before the visit to the clinic. According to the diary, the duration of the "off period" was determined over the treatment course. Depending on the form of the disease, the following groups were distinguished: group I including 40 patients with akinetic-rigid form; group II involved 40 patients with a mixed akinetic-rigid-tremor form. It has been found out that the onset of both forms of Parkinson's disease occurs mainly in old age, which is characterized by metabolic changes that may play a role in susceptibility to the therapy with levodopa drugs. These groups of patients demonstrated no statistically significant differences by the age, the age of the diseases onset, the duration of the disease and the duration of therapy with levodopa drugs, and the stage according to the Hen and Yar scale. According to the scale of Schwab and England, a higher level of dependence on assistance was revealed in group I compared to group II that may be caused by more pronounced motor disorders and motor fluctuations.

The study has demonstrated that patients with various forms of Parkinson's disease show differences in the severity of movement disorders, in particular, in the quality of motor complications of levodopa therapy, manifested in the form of motor fluctuations, provided that clinical severity, duration of the disease and the use of levodopa drugs are matched. At the same time, different forms of Parkinson's disease do not differ in the prevalence of different types of motor fluctuations and require the development of new approaches to the correction of these conditions.

Key words: coralloid nephrolithiasis, nephrolithotomy, pyelolithotomy, chronic renal failure.

This articles describes the improved preoperative techniques for preparing to the surgical operations for bilateral corallloid and multiple nephrolithiasis complicated with chronic renal failure and discusses the treatment outcomes. Materials and methods. During 2000-2020, at the Department of Urology of the Azerbaijan Medical University, more than 3,000 open surgical operations were performed on kidney and ureter stones. 974 (32.47±0.85%) patients had the operations for coralloid and multiple nephrolithiasis; 700 (23.32±0.77%) of them were found to have unilateral and 274 (9.13±0.53%) had bilateral coral stones. Results. The results of open surgical operations of 274 patients operated on for bilateral corallloid and multiple nephrolithiasis in the 2000-2020 period were analyzed. 190 (69.3±2.8%) of them, 105 men and 85 women, had renal insufficiency. 162 (59.1±3.0%) patients (82 men, 80 women) had the diagnosis of chronic renal failure, and 28 (10.2±1.8%) patients (19 men, 9 women) had acute chronic renal failure. The implementation of the preoperative preparation techniques, taking into account the stage of chronic renal failure, was presented. Out of 274 operated patients, the intervention was performed in 47 (17.2±2.3%) with nephrostomy (24 right, 23 left), in 28 (10.2±1.8%) with pyelostomy (16 right, 12 left), in 110 (40.1±3.0%) with intrarenal stenting (60 right, 50 left), in 6 (2.2±0.9%) with nephrostomy and intrarenal stenting (2 on the right, 4 on the left). Along with this, 56 (20.4±2.4%) patients had clamping of the renal artery from one side or another. After surgery, 48 (17.5±2.3%) patients experienced the exacerbation of chronic pyelonephritis. In patients with diabetes, the exacerbation of chronic pyelonephritis had a more severe course. 26 (9.8±1.8%) patients experienced the exacerbation of chronic renal failure, of them, 6 (2.2±0.9%) had a creatinine level exceeding 500 mmol/l, that was the reason for haemodialysis. Anaemia was observed in 49 (17.9±2.3%) patients with chronic pyelonephritis and chronic renal failure in the postoperative period. In patients with anaemia, the haemoglobin level was 50-85 g/l (average 71.9 ± 0.4 g/l). 11 (4.0±1.2%) of them received blood transfusions in the postoperative period. In 5 (1.8±0.8%) cases, transfusion was performed during haemodialysis. In general, 270 patients out of 274 with bilateral corallloid and multiple nephrolithiasis had open surgical treatment completed successfully, and 4 (1.5±0.7%) had fatal outcomes. In 254 (92.7±1.6%) cases, an organ-preserving operation was performed on, and in 20 (7.3±1.6%) cases, surgical resections were carried out. The study has shown the preoperative preparation and the choice of the correct surgical tactics during the operation considerably contributes to successful treatment outcomes among the patients with severe chronic renal failure.

Key words: coralloid nephrolithiasis, nephrolithotomy, pyelolithotomy, chronic renal failure.

Introduction

Urolithiasis, being one of the urgent problems of medicine nowadays, ranks the second position after inflammatory diseases of the urinary tract worldwide. Urolithiasis makes up 30-40% of all urological diseases [1, 2, 3]. Urolithiasis can be detected at any age, but in 60-75% of cases it is diagnosed in people of working age (35-55 years) [4, 5]. Among the elderly population (60-74 years old), urolithiasis occurs in 8.8% of men and in 5.6% of women, and remains as a serious social and healthcare problem.

It is no coincidence that in the general structure of the causes of primary disability in patients with urological diseases, nephrolithiasis constitutes 6.0-
14.4%. Urolithiasis in cases with the only functioning kidney in 7.6% of cases leads to disability [1, 6, 7, 8].

Coral nephrolithiasis (CN) is one of the most severe forms of the diseases. The CRF occurrence rate in the structure of urolithiasis ranges from 3-30% [1, 9]. The complexity of the CRF etiopathogenesis can complicate the choice of the treatment tactics. This problem has become even more urgent in bilateral cases. In all cases, coralloid and multiple nephrolithiasis (CMN) is aggravated by secondary complications. This in turn makes the treatment of the disease more risky. One of the most formidable complications observed during bilateral CMN is chronic renal failure (CRF).

The purpose of the work
This study aimed at improving preoperative preparation techniques for bilateral CMN complicated with CRF and evaluating surgical treatment outcomes.

Materials and methods
More than 3,000 open surgical operations for kidney and ureter stones were performed on at the Department of Urology, the Azerbaijan Medical University, for 2000 – 2020. 974 (32.47±0.85%) people were operated on for CMN, 700 (23.33±0.77%) of them had unilateral and 274 (9.13±0.53%) had bilateral coral stones.

Treatment of bilateral CMN was carried out according to the classification based on the nature of changes in both kidneys and ureters. According to this classification, the patients were divided into 4 groups [10, 11].

The first group included 137 patients (50.0%) with bilateral CMN, the second group included 38 (13.8%) patients with CMN of one and only functioning kidney, the third group involved 76 (27.0%) patients with CMN and single or multiple stones in the kidney or ureter, and the fourth group comprised 23 (10.2%) patients with CN and stone-free hydronephrosis.

Renal insufficiency was observed in 190 (69.3±2.8%) patients (105 men and 85 women) out of 274. 162 (59.1±3.0%) patients (82 men and 80 women) had chronic renal insufficiency, 28 (10.2±1.8%) patients (19 men, 9 women) had acute renal insufficiency (anuria). The stage of chronic renal failure (CRF) was determined according to the classification of Lopatkin H.A., Kuchinsky I.H. [12]. Below are the stages of renal failure in different groups (Table 1).

Table 1

| Stages of renal failure | I group | II group | III group | IV group | Total |
|------------------------|---------|----------|-----------|----------|-------|
| Men                    | 26      | 11       | 19        | 2        | 58    |
| Women                  | 20      | 3        | 4         | 1        | 28    |
| Total                  | 46      | 14       | 23        | 3        | 73    |

54 (19.7±2.4%) patients were diagnosed as being in the latent stage. At this stage, the general condition of the patient remained normal and the ability to work was preserved. There were some urinary disorders, a decrease in urine concentration, the day and night amount of urine got equalled. The content of creatinine and urea in the blood remained within normal limits.

The condition of 34 (12.4±2.0%) patients was assessed as the compensated stage. At this stage, patients had general weakness, malaise, headaches. The specific gravity of urine varied within 1014-1016. Due to a decrease in tubular reabsorption, the daily diuresis increased to 2.5 litres.

55 (20.1±2.4%) patients were diagnosed as being in the intermittent stage. At this stage, patients had a pronounced impairment of renal function.

There were 11 (4.0±1.2%) patients at the terminal stage. At this stage, patients had a very serious impairment of kidney function.

In addition to secondary acute pyelonephritis, excretory anuria was observed in 7 (5.1±1.9%) patients of the first group, in 15 (39.5±7.9%) patients of the second group, and in 2 (2.6±1.8%) patients of the third group. Most of these patients were admitted to our clinic in extremely severe condition, with acute intoxication and azotemia.

Considering that the main treatment for the patients was surgical operation, the findings obtained during the diagnostic investigation were studied in terms of their prognostic values. In this aspect, ultrasound and X-ray examination techniques played a major role in the diagnosis due to their accuracy and accessibility.

In cases of urolithiasis, including CMN, ultrasound scanning can detect the size of concretion, the size of kidney, the thickness of the parenchyma, its symmetry or asymmetry, the contours.

Based on the results of ultrasound scanning, we can see certain changes in the kidney, but it is difficult to determine the degree of preservation of the parenchyma, except the cases of far gone changes in the kidney. Uneven thinning of the kidney parenchyma in several areas, along with other ultrasound parameters, strongly indicates the irreversible changes in the kidney. The normal size of the kid-
ney or its slight enlargement with the preservation of the parenchyma thickness, are convincing regarding the preservation of the parenchyma that was confirmed during the operation. In patients with the secondary complications, including CRF under bilateral CMN, the detection of gross changes in renal parenchyma by ultrasound points out the necessity of the infusion therapy.

Statistical analysis was carried out by the method of discriminant analysis (polychoric index χ²-Pearson) and performed by MS EXCEL-2019 tabular processor.

**Results and their discussion**

Preoperative preparation of patients with CMN complicated by various stages of CRF is carried out by both conservative and extracorporeal methods. It should be noted that patients with the first and second stages of CRF demonstrated satisfactory levels enduring surgical operation. At the latent stage, antibacterial, antispasmodic, immunostrengthening therapy should be performed as a part of preoperative preparation.

At the compensated stage, preoperative preparation should be enhanced due to a pronounced impairment of kidney function and homeostasis. Detoxification therapy recommended in this case includes diet modifications and the improvement of water-electrolyte balance.

At the intermittent stage, in the presence of severe azotemia and the development of metabolic acidosis, progressive anaemia and hypoproteinemia, complex intensive therapy is carried out mainly towards this direction. Performing surgical operation at the intermittent stage is only possible when satisfactory results of conservative therapy have been achieved. In this group of patients, organ-preserving operations improve the patient's condition.

The literature shows that conservative treatment to correct homeostasis undergoing serious changes at the terminal stage of CRF is not sufficient [13, 14]. Therefore, for such patients extracorporeal blood purification (haemodialysis) is a mandatory indication.

Haemodialysis as a preoperative preparation was performed due to acute and chronic renal failure in 8 (5.8±2.0%) patients in the first, 9 (23.7±6.9%) in the second and 3 (2.6±2.6%) in the third group, in total 20 (7.3±1.6%) patients (χ²=18.581; p <0.001). The indications for haemodialysis include diet modifications and the improvement of water-electrolyte balance.

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Haemodialysis sessions improve kidney function and homeostasis indicators. In this case, homeostasis disorders are poorly corrected, and it seems the most appropriate to correct such indicators as nitrogen-releasing kidney function, plasma toxicity, as well as the electrolytic balance.

In our studies, a total of 84 (30.7±2.8%) patients with a haemoglobin concentration of 100 g/l or lower had toxic anaemia. Toxic anaemia was observed in 40 (29.2±3.9%) patients in the first, 21 (55.3±8.1%) patients in the second, 16 (21.1±4.7%) patients in the third and in 7 (30.4±6.6%) patients in the fourth group (χ²=14.528; p = 0.003).

Along with other methods of therapy during the preoperative preparation, blood transfusion was performed in 16 (117±2.7%) patients in the first, 12 (31.6±7.5%) in the second, 4 (5.3±2.6%) patients in the third and 2 (8.7±5.9%) in the fourth group (χ²=16.778; p = 0.001), i. e. in 34 (12.4±2.0%) patients in total.

Blood transfusion during haemodialysis was performed in 8 (5.8±2.0%) patients in the first, 7 (18.4±6.3%) in the second and 3 (3.9±2.2%) patients in the third group (χ²=11.284; 0.010), in general 18 (6.6±1.5%) patients.

Studies show that intensive conservative therapy can normalize or significantly reduce the concentration of residual nitrogen and urea in the blood only in the patients with preserved kidney potentials. In CMN complicated with CRF, if the urodynamics is not severely impaired and the intensive therapy has failed to have an effect, this indicates the irreversible structural changes in the kidneys (single kidney) and the futility of organ-preserving surgery [15]. Patients at the terminal stage of CRF due to pronounced changes in homeostasis are considered to be the most severe group of patients.

At this stage of CRF, most of the nephrons are destroyed, the compensatory capabilities of the kidneys and the entire body are depleted, and the continuation of conservative treatment seems unpromising. The disease continues to progress, and most patients require further replacement therapy. Treatment of patients with urolithiasis complicated with CRF should be both pathogenetic and symptomatic. In rare cases, CRF can be reversible. With urolithiasis, the elimination of the factor contributing to the development of renal insufficiency, that is the removal of stones, can cause a partial return of CRF. Surgical removal of stones in the case of severe renal insufficiency poses a high risk. The risk is associated with profound homeostasis disorders. At the same time, impaired renal function is an indication for surgical treatment of urolithiasis [14]. However, the severity of the patient's condition and a decrease in kidney function force surgeons to refrain from surgical intervention.

One of the most frightening cases observed with bilateral CMN is anuria. In our studies, excretory anuria was observed in 9 (6.6±2.1%) patients in the first, in 16 (42.1±8.0%) of the second and in 3 (3.9±2.2%) patients of the third group (χ²=49.976; p < 0.001). Most of these patients were admitted to our clinic in a very severe condition, with acute intoxication and high azotemia.

It should be noted that the desire to insert a ureteral catheter and thereby activate diuresis is extremely risky for this group of patients, since activation of infection and fever can quickly worsen the
patient's condition. In azotemia, however, it is impossible to conduct antibacterial therapy at the appropriate level, and therefore a positive effect can not be achieved.

In recent years, urgent percutaneous nephrostomy has become the treatment option for this group of patients. However, percutaneous nephrostomy does not completely solve the problem in this group of patients. This is due to the fact that the nephrostomy tube can be placed in expanded cups in a certain part of the kidneys. However, in all cases of CMN, nephrostomy does not give satisfactory results due to insufficient contact between the cups and the pelvis. Along with all this, during preoperative preparation, in certain cases, renal catheterization or stenting for a short time (2-5 days) improves the patient's condition. This can be used when the patient's condition is worsened as a result of a kidney infection, and there are suspicions of the presence of saline-purulent masses or small stones in the ureter. In such cases, detoxification therapy, performed under the introduction of a ureteral catheter or stent into the pelvis, causes a noticeable improvement and determines the favourable prognosis of surgical treatment. Hemodialysis in this group of patients is performed if all of the mentioned above is impossible.

In the first group, 3 (2.2±1.3%) patients with anuria underwent ureter catheterization, and 3 (2.2±1.3%) patients underwent intrarenal stenting. After comprehensive conservative treatment, these patients underwent surgery.

Treatment of patients of the second group is considered more complicated. The most formidable complication of urolithiasis, including CMN of the only functioning kidney, is blockage of the ureter with a stone and the development of anuria. These complications often develop due to multiple kidney stones and CMN.

The probability of anuria with CMN is very high, and with CN of a single functioning kidney is significantly low. But, despite this, chronic pyelonephritis and kidney failure can continue to progress later. It is in the treatment of patients with CMN of a single functioning kidney that one of the main tasks is to direct all measures to maximize the outflow of urine from the kidney in a short time, and thereby prevent further progression of chronic pyelonephritis and renal failure. For this purpose, conservative events should be held. If these measures are ineffective, catheterization or stenting of the ureter is performed and intensive conservative treatment is continued. If these measures fail to produce the desired results, it is advisable to use hemodialysis. If it is impossible to catheterize the ureter, the patient is urgently operated on, if his general condition is assessed as satisfactory enough to endure surgical treatment. An unsatisfactory general condition, that is, a high content of nitrogenous slags in the blood, is a direct indication for hemodialysis. Thus, in the treatment of patients of the second group, preference should be given to urgent surgical tactics. As noted, opinions on the tactics of treating CMN of a single functioning kidney remain controversial. Despite the offer of different methods of treatment, open surgery remains the main method of the treatment for this group of patients. In contrast to the CN of a single functioning kidney, combined treatment can be more effective for patients with CMN and save them from lifelong hemodialysis and death. Regardless of the type of treatment in both cases, the patient is facing a serious threat. Considering that with CMN of the single functioning kidney, surgical tactics should end up with the preservation of the kidney.

The risks associated with bleeding and other serious consequences during the surgery for kidney stone removal, doctors refrain from surgery and direct patients to conservative treatment. Conservative treatment is unable to prevent the growth of the stone and the development of purulent complications that leads to the death of the kidney and the progression of renal failure. Sometimes in these patients, preference is given to palliative operations such as nephrostomy, pyelostomy, intrarenal stenting. And in some cases, in order to prevent anuria, drainage installed in the urinary tract is left for a long time that in turn leads to other serious consequences.

Our experience shows that an operation performed at the wrong time does not save a patient with CN of a single kidney, only with its preserved function the intervention can be successful and effective. Otherwise, with wait-and-watch tactics in the treatment of these serious conditions, formidable complications may develop.

One of the important factors in the treatment is to ensure the outflow of urine in the shortest possible time to prevent chronic pyelonephritis and renal failure, when CMN leads to hydrenephrotic transformation of a single kidney, even if there is no acute pyelonephritis. First of all, preoperative conservative treatment is carried out. If these measures are ineffective, catheterization or stenting of the ureter is performed. After overcoming the obstacle with a catheter or stent, carrying out detoxification and anti-inflammatory therapy, within 2-3 days, we prepare the patient for elective surgery. If, against the background of intensive therapy, after catheterization or stenting of the ureter, his condition does not normalize, azotemia does not decrease, he is taken for urgent surgery, if his general condition allows. Continued pronounced azotemia on the background of excretory anuria, high content of nitrogenous toxins in the blood, is a contraindication for surgery and a direct indication for hemodialysis.

In the second group of 15 (39.5±7.9%) patients with anuria and ureterohydronephrosis, ureter catheterization was performed in 4 (10.5±5.0%) patients, and stenting was performed in 6 (15.5±5.8%) patients. Despite the conservative therapeutic measures taken, 9 (23.7±6.9%) patients underwent hemodialysis before surgery due to non-normalized azotemia. 5 (13.2±5.5%) patients from the second
group underwent urgent surgery due to the inability to overcome an obstacle in the ureter, 2 (6.3±2.6%) patients underwent pyelolithotomy on the left, 1 (2.6±2.6%) – subcortical posterior pyelolithotomy on the right, 1 (2.6±2.6%) patient – nephrostomy on the left, and 1 (2.6±2.6%) – pyelostomy on the right.

After preoperative preparation, open surgical treatment was performed. 274 patients underwent surgical treatment. Operations were mainly completed with nephrostomy in 47 (17.2±2.3%) patients (24 right, 23 left), pyelostomy in 28 (10.2±1.8%) patients (16 right, 12 left), intrarenal stenting in 110 (40.1±3.0%) patients (60 right, 50 left), nephrostomy with intrarenal stenting in 6 (2.2±0.9%) patients (2 on the right, 4 on the left). 56 (20.4±2.4%) patients underwent surgery with compression of the renal artery on one or the other side.

The main objective indicators for assessing the immediate results of any surgical method of treatment are postoperative complications and mortality. Studies show that due to the lack of methods of effective pathogenetic treatment and metaphylaxis, in 35-75% of cases, the disease recurs. As a result, a number of cases require repeated operations, and in 22-26% of cases, various complications are observed. And these complications resulted in nephrectomy in 11% of cases, and death in 3% of cases [1].

With CMN, operated patients, depending on the type and technique of the operation, may experience complications of various forms, severity, and frequency of occurrence. Our research showed that the number and frequency of these complications directly depends on the operation itself, the state of the operated kidney parenchyma, the number of incisions performed on the parenchyma during the intervention and other invasive manipulations.

After surgery, 48 (17.5±2.3%) patients had exacerbation of chronic pyelonephritis. Exacerbation of chronic pyelonephritis was most severe in patients with diabetes mellitus. In addition, 26 (9.5±1.8%) patients had an exacerbation of CRF. 6 (2.2±0.9%) of these patients, whose blood creatinine content exceeded 500 mmol/l hemodialysis was registered. 254 (92.7±1.6%) patients underwent organ-preserving surgery, and 20 (7.3±1.6%) patients underwent organ-bearing surgery.

Conclusion

With CMN complicated by CRF, ultrasound can be preferred to determine the potential functional capabilities of the kidneys according to the degree of preservation of the thickness of the parenchyma, which can determine a relatively more preserved parenchyma with bilateral kidney stones. These indicators helped in choosing the side for surgery in patients with significant damage to the renal parenchyma on both sides.

Thus, this study demonstrates that the right choice of diagnosis, preoperative preparation and surgical tactics during surgery predetermine the successful treatment outcomes in patients with CMN complicated by CRF.

Prospects for further research

The improvement of the results of conservative management and surgical treatment for patients with renal diseases requires in-depth research.

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Відкрите хірургічне лікування двостороннього коралоподібного та множинного нефролітіазу, ускладненого хронічною нирковою недостатністю

Реферат

Відкрите хірургічне лікування двостороннього коралоподібного та множинного нефролітіазу, ускладненого хронічною нирковою недостатністю, та покращення результатів хірургічного лікування. Матеріали та методи. Протягом 2000-2020 років на кафедрі урології Азербайджанського медичного університету було проведено понад 3000 відкритих хірургічних операцій у зв'язку з каменями у нирках та сечоводах. У 974 (32,47±0,85%) осіб операція проводилася у зв'язку з коралоподібним та множинним нефролітіазом. З цих пацієнтів 700 (23,33±0,77%) були з односторонніми і 274 (9,13±0,53%) — з двосторонніми коралоподібними каменями.

Результати. Було проаналізовано результати відкритих хірургічних операцій 274 хворих, оперованих з приводу двостороннього коралоподібного та множинного нефролітіазу в період 2000-2020 р. У 190 (69,3±2,8%) з них (105 чоловіків і 85 жінок) відзначена ниркова недостатність. З них у 162 (59,1±3,0%) пацієнтів ниркова недостатність була хронічною (82 чоловіків, 80 жінок), у 28 (10,2±1,8%) гострою (19 чоловіків, 9 жінок). Були представлені розроблені заходи передоперативної підготовки хворих з урахуванням стадії хронічної ниркової недостатності. З 274 оперованих хворих, втручання завершилося у 47 (17,2±2,3%) нефростомією (24 праворуч, 23 зліва), у 28 (10,2±1,8%) пієлостомією (16 праворуч, 12 зліва), у 110 (40,1±3,0%) внутрішньонирковим стентуванням (60 праворуч, 50 зліва), у 6 (2,2±0,9%) нефростомією та внутрішньонирковим стентуванням (2 праворуч, 4 зліва). Поряд з цим у 56 (20,4±2,4%) хворих операція проводилася перетисненням ниркової артерії. Після операції у 48 (175±23%) хворих спостерігалося загострення хронічного пієлонефриту. У хворих з діабетом загострення хронічного пієлонефриту мало тяжчий перебіг. Також у 26 (9,5±1,8%) хворих спостерігалося загострення хронічної ниркової недостатності. З них у 6 (2,2±0,9%) рівень креатиніну становив понад 500 мкмоль/л, у зв'язку з чим було проведено гемодіалізу. У 49 (17,9±2,3%) хворих на фоні хронічного пієлонефриту, хронічної ниркової недостатності у післяоперативному періоді спостерігалась анемія. У хворих з анемією рівень гемоглобіну у крові становив 50-85 г/л (середній показник 71,9±0,4 г/л). 11 (4,6±1,2%) хворим було проведено переливання крові в післяоперативному періоді. У 5 (1,8±0,8%) випадках переливання проводилося на фоні гемодіалізу. Загалом із 274 хворих із двостороннім коралоподібним та множинним нефролітіазом, у 270 відкрите хірургічне лікування завершено успішно, у 4 (1,5±0,7%) результат був летальним. У 254 (92,7±1,8%) хворих для хірургічного лікування застосовано органозберігаючі операції, у 20 (7,3±1,6%) - операції з втратою органу. Висновок. Дослідження показа́ло, що передоперативна підготовка та вибір правильної хірургічної тактики під час операції дозволя́ють успішно завершити лікування тяжкої групи хворих із хронічною нирковою недостатністю.