cysts, laparoscopy, surgical treatment.

Results and discussions. In general, the laparoscopic approach can be retroperitoneoscopic or transperitoneal. Usually, the use of the transperitoneal approach is recommended for anterior and parapelvic cysts, while the retroperitoneal approach is for posterior cysts. A study conducted by researchers from Italy described the performance of laparoscopic decortication (deroofing) in 19 pediatric patients (mean age was 12.2 years) with Bosniak stage I and II renal cysts with exacerbation of the clinical course. Percutaneous aspiration with/without sclerotherapy was performed in 9 of 19 patients, after which a relapse of the cyst was noted. After the laparoscopic intervention, all children showed no complaints or symptoms. A functional study of the kidneys was performed using MAG3 renal scintigraphy, the results of which were satisfactory in all patients (Antonio M. , Lucia P ., 2018). In another work compiled by researchers from Ukraine, a comparative analysis of various surgical methods for treating simple renal cysts was conducted in 552 patients between 1989 and 2012. Laparoscopic intervention was performed in 42 patients, while the recurrence rate was 4.8% (2 patients), complications occurred in only one patient, and normalization of blood pressure was observed in 92.9% of patients. As a result of the comparative analysis, the following conclusions were made: the authors recommend using laparoscopic treatment if the cyst diameter exceeds 10 cm; laparoscopic excision should be performed on cysts adjacent to the vascular pedicle of the kidney. Conclusions Thus, taking into account the above data, a conclusion should be made about the advisability of using laparoscopic decortication due to its high efficiency. This technique allows achieving successful clinical results in 95% of patients, and the risk of complications

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is reduced to a minimum (about 1.4%). It is certainly important to take into account the presence of clear indications described in the work, as well as to correlate them with absolute and relative contraindications.

A renal cyst is an anomaly of the kidney structure, a common urological pathology characterized by the formation of one or more closed cavities in the kidney, limited by a connective tissue capsule and containing serous fluid. In the general population, renal cysts are common up to 20–50% (Bas O., Nalbant I., Can Sener N., 2015; Skolarikos A., Laguna MP., 2016). Simple renal cysts are most often asymptomatic and are often detected by chance during an ultrasound examination performed for other reasons. It is believed that the incidence of this pathology increases with age. Thus, during a screening ultrasound examination in patients aged 30–49, 50–70 and over 70 years, they were detected with a frequency of 1.7, 11.5 and 22.1%, respectively, and when performing computed tomography (CT) among patients aged 17–39, 40–59, 60–80 and over 80 years - with a frequency of 8.2, 27.5, 49 and 60.6%, respectively. Clinically, renal cysts often manifest themselves as pain, discomfort, a sensation of a foreign body in the lumbar region, nephrogenic arterial hypertension, impaired urodynamics of the upper urinary tract, hematuria, impaired renal function, and urinary tract infections. Renal cysts tend to grow; according to the literature, the average growth rate is about 1.6 mm (5%) per year; on average, simple renal cysts grow 2 times in 10 years. Today, endoscopic excision of the renal cyst wall is becoming increasingly common, which, unlike percutaneous puncture methods, makes it possible to conduct a histological examination of the tissue. In 1986, American radiologist M. Bosniak published an article in the journal *Radiology*, in which he proposed a classification of cystic kidney lesions and tactics for further management of patients with this pathology, based on the results of CT with the use of intravenous contrast enhancement. The next version of the classification by M. Bosniak was published in 2019, as before, it includes 5 categories. Its main objective is to assess the risk of malignancy of renal cysts with the improvement of the definition criteria for each of the categories. The development of ultrasound examination methods contributed to the early diagnosis

of renal cysts. Puncture of a renal cyst under ultrasound guidance is a minimally invasive surgical intervention performed in most urology departments. However, the inability to obtain material for histological examination, as well as the high recurrence rate, which, according to a number of authors, varies from 12.5 to 33% when using sclerosing solutions and up to 90% with a simple puncture, led to the development of endoscopic surgeries for cystic kidney diseases. The first description of laparoscopic excision of the wall of symptomatic renal cysts, the advantages and disadvantages of the method was presented by J. Hulbert in 1992. Currently, according to domestic and foreign clinical studies, the most effective method for treating renal cysts is laparoscopic excision of the cyst. However, despite its high efficiency, the urological community is skeptical about this method of treatment, given its high invasiveness, the need to use endotracheal anesthesia, which is not always possible in patients with concomitant, for example, cardiac or bronchopulmonary pathology.

The approach to managing patients with cystic renal lesions has changed over the 35 years since the first publication of M. Bosniak's classification. Evaluation of the risk of malignancy of renal cysts and the ability to predict the course of the disease, as well as the elimination of symptoms, are fundamental criteria for deciding on the need for surgical treatment for each patient. Some authors present results according to which the frequency of malignancy for cysts of category I according to the Bosniak classification is less than 1%, category II - less than 3% and category IIF - 5%. Other authors note malignancy in 25% of cysts of category IIF and in 54.2% of cysts of category III (Smith A. D. , Remer E. M. , Cox K. L. , 2012). Other literature data note a higher frequency of malignancy of category IIF cysts - up to 15.1% (Darenkov S.P., Proskokov I.A., Agabekyan A.A., Trofimov I.A., 2018). Based on the data we obtained , the risk of malignancy of category IIF cysts can reach 36.4% and category III - 66.7%. The method of surgical treatment of renal cysts by puncture and aspiration of the contents is practically devoid of complications, recurrence of cysts was noted in 10.26% of cases. Atypical cells were not detected in any observation. One clinical case is described in which, after

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drainage of a cyst larger than 11 cm, suppuration occurred, which required revision of the kidney and resection of the cyst dome. It is worth noting the clinical case of a patient from our study with a category IIF renal cyst up to 131 mm in diameter in the upper segment with a thin capsule and the presence of a parietal soft tissue component that does not accumulate contrast. Figures 1–4 show multispiral CT images of the patient before surgery with intravenous contrast in various sections with demonstration measurements. A surgical intervention was performed - laparoscopic excision of the cyst wall. During the operation, after opening the wall of the formation, up to 650 ml of brown fluid with yellow-brown flakes were evacuated. Upon receipt of the histological conclusion, renal cell carcinoma was verified, and delayed radical nephrectomy was performed. Morphological examination of the removed kidney after repeated surgery confirmed the diagnosis of papillary carcinoma, type 2, G2 according to Fuhrman. T3N0M-R0.

Surgical treatment of symptomatic renal cysts is reasonable and necessary, which is confirmed by symptom relief and verification of cysts suspicious in terms of the probability of oncological pathology. Puncture drainage and sclerotherapy methods are less radical compared to other methods of surgical treatment, and when puncture parapelvic cysts, they pose a risk of damaging the renal pelvis and require the operator to have experience in using ultrasound. At the same time, this type of treatment is justified in elderly and senile patients with high surgical risk. Excision of the cyst or resection of the kidney by laparoscopic access is the most effective treatment method with a comparable level of recurrence probability, meeting modern treatment safety requirements. An undeniable advantage of the method is the possibility of histological examination of cyst wall tissues, ensuring a high level of patient satisfaction, relieving the patient of clinical symptoms, and therefore it can be considered preferable.

The only effective way to treat cystic lesions of the renal parenchyma is surgery. The use of minimally invasive surgical treatment methods is a priority for pediatric surgery (Akramov N.R., Baibikov R.S., 2016). Due to the widespread introduction of ultrasound examination methods, not only diagnostics, but also

treatment of cysts using puncture have become available to most medical institutions. The view of urologists on the treatment of cystic kidney lesions has changed significantly; a sharp reduction in open surgeries has been noted (Malkhasyan V.A., Semenyakin I.V., Pushkar D.Yu., 2017). Despite the minimal invasiveness of puncture methods, cyst recurrence occurs in 80–90% of cases. In addition to puncture, sclerosing solutions are introduced into the cyst cavity, which are then drained with step-by-step sanitation. However, even when using sclerosing solutions, the recurrence rate of cysts remains high and, according to some authors, it varies from 12.5 to 33%, while according to other authors, the incidence of complications after puncture and sclerotherapy of renal cysts reaches 40–60%. The advent of endovideo technologies has opened up unique opportunities in the use of new minimally invasive methods. Currently, laparoscopy is one of the common methods as an alternative to traditional open surgeries, and its effectiveness has been proven by many authors (Korneev I.A., Kiselev A.O., Ishutin E.Yu., 2017).

Over a 6-year period, 22 nephrectomies were performed in 20 patients with ARPKD. Unilateral nephrectomy was performed in 12 cases, and one-stage bilateral surgery was performed in 8 cases. The average age of patients was 51.3 ± 7.9 years. Nephrectomy was mainly performed laparoscopically (17 patients), and lumbotomy was performed in 3 patients. There was no need for conversion in laparoscopic interventions. Results. Open surgery was performed only due to uncontrolled macrohematuria and cyst suppuration. All patients were transferred to the intensive care unit after surgery. Repeated surgery due to bleeding was required in 33.3% of cases. The inpatient treatment period was 15.1 ± 2.8 days. There was a fatal outcome in 1 case. Laparoscopic nephrectomy was performed in 17 patients, unilateral – 7, staged bilateral – 2 and one-stage bilateral – 8 patients. In 41% of cases, in addition to pain syndrome and hypertension, nephrectomy was due to the upcoming kidney transplant. The average volume of the removed kidneys was 3138.74 ± 356.30 ml. The average bed-day was 8.86 ± 2.4 days. Conclusion. The increase in the number of patients with ARPKD and ESRD raises the issue of improving their quality of life, which can be achieved by performing mono- or bilateral nephrectomy. However,

there are no clearly regulating criteria that determine the indications for these types of surgical intervention. Despite certain difficulties, we believe that performing nephrectomy by laparoscopic access in patients with ARPKD and ESRD is the most optimal.

Polycystic kidney disease makes a significant contribution to the structure of all causes leading to end-stage chronic renal failure (ESRD), and occupies one of the leading places in the list of urological diseases - up to 8.1% (Banaga A. SI . , Mohammed E. B. , 2015) . Autosomal dominant polycystic kidney disease (ADPKD), for example, in the United States is the cause of the development of end-stage chronic kidney disease (ESRD and CKD, respectively) in 5% of patients receiving renal replacement therapy, and this figure is gradually increasing. Brazilian specialists record that this pathology is the most common nosology among urological diseases, accompanied by the development of ESRD, - 6.2% (Sarmento L. R. , Pontes M. X. , 2018). ARPKD is genetically heterogeneous, and the development of renal failure in this pathology varies greatly . Studies by H. Mitcheson et al. demonstrated that approximately 70% of patients with ARPKD develop renal failure by the age of 65. Recurrent urinary tract infections, nephrolithiasis, as well as constant pain, discomfort in the lower back and abdomen are frequent "companions" of patients with ARPKD. Studies by J. Grantham et al. also proved that an increase in kidney volume accompanies some complications leading to the appearance of macrohematuria or pyelonephritis, and is a prognostic risk factor for the development of CKD. An increase in the size of cysts can lead to activation of the renin-angiotensin-aldosterone system and the development or progression of hypertension syndrome. According to domestic authors, the use of laparoscopic technologies significantly reduces the trauma of the intervention, the frequency of postoperative complications and mortality of patients with this pathology. The advantage of laparoscopic access is the virtual absence of complications accompanying laparo- or lumbotomy access. The risk of severe postoperative complications of open interventions, such as severe intestinal paresis

and sepsis, is disproportionately high, which does not always allow to avoid fatal outcomes (Reznik O.N., Ananyev A.N., 2016). Studies by American colleagues have shown that bilateral laparoscopic nephrectomy is a safe and reliable option for surgical treatment of patients who require simultaneous removal of both kidneys. However, an increase in kidney volume of more than 3500 cm³ leads to an increased risk of open conversion. Staged laparoscopic nephrectomy provides effective symptom relief in patients with ARPKD associated with heaviness, pain and discomfort in the abdominal cavity. The method and extent of surgical treatment should be carefully selected, taking into account the effectiveness, safety and risk minimization, given the already reduced resources of the body of these patients. It is worth noting that one of the indications for nephrectomy of polycystic kidneys is the planned transplantation. At the same time, there is no clear opinion on the need to perform nephrectomy before, after or during kidney transplantation. Some studies show no difference in patient survival and graft engraftment (Bhutani G. , Astor B. C. , 2021). The use of bilateral nephrectomy improves the quality of life (QOL) of most patients because it eliminates pain, hypertension, and eliminates the increased risk of developing cancer in the urogenital tract. However, the exclusion of the kidney from participation in the regulation of homeostasis affects the decrease in erythropoietin production, which must be taken into account when planning the operation. The progressively increasing number of patients with ARPKD and ESRD requires continued search and definition of clearer criteria and timing for performing bi- or unilateral nephrectomy, taking into account the high probability of developing infectious, hemorrhagic and other complications, as well as the influence of renal function on other homeostatic processes of the body.

Conclusion. The developed method of preoperative planning with determination of the optimal point for installation of the optical trocar in laparoscopic operations on the organs of the retroperitoneal space is effective, technically simple and allows to improve intraoperative parameters and reduce the

frequency of iatrogenic surgical complications, especially at the stage of mastering laparoscopic operations.

Thus, taking into account the above data, a conclusion should be made about the expediency of using laparoscopic decortication due to its high efficiency. This technique allows achieving successful clinical results in 95% of patients, and the risk of complications is reduced to a minimum (about 1.4%). Undoubtedly, it is important to take into account the presence of clear indications described in the work, as well as to correlate with absolute and relative contraindications.

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