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QUALITY OF LIFE OF PATIENTS WITH KIDNEY STONES

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Relevance. In 2013, the Wisconsin Stone Quality of Life Questionnaire (WISQoL) was developed – a specific tool for assessing the quality of life (QoL) in patients with urolithiasis. **Aim.** To determine the possibility of using the WISQoL and SF-36 questionnaires to study the treatment results of patients with kidney stones. **Materials and methods.** The study included 218 patients with nephrolithiasis. Patients were divided into 2 groups: the first – the size of the stone up to 10 mm and the second – from 11 to 20 mm. At the first stage, the efficacy of treatment patients by the extracorporeal shock wave lithotripsy (ESWL) and percutaneous nephrolitholapaxy (PNL) 1 week, 1 and 3 months after surgery was compared. Questionnaires were used to study factors affecting the QOL of patients, including: gender, age, number, density and size of stones, hydronephrosis, stone free rate (SFR), type of surgery. At the next stage, the dynamics of changes in scores for the domains of questionnaires at different stages of treatment was evaluated. **Results.** The efficacy of treating kidney stones up to 1 cm in size after 3 months with ESWL was 86,1% and PNL – 94,4 %, while stones up to 20 mm using ESWL – 73,4% and percutaneous techniques – 90,6%. Gender, age, stone size, SFR affected the QoL of patients with nephrolithiasis, while the number and density of stones, the presence of hydronephrosis and the type of operation were not significant. Patients 1 week after PNL had lower QoL scores in the domains of social impact and impact on vitalyty of WISQoL and mental heals of SF-36. After 1 month, these changes were determined only in the social impact domain and completely regressed by the 3rd month. **Conclusion.** SFR after ESWL and PNL in the first group is comparable, in the second group, percutaneous operations were 17,2% more effective. Male gender, age up to 40 years, stone size more than 1 cm, and also not reached SFR negatively affects patients with nephrolithiasis. Compared with ESWL and PNL is accompanied by the worst dynamics of QOL scores only 1 week after the operation; upon further observation, negative changes are leveled.

Keywords: urolithiasis; kidney stones; treatment effectiveness; extracorporeal shock wave lithotripsy; percutaneous nephrolitholapaxy; quality of life; Wisconsin Stone Quality of Life Questionnaire WISQoL; SF-36.

КАЧЕСТВО ЖИЗНИ БОЛЬНЫХ НЕФРОЛИТИАЗОМ

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Актуальность. В 2013 г. разработан Висконсинский опросник (WISQoL) — специфический инструмент для оценки качества жизни (КЖ) у больных мочекаменной болезнью. **Цель.** Определение возможности использования опросников WISQoL и SF-36 для изучения результатов лечения пациентов с камнями почек. **Материалы и методы.** В исследование включены 218 пациентов с нефролитиазом. Больные были разделены на 2 группы: первая — размер камня до 10 мм и вторая — от 11 до 20 мм. На первом этапе сравнивали эффективность лечения пациентов методами дистанционной литотрипсии (ДЛТ) и перкутанной нефролитолапаксии (ПНЛ) через 1 неделю, 1 и 3 месяца после операции. С помощью опросников исследовались факторы, влияющие на КЖ пациентов, среди которых: пол, возраст, количество, плотность и размер камней, гидронефроз, достигнутое состояние, свободное от камней (SFR), вид оперативного вмешательства. На следующем этапе оценивали динамику изменения баллов по доменам опросников на разных этапах лечения. **Результаты.** Эффективность лечения камней почек размером до 1 см через 3 месяца методом ДЛТ составила 86,1 % и ПНЛ — 94,4 %, в то время как камней до 20 мм с помощью дистанционного дробления — 73,4 % и перкутанных методик — 90,6 %. Пол, возраст, размер камня, SFR влияли на КЖ пациентов с нефролитиазом, в то время как количество и плотность камней, наличие гидронефроза и вид операции не имели значимости. Пациенты через 1 неделю после ПНЛ имели более низкие показатели качества жизни в доменах социального функционирования и влияния на здоровье (WISQoL)

и психологического функционирования SF-36. Через месяц указанные изменения определялись только в домене социального влияния и к третьему месяцу полностью регрессировали. **Заключение.** SFR после ДЛТ и ПНЛ в первой группе сопоставимо, во второй группе перкутанные операции были эффективнее на 17,2 %. Мужской пол, возраст до 40 лет, размер камня более 1 см, а также не достигнутое SFR негативным образом влияет на пациентов с нефролитиазом. ПНЛ в сравнении с ДЛТ сопровождается худшей динамикой показателей качества жизни только на 1 неделе после операции, при дальнейшем наблюдении негативные изменения нивелируются.

Ключевые слова: мочекаменная болезнь; камни почек; эффективность лечения; дистанционная литотрипсия; перкутанная нефролитолапаксия; качество жизни; Висконсинский опросник WISQoL; опросник SF-36.

INTRODUCTION

Background. In the recent years, the scientific literature has been presented a large body of work on the quality of life (QoL) [1, 2]. This tendency is explained by the need for an integrated approach for studying the effectiveness of a therapy. A subjective assessment of a person's condition becomes equally significant as an objective improvement in the parameters of laboratory and instrumental examination after treatment. The QoL can generally be determined through questionnaires developed in major medical studies; these questionnaires help to obtain a numerical equivalent associated with a change in the health status of the respondent [3].

Moreover, for the majority of nosological units at various medical specialties, a specific questionnaire has been developed to assess the QoL. For instance, in urology, questionnaires such as IPSS (International Prostate Symptom Score), PROM-USS (Patient-Reported Outcome Measure for Urethral Stricture Surgery), KHQ (King's Health Questionnaire), and OAB-q (the Overactive Bladder Questionnaire) are used for screening the diseases of the prostate gland, urethral strictures, and inappropriate urination [4–7]. Surprisingly, despite the widespread prevalence, a tool for assessing the QoL of the patients particularly suffering from kidney stone disease (KSD) has appeared relatively recently. The Wisconsin Stone Quality of Life Questionnaire (WISQoL) was first mentioned in 2013 by K. Penniston et al. [8]. The suitability of this questionnaire in patients with urolithiasis was further confirmed in 2017 during a multicenter study in American and Canadian clinics [9]. A year later, the Russian-language version of the WISQoL was validated, which enabled us to study the influence of various factors associated with the disease on all spheres of patients' lives [10].

According to the clinical guidelines, kidney stones up to 20 mm in size allow for the possibility of using the entire range of contemporary surgical interventions, namely extracorporeal lithotripsy (ESWL) and endourological surgeries, such as percutaneous nephrolitholapaxy (PNL), and transurethral nephrolithotripsy [11, 12]. While the effectiveness of various surgical techniques used for nephrolithiasis treatment depends on many clinical factors and varies over a wide range (51–100%) [13–17], the results of the KSD treatment are determined not only by the choice of patient management tactics but also by an comprehensive approach in the pre- and postoperative period, taking into account the QoL of the patients.

The present study was aimed to determine the possibility of using the WISQoL and SF-36 questionnaires in assessing the results of the treatment and postoperative monitoring of patients with nephrolithiasis.

Based on the aim of the study, the following tasks were set:

(1) studying the clinical efficacy of extracorporeal and percutaneous nephrolithotripsy in treatment of kidney stones

(2) determining the clinical factors influencing the QoL of patients with nephrolithiasis; and

(3) assessing the dynamics of the QoL change after different types of treatment.

MATERIALS AND METHODS

The present study was conducted at the urology clinic of the Kirov Military Medical Academy (St. Petersburg) and included 218 patients (139 men and 79 women) over 18 years of age with a confirmed clinical diagnosis of urolithiasis, stone of renal pelvis, upper, middle, or lower group of renal calix up to 20 mm in size. The average age of the patients was 50.8 ± 11.5 years (18–82 years).

To establish the diagnosis and determine the management approach and indications for selecting a treatment option, all patients underwent the traditional urological examination (clinical and laboratory, ultrasound, radiological, etc.). While the examination data comprised of the patients' complaints,

history taking, risk factors for the disease, and the results of physical examination, the laboratory techniques included clinical analysis of blood and urine, biochemical blood test (for determining the levels of urea, creatinine, and electrolytes), and urine culture (for determining the sensitivity of microorganisms to antibacterial drugs). In order to visualize the calculus and clarify its main characteristics, as well as confirm renal function, an ultrasound examination, survey radiography of the urinary tract, and excretory X-ray or computed tomography (CT) urography were performed.

The treatment approach was chosen in accordance with the Russian and European clinical guidelines for the treatment of KSD. The indications for active stone removal included calculi causing severe pain, hematuria, obstruction or impaired renal function, stone growth and localization in the renal pelvis, and calyx calculi >15 mm in size. In addition, some professions were attributed to social indications, for example, military personnel of special units or those involved in flight work.

Moreover, kidney stones up to 1 cm in size were predominantly subjected to ESWL, and while mini-PNL was the preferred technique, percutaneous techniques were used only in the case of ESWL ineffectiveness. ESWL and percutaneous methods were often equally used for uroliths of 10–20 mm, and the decision to use a certain method was based on the patient's request after a detailed presentation of the aspects of these surgeries.

While the ESWL was performed using a Medolit apparatus (Russia) under an X-ray guidance at a frequency of 90 pulses/min using an electromagnetic generator, the PNL was performed by a team of surgeons using Karl Storz nephroscopes (Germany) of different diameters (24 Ch for standard PNL, 12 Ch for mini-PNL). Access to the calyx-pelvis system was implemented under an X-ray control. The formation of the nephrostomy path was performed according to a single-step technique with the installation of an Amplatz 30 Ch casing for standard PNL and a metal tube of 16.5/17.5 Ch for mini-PNL. Lithotripsy was performed using a combined ultrasound and pneumatic Lithoclast Master (Switzerland) and laser lithotriptors Dornier Solvo 40 (Germany) or FiberLase U2 (Russia). Finally, the surgery was completed with the installation of a 14–20 Ch nephrostome, which was removed on days 1–4.

Further, the QoL was assessed using the SF-36 nonspecific questionnaire and the Russian-language version of the WISQoL questionnaire. While the SF-36 questionnaire contains eight scales that form two indicators, the physical (PhF) and psychological (PsF) functioning [18], the WISQoL consists of 28 questions grouped into four domains, namely social influence (SI), emotional influence (EI), health effect (HE), and impact on vital activity (IVA). Besides, the methods of calculation and interpretation of the results have been described in detail in our previous works [9, 10]. When assessing the QoL, a higher score (maximum 100) on the WISQoL and SF-36 questionnaires typically corresponds to a better patient's well-being.

In the present study, the patients were divided into two groups based on the size of the stone. Group 1 included patients with stones <10 mm in size and group 2 included patients with stones 11–20 mm in size. Depending on the type of surgical treatment, each group was further divided into two subgroups, where A represented *ESWL* and B represented PNL (Table 1).

In stage 1, the efficiency of the treatment was assessed using the stone-free rate (SFR), which implied complete absence of a stone or the presence of clinically insignificant fragments <4 mm in size after a surgical intervention. The SFR was recorded one week, one month, and three months after the treatment.

Table 1 / Таблица 1

Allocating patients with urolithiasis to treatment groups
Распределение пациентов с мочекаменной болезнью по группам исследования

Subgroup	Group 1 (up to 10 mm)	Group 2 (11–20 mm)
A (ESWL)	72	64
B (PNL)	18	64
Total	90	128

Note. ESWL — extracorporeal shock wave lithotripsy, PNL — percutaneous nephrolitholapaxy.

Table 2 / Таблица 2

Clinical characteristics of patients

Клиническая характеристика больных

Parameter	Group 1 (up to 10 mm)		Group 2 (11–20 mm)	
	A (ESWL) *n* = 72	B (PNL) *n* = 18	A (ESWL) *n* = 64	B (PNL) *n* = 64
Age years	45.6 ± 14.6	49.9 ± 13.9	49.8 ± 8.9	50.9 ± 8.6
Gender, m/f	48/24	13/5	37/27	41/23
Body mass index, kg/m^2	27.7 ± 2.3	25.4 ± 4.3	25.1 ± 3.1	29.1 ± 2.8
Stone size, mm	8.1 ± 1.1	8.1 ± 1.7	13.3 ± 1.5	16.3 ± 2.0
Stone localization, n. (%):				
pelvis	23 (31.9%)	5 (27.8%)	41 (64.1%)	45 (70.3%)
upper, middle, or lower calyx	49 (68.1%)	13 (72.2%)	23 (35.9%)	19 (29.7%)
Number of stones:				
1	48 (66.7%)	15 (83.3%)	36 (56.3%)	34 (53.1%)
2 or more	24 (33.3%)	3 (16.7%)	28 (43.2%)	30 (46.9%)
Maximum stone density, Hounsfield units	931.3±204.0	1225.2 ± 153.4	1139.8 ± 275.8	1197.2 ± 321.3
Hydronephrosis, n. (%)	14 (19.4%)	3 (16.7%)	17 (26.6%)	19 (29.7%)
WISQoL*, points:				
SI	71.0 ± 18.0	69.7 ± 14.4	60.8 ± 15.2	58.6 ± 14.8
EI	64.3 ± 19.7	57.1 ± 21.0	57.3 ± 10.8	66.3 ± 12.7
HE	76.2 ± 18.2	62.7 ± 18.8	44.3 ± 21.7	50.2 ± 18.2
IVA	79.3 ± 25.4	70.5 ± 17.3	43.8 ± 17.9	50.7 ± 17.6
Total score	67.6 ± 15.6	64.8 ± 13.5	54.9 ± 15.3	57.5 ± 17.0
SF 36**, points:				
PhF	37.4 ± 7.5	32.1 ± 7.0	36.6 ± 10.8	38.5 ± 9.2
PsF	39.5 ± 8.4	42.5 ± 8.7	30.4 ± 12.5	31.0 ± 13.7

Note. * WISQoL domains: SI – social influence, EI – emotional influence, HE – health effect, IVA – influence on vital activity. ** Domains SF-36: PhF – physical functioning, PsF – psychological functioning. ESWL – extracorporeal lithotripsy, PNL – percutaneous nephrolitholapaxy.

Then, using questionnaires, the influence of various clinical factors on QoL in patients with kidney stones was studied. In particular, the values of the corresponding questionnaires before and after the treatment were compared by domain and in the total amount of points. The characteristics such as gender, age, number, density and size of stones, presence/absence of hydronephrosis, stone-free state achieved during treatment, and type of surgery were selected for the study.

Finally, at the last stage, the dynamics of the total scores for the domains of both questionnaires were evaluated in 1 week, 1 and 3 months after ESWL and PNL separately for both study groups

Most patients with kidney uroliths were male overweight patients of the middle age group with symptoms of upper urinary tract obstruction, mainly single stones, with a period of <1 week from the first clinical symptoms to the surgery. Depending on the group, the calculi had an average density from 931 ± 249 to 1225.2 ± 153.4 HU and were more often found in the renal pelvis than in the calyx of the kidney. Table 2 presents the clinical characteristics of patients in different groups.

A comparison of the subgroups of patients in terms of preoperative characteristics, however, did not reveal any significant differences ($p > 0.05$).

The database was created in Microsoft Excel 2010 in Windows 7 operating system. The statistical analysis of the results was performed using the Past program and the Data Analysis module of Microsoft Excel 2010. The differences were considered significant at $p < 0.05$.

RESULTS AND DISCUSSION

Efficiency of the treatment of patients with kidney stones

The ESWL was effective for stones up to 1 cm in size after one week in 45 (62.5%) patients, one

month in 54 (75.0%) patients, and three months in 62 (86.1%) patients (see Figure).

It is important to know that after performing the PNL in group 1, the SFR was achieved after one week in 15 (83.3%) patients, one month in 16 (88.9%), and three months in 17 (94.4%) cases. While in group 2, when performing the ESWL, a stone-free state was recorded after one week in 34 (53.1%) patients, one month in 43 (67.1%), and three months in 47 (73.4%) patients. Moreover, for patients with renal stones of 11–20 mm in size, the PNL was effective after one week in 53 (82.8%) patients, one month in 55 (85.9%), and three months in 58 (90.6%) cases.

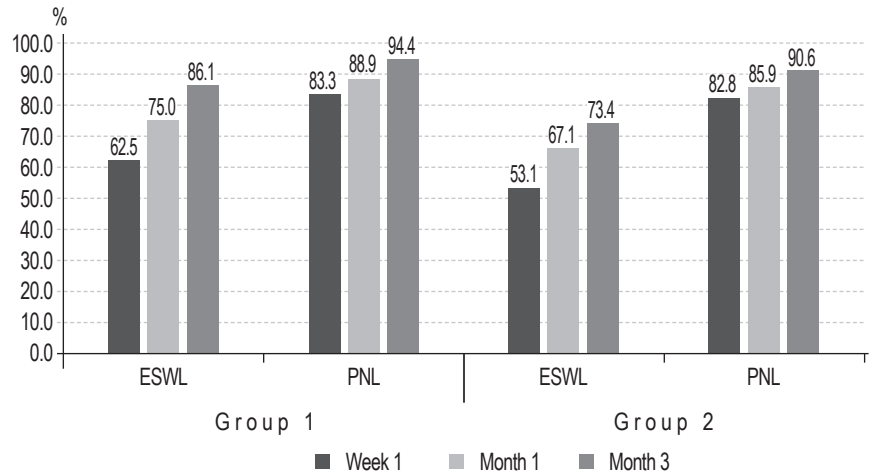
According to a meta-analysis by P. Yuri et al. [16], in the group of patients with renal calculi of 10–20 mm in size, the SFR was achieved in 64.7% and 90.8% of cases three months after the ESWL and PNL, respectively. Similar data were obtained in G. Bozzini et al.'s study [17] which compared the effectiveness of <2 cm in diameter calculi treatment in the lower group of calices. Complete elimination of stones was detected in 61.8% of cases after *ESWL* and in 87.3% of cases after percutaneous surgery. Similar results in this category of patients were obtained by H. Zhang et al. [19], where SFR was achieved in 73% and 98% of cases after ESWL ultramini-PNL, respectively. Therefore, our data on clinical efficacy correlates with the findings of other previous studies. In general, the ESWL and PNL in lithotripsy of stones up to 1 cm in size had a similar percentage of effectiveness in the long-term postoperative period, 86.1% and 94.4%, respectively ($p > 0.05$). However, a significant difference was recorded in the group of patients with stones 11–20 mm in size. Percutaneous methods, in comparison with the *ESWL*, demonstrated significantly higher rates of clinical efficacy throughout all postoperative stages of monitoring.

Clinical factors affecting the QoL in patients with nephrolithiasis

The influence of factors such as gender, age, size of the stone and complete removal of the stone achieved during the surgery on patients' QoL was established (Table 3).

While according to the SF-36 questionnaire, no differences in the increase in points among the male and female populations were observed, according to the WISQoL, men had a smaller increase in the total points in the domain of SI in contrast to women (11.8 ± 13.6 vs 25.5 ± 8.7, respectively) ($p < 0.05$). This is explained by the fact that nephrolithiasis presupposes a disability for a certain period of time and therefore affects significantly the social functioning of men to a greater extent.

Interestingly, age was an important clinical factor determining the change in the QoL levels during the treatment. Therefore, patients over 40 years of age after the treatment showed a higher statistically significant increase in the total points of all domains, excluding the effect on the vital activity of the WISQoL, in contrast to the younger patients. Also, the loss of ability to work is more significant for the young population, and therefore, in the domain of SI, the ratio of the difference in



Dynamics of the effectiveness of treatment of patients with kidney stones. ESWL – extracorporeal shock wave lithotripsy, PNL – percutaneous nephrolitholapaxy

Динамика эффективности лечения пациентов с камнями почек. ДЛТ — дистанционная литотрипсия, ПНЛ — перкутанная нефролитолапаксия

Table 3 / Таблица 3

The effect of clinical factors on QoL

Влияние клинических факторов на качество жизни

Attribute	SF-36		WISQoL				
	Δ PhF	Δ PsF	Δ Total score	Δ SI	Δ EI	Δ HE	Δ IVA
Gender							
M / F	5.8 ± 3.0 / 6.1 ± 2.9	5.4 ± 3.0 / 7.0 ± 2.4	18.5 ± 12.6 / 19.7 ± 12.2	11.8 ± 13.6 / 25.5 ± 8.7*	26.7 ± 18.7 / 23.6 ± 23.8	20.7 ± 18.1 / 11.5 ± 13.4	18.9 ± 22.5 / 31.9 ± 29.2
Age							
Under 40 years / Over 40 years	2.1 ± 3.8 / 10.7 ± 4.5*	4.4 ± 5.8 / 12.1 ± 4.3*	12.2 ± 9.5 / 27.6 ± 13.7*	7.2 ± 11.1 / 27.2 ± 14.8*	20.4 ± 20.3 / 36.9 ± 17.5*	11.9 ± 13.0 / 24.6 ± 14.4*	15.2 ± 25.3 / 29.0 ± 23.2
Number of stones							
1 / 2 and more	8.0 ± 5.6 / 9.4 ± 6.3	5.3 ± 4.0 / 4.2 ± 3.8	22.2 ± 14.0 / 18.0 ± 13.4	19.8 ± 16.4 / 21.5 ± 14.3	32.4 ± 20.4 / 18.7 ± 20.7	18.5 ± 13.4 / 18.1 ± 18.7	27.3 ± 24.8 / 16.7 ± 24.1
Stone size							
<10 mm / 11–20 mm	8.1 ± 4.8 / 10.0 ± 6.2	6.8 ± 3.8 / 8.1 ± 4.2	20.6 ± 12.6 / 21.4 ± 13.5	20.7 ± 18.4 / 19.7 ± 14.0	33.5 ± 22.4 / 24.8 ± 17.1	17.6 ± 14.2 / 19.7 ± 15.3	9.4 ± 22.1 / 31.4 ± 21.1*
Stone density							
<1000 HU/ >1000 HU	2.9 ± 4.4 / 3.4 ± 5.0	4.6 ± 5.0 / 4.4 ± 3.6	19.3 ± 14.9 / 23.9 ± 14.0	19.8 ± 16.3 / 18.4 ± 17.2	27.6 ± 24.8 / 33.3 ± 21.0	15.6 ± 14.9 / 25.3 ± 13.3	18.1 ± 27.5 / 29.7 ± 26.3
Hydronephrosis							
Presence / absence	6.4 ± 4.5 / 5.5 ± 3.9	7.7 ± 3.9 / 4.9 ± 5.2	22.2 ± 15.4 / 23.2 ± 13.4	20.6 ± 19.1 / 23.9 ± 10.5	32.2 ± 21.4 / 27.7 ± 20.5	18.7 ± 15.0 / 21.1 ± 15.6	25.0 ± 17.4 / 32.3 ± 13.8
SFR							
Achieved / not achieved	4.4 ± 3.0 / 3.9 ± 2.4	7.0 ± 1.6 / 1.5 ± 2.3*	23.4 ± 13.0 / 15.5 ± 14.5	18.8 ± 16.3 / 17.3 ± 16.0	35.6 ± 19.3 / 17.9 ± 18.2*	23.0 ± 14.2 / 11.0 ± 12.4*	21.7 ± 23.2 / 25.0 ± 29.9
Surgical treatment							
ESWL / PNL	1.8 ± 3.0 / 2.7 ± 4.6	3.2 ± 4.7 / 3.7 ± 5.1	17.6 ± 11.7 / 23.2 ± 14.9	16.2 ± 14.5 / 22.2 ± 14.4	27.1 ± 19.1 / 28.4 ± 23.7	12.3 ± 10.7 / 23.0 ± 15.1	23.1 ± 23.7 / 28.9 ± 24.8

Note. * Changes are statistically significant compared to the compared attribute ($p < 0.05$). ESWL – extracorporeal shock wave lithotripsy. PNL – percutaneous nephrolitholapaxy.

scores was 7.2 ± 11.1 and 27.2 ± 14.8 in the groups under and over 40 years, respectively. In the emotional sphere, older patients were less irritable and concerned about the state associated with KSD and showed an increase in points of 36.9 ± 17.5, while it was 20.4 ± 20.3 in the younger patients. In addition, patients over 40 years of age tolerated pain and dysuric manifestations better in the postoperative period, and also had less pronounced sleep disorders (11.9 ± 13.0 points vs 24.6 ± 14.4 in younger patients). The revealed effect on health was due to a long history of KSD. The findings were supported by a more pronounced increase in the total score of the WISQoL questionnaire, as well as in the PhF and PsF in patients over 40 years old. Moreover, patients with stones up to 1 cm in size in the postoperative period had a higher increase in points in the domain of IVA of WISQoL (31.4 ± 21.1), in contrast to patients with smaller stones (9.4 ± 22.1). The result is quite logical, since after the removal of a large calculus, complaints of fatigue and decreased activity during the day disappeared in most patients. When comparing the scores of the SF-36 questionnaire and the rest of the WISQoL domains, no differences were observed between the groups.

When comparing the groups of patients in which a "stone-free state" after the surgery was and was not detected, statistically significant differences were obtained in both questionnaires. In the segment of PsF of the general SF-36 questionnaire, the ratio of points for effective and ineffective treatment was 7.0 ± 1.6 and 1.5 ± 2.3, respectively. Differences were also noted in the domains of EI and HE of the WISQoL questionnaire. Thus, while patients with nephrolithiasis who were completely free of stones during the surgery had an increase in points

of 35.6 ± 19.3 in the domain of EI, patients with residual stones has an increase of only 17.9 ± 18.2. The patients had a lower level of anxiety and concern about their condition after a successful surgery. Also, stone removal led to the relief of pain syndrome, frequent urination, and poor sleep, which was reflected in the scores received. Thus, with SFR, patients had a difference in the sum of points of 23.0 ± 14.2, in contrast to the state when it was not possible to remove effectively the stone, where the average sum was 11.0 ± 12.4.

Therefore, based on the WISQoL and SF-36 questionnaires, an analysis of the effect of the number of stones, the presence of hydronephrosis, the type of surgical treatment, as well as the number and density of calculi on the QoL of a patient did not show statistically significant differences between the study groups.

In the Russian literature, A.S. Panferov et al. [20] studied the efficacy and QoL of patients with simultaneous and staged bilateral mini-percutaneous nephrolithotomy in history. Despite the absence of differences in efficacy between the two types of treatment, it was concluded that there was a higher level of QoL in patients after a single-stage surgery, which is explained by a shorter duration of hospitalization and early rehabilitation of the patients. However, our data partially does not cohere with the results of K. Stern et al. [21] who found that young age, female gender, and non-Caucasian race are factors leading to a lower assessment of the condition. Our study proved that men had lower scores in the WISQoL social functioning domain. These discrepancies may probably be explained by the peculiarities of Russian traditions and mentality, as well as by the differences in the samples, as in the study of international colleagues, where patients with stones of all localizations were studied.

Analysis of the dynamics of changes in the QoL of patients before and after the treatment for kidney stones

When assessing the dependence of QoL on a specific type of intervention at different stages of treatment, it was revealed that in patients with stones up to 1 cm in size, statistically significant differences were identified only after one week (Table 4).

Moreover, patients after percutaneous interventions have lower QoL in several domains of the WISQoL and SF-36. So, one week after the PCNL, significant differences were found in the domains of HE and EI, the total score of the WISQoL questionnaire, as well as in the PhF segment of the SF-36, compared with patients who underwent ESWL.

Table 4 / Таблица 4

QoL dynamics of patients with kidney stones up to 1 cm in size

Динамика качества жизни пациентов с камнями почек размером до 1 см

Domains		Week 1		Month 1		Month 3	
		ESWL	PNL	ESWL	PNL	ESWL	PNL
WISQoL	SI	84.6 ± 12.6	66.4 ± 25.4	87.4 ± 15.3	74.1 ± 32.3*	97.0 ± 7.1	92.4 ± 5.7
	EI	63.1 ± 18.0	26.1 ± 18.6*	87.8 ± 10.9	72.3 ± 13.8	90.2 ± 5.6	85.0 ± 6.4
	HE	84.4 ± 8.9	55.5 ± 22.7*	88.8 ± 11.0	78.1 ± 20.3	91.5 ± 8.7	87.1 ± 11.3
	IVA	85.6 ± 16.2	62.5 ± 22.9	91.7 ± 11.9	75.0 ± 16.5	93.4 ± 9.5	88.3 ± 6.4
	Total score	79.9 ± 10.6	55.2 ± 15.5*	90.3 ± 7.8	76.1 ± 11.4	88.1 ± 7.8	83.3 ± 5.8
SF-36	PhF	43.7 ± 6.7	41.1 ± 7.5	49.6 ± 4.9	47.3 ± 5.6	50.8 ± 5.2	52.3 ± 3.6
	PsF	34.8 ± 5.9	26.5 ± 5.9*	45.2 ± 8.3	42.9 ± 5.1	49.0 ± 7.7	50.1 ± 4.1

Note. * Difference between ESWL and PNL is significant in the same comparison period ($p < 0.05$). WISQoL domains: SI – social influence, EI – emotional influence, HE – health effect, IVA – influence on vital activity. Domains SF-36: PhF – physical functioning, PsF – psychological functioning. ESWL – extracorporeal shock wave lithotripsy, PNL – percutaneous nephrolitholapaxy.

Table 5 / Таблица 5

QoL indicators in group II patients at different periods after the surgery
Показатели качества жизни пациентов II группы в разные сроки после операции

Domains		Week 1		Month 1		Month 3	
		ESWL	PNL	ESWL	PNL	ESWL	PNL
WISQoL	SI	61.4 ± 20.9	69.6 ± 11.7	79.9 ± 6.5	80.8 ± 13.3	85.0 ± 6.4	89.2 ± 6.2
	EI	54.6 ± 13.7	61.1 ± 19.8	76.4 ± 5.5	83.3 ± 18.9	82.4 ± 6.0	86.2 ± 5.8
	HE	54.6 ± 25.1	64.5 ± 9.5	81.2 ± 8.1	74.0 ± 16.5	83.4 ± 7.2	82.1 ± 8.6
	IVA	57.4 ± 23.0	60.7 ± 23.0	77.5 ± 10.4	82.2 ± 16.1	85.7 ± 9.0	82.3 ± 5.7
	Total score	55.9 ± 11.8	62.9 ± 11.0	83.0 ± 5.4	79.3 ± 12.8	86.1 ± 8.5	85.7 ± 6.3
SF-36	PhF	38.5 ± 11.2	40.9 ± 8.7	47.3 ± 6.2	45.3 ± 8.4	52.7 ± 3.8	50.2 ± 5.5
	PsF	33.1 ± 7.0	36.1 ± 12.3	45.5 ± 8.0	44.9 ± 7.9	50.3 ± 2.7	51.4 ± 4.5

Note. WISQoL domains: SI – social influence, EI – emotional influence, HE – health effect, IVA – influence on vital activity. Domains SF-36: PhF – physical functioning, PsF – psychological functioning. ESWL – extracorporeal shock wave lithotripsy, PNL – percutaneous nephrolitholapaxy.

By one month after the surgery, there were practically no changes, while remaining significant only in the social impact of WISQoL (74.1 ± 32.3 with PNL vs 87.4 ± 15.3 with ESWL) which smoothed out completely after three months.

Thus, the mean score in the HE domain after percutaneous surgery was 57.6 ± 16.1 and after the ESWL 74.2 ± 15.2 ($p < 0.05$).

While the QoL indicators in patients after different types of surgery become approximately the same after a month, by the third month, they become the highest for the entire follow-up period.

However, no such trend in the QoL change was observed in patients with 11–20 mm stones. When studying the dynamics of the physical and psychological well-being using the WISQoL and SF-36 in different periods after surgery, no significant differences were found between the ESWL and PNL groups (Table 5).

The results of the QoL changes after the *ESWL* and PNL are explained by the different efficacy and characteristics of the postoperative period of these techniques. Comparable SFR indices in patients of group 1 with different treatment options, the need for general anesthesia, the presence of a nephrostome, and a generally more difficult postoperative period in case of PNL, on the other hand, lead to the fact that patients with stones up to 1 cm in size rated their QoL higher after *ESWL* than after percutaneous methods. The absence of a difference in the QoL dynamics of patients in group 2 is because in such cases, PNL is more effective than ESWL, is associated with a shorter treatment period, and also solves the problem of stone removal during one hospitalization, which is perceived more favorably by patients with stones 11–20 mm in size.

CONCLUSION

In patients with kidney stones up to 10 mm, after *ESWL* and PNL, the frequency of achieving SFR is comparable. When using percutaneous techniques in patients with 11–20 mm calculi, SFR is achieved in 90.6% of cases, which is 17.2% more than after extracorporeal shock wave lithotripsy. Male gender, young age, stone size >1 cm, as well as stone removal unattained during treatment negatively affect the QoL of patients. Percutaneous interventions on the kidney in comparison with *ESWL* are accompanied by worse QoL dynamics only in treatment of patients with stones up to 1 cm in size, while with larger stones such changes are mitigated.

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