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Burdened urological history as a risk factor in kidney transplantation for older age group recipients

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Abstract

Introduction. *Chronic renal failure develops more often in elderly patients after previous repeated urological operations. Urological diseases are an important additional factor that multiply complicates kidney transplantation due to the need for preliminary correction of existing disorders. Not to mention the fact that the recipient's advanced age contributes to the risk of developing graft dysfunction due to the presence of concomitant diseases that worsen the immediate and long-term results of transplantation.*

Material and methods. *We carried out the analysis of clinical observations and studies performed in 124 patients who underwent cadaveric renal allotransplantation at the N.V. Sklifosovsky Research Institute for Emergency Medicine, including from suboptimal donors. Of these, 69 (55.6%) recipients older than 60 years were included in the main group (group 1), and 55 recipients younger than 60 years (44.4%) -*

in the comparison group (group 2). From the patients of group 1, patients with urological diseases that led to the development of terminal chronic renal failure, or with previously undergone surgeries for urological diseases (subgroup 1A, 43 patients) were isolated. The remaining 26 patients who did not have urological diseases were put in subgroup 1B.

Results. *The analysis showed that in the early postoperative period in the recipients of group 1, complications developed in almost all the patients (80 complications in 64 of 69 patients, that is 92.8% of patients in this group), whereas in group 2, complications developed only in 30.9% of patients (27 complications in 17 of 55 patients). At the same time, on average, 1.2 complications per 1 patient were noted in group 1, and 0.5 complications per 1 patient in group 2, a significant part of the complications occurred in the subgroup of patients with a burdened urological history (subgroup 1A). Late complications also developed statistically significantly more often (almost 2 times) in recipients with a burdened urological history.*

Conclusions. *Complications of the early and late postoperative period develop statistically significantly more often in elderly recipients. The presence of a burdened urological history in elderly recipients significantly increases the risk of early and late postoperative complications.*

Keywords: kidney transplantation, older age group recipients, burdened urological history

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BPH – benign prostatic hyperplasia
CRF – chronic renal failure
ECG – electrocardiography
PCR – polymerase chain reaction
TUR – transurethral resection
Ultrasound – ultrasonography

Introduction

Chronic renal failure (CRF), which developed as associated with urological diseases, occurs in 25–34% of cases among all patients admitted for dialysis treatment. CRF often develops in elderly patients after previous repeatedly performed urological operations [1].

The task of urologists before kidney transplantation is to optimize the state of the urinary tract, which must be sterile, continent, and functionally adequate [2]. At the same time, potential recipients may have latent urological diseases with minimal symptoms, which can be activated after kidney transplantation. A number of urological diseases are difficult to diagnose in patients with anuria [3].

Urological diseases may develop or be diagnosed after kidney transplantation. According to M.F. Trapeznikov et al. (2009), diseases such as chronic pyelonephritis, vesicoureteral reflux, chronic prostatitis, and chronic cystitis can be treated conservatively on an outpatient basis, while the detection of kidney stones, benign prostatic hyperplasia (BPH) with severe obstructive symptoms require surgical treatment in a hospital setting. In this case, it is preferable to use standard minimally invasive methods of surgical interventions and research [4].

According to M.D. Tyson et al. (2013) compared the results of bilateral nephrectomy in patients with polycystic kidney disease as a preliminary stage (2297 patients) or simultaneously with kidney transplantation (271 patients) and revealed the presence of more frequent

hemorrhagic and urological complications in simultaneous nephrectomy and transplantation with the need for blood transfusion. However, hospital mortality in these patients was even lower [5].

An impaired evacuation function of the bladder and reduced elasticity of its wall are often detected in candidates for kidney transplantation during a comprehensive urodynamic study. Although it is not necessary to conduct these studies for all recipients, but in patients with anuria, as well as with symptoms of urination disorders, it allows a timely detection of existing disorders and their timely treatment, and may also affect the decision on the advisability of transplantation [6]. When performing cystography, it is possible to detect a reduced capacity of the bladder and the presence of anomalies in the development of this organ, which may increase the risk of urological complications after kidney transplantation [7]. Meanwhile, their preoperative correction improves the prognosis of the operation [8, 9].

At the same time, according to some authors, an impaired bladder function, accompanied by a decrease in its capacity, increased intravesical pressure, and decreased compliance, does not significantly negatively affect the results of kidney transplantation during follow-up periods of up to 10 years [10].

The incidence of urological complications requiring surgical treatment (urinary fistula, vesicoureteral anastomosis stricture, vesicoureteral reflux) increases in elderly recipients over the age of 65 [11], especially when they receive a kidney graft from expanded criteria donors, from suboptimal donors; the studies performed and the algorithm for these patients were standard [12].

Elderly patients often have problems with urination due to the progression of prostatic hyperplasia, which requires surgical treatment. Transurethral resection (TUR) of the prostate, if necessary, can be

performed both before and after kidney transplantation. Meanwhile, Y. Reinberg et al. (1992) note that TUR immediately after transplantation is possible only with sterile urine, adequate antibiotic and steroid therapy, low-pressure urethral lavage, and meticulous hemostasis [13].

Obviously, the advanced age of the recipient introduces a certain risk of developing graft dysfunction due to the presence of concomitant diseases, which can worsen the immediate and long-term results of transplantation [14]. Among the factors that potentially affect the results of kidney transplantation in recipients of the older age group, one can mention the presence of many comorbidities that limit the possibilities of transplantation [15, 16]. Their progression often leads to the death of recipients with a normally functioning kidney graft [17–19].

Urological diseases are an important additional factor that greatly complicates kidney transplantation due to the need for preliminary correction of existing disorders, often these are conditions of the upper and lower urinary tract. Previous operations on the organs of the genitourinary system can also significantly complicate the technical implementation of kidney transplantation. Chronic urinary infection, which constantly accompanies diseases of the urinary system, is a significant risk factor for the development of complications after transplantation and poor surgical outcomes [20, 21].

In this regard, it is relevant to assess the significance of the factor of the presence of urological diseases that led to the CRF development in order to assess the possibility of kidney transplantation in these patients and determine the prognosis of its efficacy [22].

Aim of the study was to analyze the impact of urological history as a risk factor in kidney transplantation from suboptimal donors to patients of the older age group.

Material and methods

The study was based on the analysis of case histories of 124 patients who underwent a cadaveric kidney allotransplantation from suboptimal donors at the N.V. Sklifosovsky Research Institute for Emergency Medicine for the period from February 1, 2016, to March 1, 2020. Of these, 69 recipients (55.6%) were over 60 years old (Group 1). These patients were selected from 116 patients of the older age group included in the waiting list for kidney allotransplantation under the Program to improve the efficiency of care for elderly patients with end-stage renal disease. The diseases that led to the development of terminal CRF, as well as chronic urological diseases that led to surgical treatment, were taken as urological history.

During the follow-up period, the analysis also included 55 kidney transplantations in patients under 60 years of age (44.4%), which constituted the 2nd group. From patients of the 1st group, the patients with urological diseases that led to the development of terminal chronic renal failure, or with previous surgeries for urological diseases (subgroup 1A, 43 patients) were identified. The remaining 26 patients over 60 years of age who did not have urological diseases constituted subgroup 1B.

The mean age of all recipients older than 60 years was 64.3±2.2 years. Distribution of all patients by age was as follows: 55 patients (44.4%) of 55–60 years old, 37 patients (29.8%) of 61–65 years old, 27 patients (21.8%) of 66–70 years old, and 5 patients (4.0%) over 70 years old. The ratio of men and women was 45 men (65.2%) and 24 women (34.8%) in the 1st group, and 29 men (52.7%) and 26 women (47.3%) in the 2nd group. That is, men predominated in both groups, meanwhile, to a greater extent in the 1st group (a group of elderly recipients), however, the differences between the groups in this parameter were not statistically significant.

The main causes of the end stage CRF development were diabetic nephropathy (24 patients), polycystic disease (27 patients), chronic glomerulonephritis (38 patients), and urolithiasis (21 patients). Significantly rarer causes of CRF were primary chronic pyelonephritis (3 patients), amyloidosis of the kidneys (3 patients), gouty nephropathy (3 patients), systemic vasculitis with kidney damage (2 patients), lupus nephritis (1 patient), and nephropathy of unknown origin (2 patients). In addition to nephro-urological pathology, which led to the end stage of CRF, most patients had concomitant diseases affecting the general somatic condition of the recipients. Most often, these were chronic diseases of the cardiovascular system (atherosclerosis, arterial hypertension), which were detected in 49 patients (71.0%) in the 1st group, and in 18 patients (32.7%) in the 2nd group. In 1/3 of the 1st group patients, mitral valve calcifications were revealed. Chronic nonspecific lung diseases were detected in 26 patients (37.7%) in the 1st group, and in 7 patients (12.7%) in the 2nd group. Chronic degenerative lesions of the joints and spine prevailed in patients in 15 patients (21.7%) of the 1st group compared with 4 patients in the 2nd group (7.3%). Infravesical obstruction due to previously sustained urological diseases was determined in 31 patients of the 1st group (44.9%) and 5 patients of the 2nd group (9.0%). Infravesical obstruction is a large group of diseases and their correction should be necessary performed before the surgical stage of treatment. BPH is one of the main causes of this condition. Signs of BPH were detected in 52% (n=21) of men of the 1st group and 14% (n=4) of men of the 2nd group. The patients with chronic cystitis (41 patients) and chronic urinary tract infection (8 patients) were identified only in the 1st group.

All patients in the process of preparing for kidney transplantation underwent a general clinical examination with a physical examination and

periodic complete blood and urine tests, biochemical blood tests, and bacteriological examination of urine. The biochemical parameters, water-electrolyte and acid-base state (ABS) (pH and BE) were analyzed using conventional laboratory methods. Monitoring of the oxygen partial tension in arterial and venous blood (PaO_2, PvO_2 mm Hg); oxygen saturation of hemoglobin in arterial (SaO_2, %) and venous blood (SvO_2, %), using ABL 55, 705, and OSM 3 (Radiometer) analyzers.

The instrumental methods of examination used included electrocardiography (ECG) recording, radiography of the lungs and abdominal organs. If necessary, computed tomography was performed, the contrast-enhanced one when indicated.

In patients with an aggravated urological history, an ultrasound examination (ultrasonography) of kidneys, bladder, and prostate gland and uroflowmetry were mandatory performed, according to indications; cystography, urethrography and voiding cystoureterography were additionally performed.

In order to assess the immunological compatibility of the recipient and the kidney graft, the presence of HLA antigens on the blood cells of the donor and recipient and the presence of pre-existing donor-specific antibodies in the blood of the recipient were determined. A cross-match test was also performed according to the standard technique.

After transplantation, all recipients underwent regular measurements of diuresis, blood urea, creatinine and electrolytes in order to monitor the graft function. In order to assess the liver function, the concentration of bilirubin and the activity of aminotransferases in the blood were determined. Doppler ultrasonography of the graft, and isotopic nephroscintigraphy were intermittently made. With the development of a graft dysfunction with suspected occurrence of vascular

complications, computed tomography was performed with additional contrast enhancement with intravenous administration of a contrast agent.

To control viral infection, a polymerase chain reaction (PCR) for DNA of cytomegalovirus and Epstein-Barr virus was performed.

A fine needle biopsy of the transplanted kidney was performed if an acute rejection crisis was suspected and for the differential diagnosis of rejection and ischemic or nephrotoxic graft dysfunction.

We analyzed in dynamics (up to 1 year) the recipient survivals, the timing of the kidney graft functioning, the rates of immediate and delayed graft function, the graft functional state parameters, and the incidence and type of complications in the early and late postoperative periods. Based on these parameters, the feasibility of kidney transplantation in patients of the older age group, including those with an aggravated urological history, was assessed.

Microsoft Excel and Statistica 10.0 software packages were used to perform a statistical analysis. The normality of the distribution of digital values in the groups was assessed using the Kolmogorov test. Arithmetic mean values (M), mean data frequency (P) and errors of mean values (m) were calculated.

Fisher's exact test was used to compare data from different groups with a normal distribution of data; and the Mann-Whitney test was used for an abnormal distribution. The presence and severity of correlations were determined using Spearman's correlation test. Depending on the r value, the evidence of relationship was assessed as pronounced correlation at 1.0–0.7; moderate correlation at 0.69–0.4; weak correlation at less than 0.39.

Results and discussion

Complications of the early postoperative period

In the early postoperative period, 81 patients (65.3% of recipients) of the 1st and 2nd groups developed 107 complications. In this regard, the hospital length of stay varied greatly: it ranged from 11 to 104 days (mean 28.5±3.4 days) in the 1st group, and from 17 to 62 days (mean 24.1±2.5 days) in the 2nd group. Differences between the groups were not statistically significant at p=0.221. Meanwhile, in recipients with an aggravated urological history, the hospital length of stay was statistically significantly longer than in those without concomitant urological problems. In the subgroup with concomitant urological pathology (1A), the patients stayed in hospital for 21–104 days (mean 38.3±3.6 days), while in those without it, the hospital length of stay was 11–67 days (mean 24.2±2.6 days, $p < 0.05$) that was statistically significantly shorter (subgroup 1B).

An analysis of complications showed that they developed more often in patients of the 1st group: 80 complications were noted in 64 patients in the 1st group (in 92.8% of patients in this group), and 27 in 17 patients in the 2nd (in 40.0% of patients in this group). That is, complications developed in almost all recipients in the 1st group, and in less than half of the patients in the 2nd group. On average, the development of 1.2 complications per patient was noted in the 1st group, and 0.5 complications per patient in the 2nd group. The differences were highly statistically significant ($p<0.001$). Meanwhile, the complications that required surgical intervention (grade 3 according to the Clavien classification) developed statistically significantly more often: 32 complications in 32 patients (46.4%) in the 1st group and 15 complications in 15 patients (27.3%) in the 2nd group ($p<0.01$). Less significant complications (Clavien grade 1) developed in 32 patients

(46.4%) and 7 patients (12.6%) in group 1 and 2, respectively; and these differences were also statistically significant. ($p<0.001$).

Among the complications that arose rapidly and at early stages after surgery, there was thrombosis of the vascular pedicle in 2 patients of the 2nd group, which manifested itself as acute anuria 40–44 hours after transplantation against the restored diuresis from the first hours post-surgery. A rapid increase in the blood creatinine level and the appearance of pain in the graft area were noted; and Doppler ultrasound examination demonstrated an increased kidney graft size with impaired blood flow through its artery. The cause of arterial thrombosis was damage to the arteries of the kidney during its removal from the donor and hypercoagulation that developed in the postoperative period. The second patient had detachment of the intima flap in the distal anastomosis. Both patients underwent a postoperative wound revision. Due to irreversible damage, thrombectomy was performed in one case, and nephrograftectomy in the other. In group 1, no such complications were observed. Differences in the incidence of this complication turned not statistically significant ($p>0.05$ according to χ^2 test and Fisher's exact test).

Acute urinary retention in the early stages after surgery (from the 1st to the 5th day after surgery) developed in 24 patients (19.4%), including 14 patients in the 1st group (20.3%) and 10 patients in the 2nd group (18.2%). In all cases, urinary retention was associated with obstruction of the urethral catheter or bladder neck by a blood clot. At the same time, in 12 of these patients in the 1st group (17.4%) and in 5 patients of the 2nd group (9.1%), severe hematuria was noted due to the presence of a bleeding vessel in the area of the vesicoureteral anastomosis or erosive cystitis, which could cause the blood clot. There were no statistically significant differences in these parameters between the

compared groups ($p>0.05$), either. In 6 patients, cystoscopy was performed for a therapeutic and diagnostic purpose, with the evacuation of blood clots and coagulating the bleeding vessel. The remaining patients underwent conservative therapy with the urethral catheter replacement and the temporary withdrawal of anticoagulation therapy.

In 17 patients (13.7%), the extravazation of urine developed in the early postoperative period due to necrosis of the graft distal ureter and the leak from the vesicoureteral anastomosis. Of these, 14 recipients (20.3%) were from the 1^{st} group and 3 (5.5%) from the 2^{nd} group. A more frequent development of this complication in elderly patients was statistically significant at $p<0.05$.

The extravazation of urine manifested itself as a sudden onset of acute pain in the abdomen often accompanied by fever, decreased diuresis, and swelling of the anterior abdominal wall and genitals. The diagnosis was established on the basis of palpation, ultrasound data, and radioisotope studies. Most often, the extravazation of urine was detected on the 3^{rd}–7^{th} day after the operation, and several hours after the urinary catheter removal. In 3 cases, the extravazation of urine was noted against the diuresis recovery with the development of polyuria (more than 3000 ml per day). It should be noted that the main cause of the extravazation of urine in these patients was ischemic necrosis of the distal ureter, possibly due to excessive skeletonization of the ureter and hilum of the kidney during organ removal. Only in 2 cases, the extravazation of urine developed against an acute rejection crisis with a significant decrease in blood flow through the ureteral artery.

In 3 cases, the development of the extravazation of urine occurred in the presence of a urinary catheter that provided an adequate outflow from the bladder and drainage from the paravesical space. These patients underwent conservative therapy with high doses of antibacterial drugs

under the dynamic control of ultrasound (every 6 hours) and radioisotope studies. In other cases, during the first 12 hours after the detection of the extravazation of urine, a revision of the postoperative wound was performed with forming a neoureterocystoanastomosis on the internal ureteral stent with a longer drainage of the bladder using a urethral catheter. The ureteral stent was removed after an average of 1 month.

Given a high incidence of this complication in elderly recipients, an intraoperative placement of an ureteral stent was performed to prevent it in 20 patients of the 1st group. None of these patients developed extravazation of urine. In group 2, prophylactic stent placement was performed in 4 patients with suspected impaired blood supply to the distal ureter part of the graft. None of these recipients developed a vesicoureteral anastomosis insufficiency.

Obstructive complications of the ureter and vesicoureteral anastomosis developed in 15 patients (12.1%), namely in 13 cases in patients of the 1st group (18.8%) and in 2 patients of the 2nd group (3.6%). A more frequent development of ureteral obstruction among elderly patients was statistically highly significant ($p=0.01$). At the same time, the causes of obstruction in patients of the 1st and 2nd groups were different. All patients of the 1st group experienced compression of the distal ureter part of the graft by a massive lymphocele (12 patients) or hematoma (1 patient), while in both patients of the 2nd group, the obstruction occurred due to a technical error while forming the vesicoureteral anastomosis. Thus, lymphocele was the main cause of ureteral obstruction in the early postoperative period in older recipients ($p<0.001$, statistically significant).

In both patients of the 2nd group and 6 patients of the 1st group, in whom the results of ultrasound examination of the renal graft showed negative dynamics in the degree of the graft pyelocaliceal system

expansion and the volume of the lymphocele; in cases of an increasing risk of the graft ureter necrosis dvelopment, a laparoscopic correction of the vesicoureteral anastomosis and elimination of lymphocele were performed. In all cases, a positive effect was achieved with the restoration of the urine passage and the graft salvage.

In the early postoperative period, in the high blood levels of cyclosporine or tacrolimus, there were often signs of aseptic urethritis, which was accompanied by dysuria, and balanopostitis (in 34 patients, 27.4%) due to the irritation of the urinary tract mucosa occurring in immunosuppression. Most often, these signs were observed in patients of the 1st group (27 patients, 39.1%), and more often in the presence of concomitant type 2 diabetes mellitus (16 patients, 23.2%), polycystic kidney disease and urolithiasis (11 patients, 15.9%), while in the 2nd group these complications developed in 7 (12.7%), including 4 of them (7.3%) in the presence of concomitant diabetes mellitus and polycystic kidney disease. Differences between groups were statistically significant ($p<0.01$). In order to prevent the possible development of urethral stricture in these cases, a temporary catheterization of the bladder with a Foley catheter was used.

Thus, the renal transplant recipients of the older age group were statistically significantly more likely to develop complications in the early postoperative period. Statistical analysis showed that the relative risk of complications in patients of the 1st group was 3.001 (95% CI 2.010–4.479) compared with that in the 2nd group. Meantime, more often were developed both mild complications (the relative risk of development was 3.644 (95% CI 1.744–7.615), and more severe complications requiring additional surgical interventions (the relative risk of their development was 1.700, 95% CI 1.031–2.805).

We analyzed the role of an aggravated urological history in complication development, that is, we compared the incidence of complications in 1A subgroup of recipients with concomitant urological diseases and/or previous surgical interventions on the urinary system, and in 1B subgroup of recipients who did not have these potentially negative factors.

The analysis showed that in the recipients of the older age group, early postoperative complications generally developed statistically significantly more often in recipients with aggravated urological history: of 80 complications registered in all recipients of the 1st group, 59 (73.8%) developed precisely in these patients, while recipients without urological comorbidities developed only 21 complications (26.2%). The differences were highly statistically significant at $p<0.001$ (Table 1). At the same time, recipients in subgroup 1A developed a mean of 1.4 complications per patient, while in subgroup 1B it was 0.8. This figure was not much higher than in the group of younger recipients (Group 2), where it was 0.5 complications per patient.

Table 1. Impact of concomitant urological pathology in older age group recipients on the development of early postoperative complications

Complication	Total in the 1st group	1A subgroup	1B subgroup	p (1A–1B)
Acute urinary retention	14 (20.3%)	10 (23.3%)	4 (15.4%)	0.431
Hematuria	12 (17.4%)	10 (23.3%)	2 (7.7%)	0.099
Extravazation of urine	14 (20.3%)	12 (27.9%)	2 (7.7%)	**0.044**
Ureteral obstruction, incl. by lymphocele by hematoma	13 (18.8%) 12 (17.3%) 1 (1.4%)	9 (20.9%) 8 (18.6%) 1(2.9%)	4 (15.7%) 4 (15.7%) 0	0.569 0.733
Urethritis	27 (39.1%)	18 (41.9%)	9 (34.6%)	0.551
Total complications	80(100%)	59 (73.8%)	21 (26.2%)	<0.001

Although in general the incidence of early complications was higher in subgroup 1A, the analysis by individual types of complications

in most cases did not reveal statistically significant differences. Only in relation to the extravazation of urine, a statistically significantly more frequent development was revealed in subgroup 1A (27.9% compared to 7.7% in subgroup 1B; p=0.044). With regard to other complications, despite the trend towards their more frequent development in recipients with an aggravated urological history, the revealed differences did not reach statistical significance. It is possible that this is due to the relatively small number of cases for each type of complication.

The clinical significance of the identified trend is emphasized by the analysis of the relative risk of each complication development in patients of subgroup 1A compared with recipients of subgroup 1B. This analysis showed that the risk (OR) of developing acute urinary retention in patients with an aggravated urological history was a mean of 1.52 times higher (95% CI 0.528–4.330) with respect to the development of significant hematuria OR=3.023 (95% CI 0.718–12.735), the risk of developing the extravazation of urine OR=3.628 (95% CI 0.881-14.943), for the risk of developing ureteral obstruction OR=1.360 (95% CI 0.466-3.976), and for the development of urethritis OR=1.209 (95% CI 0.641-2.282). That is, the risk of developing these complications in elderly patients with an aggravated urological history is 1.2–3.6 times higher than that in its absence. It is important to note that this also applies to serious complications in the form of the extravazation of urine and ureteral obstruction.

Complications of a late postoperative period

Since 8 primary non-functioning grafts had to be removed in the early postoperative period in the 1st group and 1 graft in a patient from the 2nd group (thrombosis of the vascular pedicle of the graft), and these patients were returned to chronic dialysis, complications in the long-term

period were followed up in 61 patients of 1st group and 54 patients of the 2nd group.

Dynamic monitoring of recipients after discharge from the hospital (follow-up period up to 1 year) in both groups revealed the development of 156 complications in 78 patients. Meantime, in patients of the 1st group, they developed statistically significantly more often than in the recipients of the 2nd group: in general, 101 complications developed in 47 patients in the 1st group, and 55 complications in 31 patients in the 2nd group. That is, patients of the 1st group developed 64.7% of the total number of complications in both groups; and in the 2nd group? 35.3% of the total number of complications developed (Figure). Statistical analysis using the χ^2 test revealed a high statistical significance of these differences at $p<0.001$. The proportion of patients with developed complications within 1 year was 77.0% in the 1st group, and 56.4% in the 2nd group. These differences were also statistically significant at $p=0.025$.

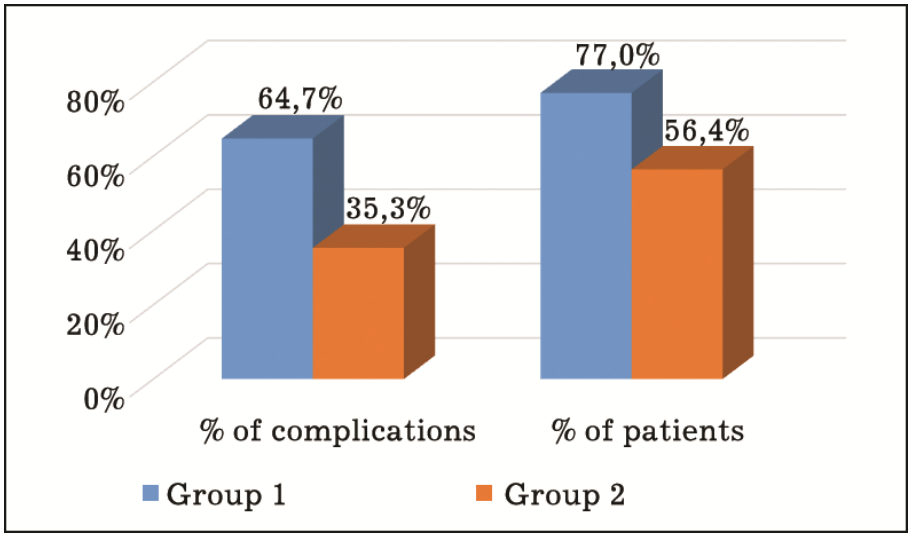

Figure. Distribution of incidence of complications and patients with postoperative complications in the compared groups (%)

Thus, in the long-term period, recipients of the older age group develop more complications in more patients compared to younger recipients.

Analysis by the type of developed complications showed that the most frequent in both groups were infectious complications Table 2). At the same time, they more often developed in the patients of the older age group.

Table 2. Late postoperative complications

Complications	Total	Group 1	Group 2	p (Groups 1–2)
Pneumonia	35 (30.4%)	24 (39.3%)	11 (20.4%)	**0.028**
Urinary tract infection	67 (58.3%)	45 (73.8%)	22 (40.7%)	**<0.001**
Extravazation of urine	3 (2.6%)	3 (4.9%)	0	0.0 99
Infravesical obstruction	11 (9.5%)	9 (14.8%)	2 (3.7%)	**0.048**
Vesicoureteral anastomosis calculi	8 (7.0%)	3 (4.9%)	5 (9.3%)	0.362
Chronic pancreatitis exacerbation	4 (3.5%)	3 (4.9%)	1 (1.9%)	0.371
Chronic colitis exacerbation	7 (6.1%)	5 (8.2%)	2 (3.8%)	0.315
Chronic gastroduodenitis exacerbation	8 (7.0%)	4 (6.6%)	4 (7.6%)	0.859
Neurogenic bladder	11 (9.6%)	4 (6.6%)	7 (13.0%)	0.244
Cytomegalovirus infection	2 (1.7%)	1 (1.6%)	1 (1.9%)	0.931
Total	156	101	55	–

To assess the impact of the presence of urological comorbidities on the incidence of complications in recipients of the older age group, a comparative analysis of the complication development in subgroups 1A (with an aggravated urological history) and 1B (without it) was performed.

The analysis showed (Table 3) that the total number of developed complications was statistically significantly higher in 1A subgroup (68.3%) compared to that in 1B subgroup (31.7%) ($p<0.001$).

Table 3. Impact of concomitant urological pathology in older age group patients on the development of late postoperative complications

Complications	Group 1 (n=61)	Subgroup 1A (n=39)	Subgroup 1B (n=22)	p (1A-1B subgroups
Pneumonia	24 (39.3%)	13 (33.3%)	11 (50.0%)	0.201
Urinary tract infection	45 (73.8%)	35 (89.7%)	10 (45.5%)	**<0.001**
Extravazation of urine	3 (4.9%)	3 (7.7%)	0	0.183
Infravesical obstruction	9 (14.8%)	7 (17.9%)	2 (9.1%)	0.349
Stenosis of vesicoureteral anastomosis	3 (4.9%)	2 (5.1%)	1 (4.5%)	0.920
Chronic pancreatitis exacerbation	3 (4.9%)	1 (2.6%)	2 (9.1%)	0.814
Chronic colitis exacerbation	5 (8.2%)	3 (7.7%)	2 (9.1%)	0.849
Chronic gastroduodenitis exacerbation	4 (6.6%)	2 (5.1%)	2 (9.1%)	0.763
Neurogenic bladder	4 (6.6%)	3 (7.7%)	1 (4.5%)	0.634
Cytomegalovirus infection	1 (1.6%)	0	1 (4.5%)	08 86
Total	101(100%)	69(68.3%)	32 (31.7%)	**<0.001**

However, in a comparative analysis of various types of complications, only urinary infection developed statistically significantly more often (almost with a twofold excess) in subgroup 1A ($p<0.001$). Although all 3 cases of the extravazation of urine were in patients of subgroup 1A, nevertheless, in statistical analysis, this difference was not statistically significant ($p=0.183$), which may be due to the relatively small number of cases. Other types of complications (pneumonia, vesicoureteral anastomosis calculi, exacerbations of chronic diseases, neurogenic bladder, infravesical obstruction, cytomegalovirus infection) were observed with approximately the same frequency in both subgroups. We should note that all cases of infravesical obstruction progression developed in patients with benign prostatic hyperplasia.

As can be seen, an aggravated urological history negatively affected the overall incidence of complications in the long-term period only due to a more frequent development of urinary infection. As a result of the aggressive course of chronic pyelonephritis in subgroup 1A, 6

transplanted grafts had to be removed (17.1% of the total number of patients with persistent urinary infection in this subgroup), and 3 transplanted grafts had to be removed in subgroup 1B (13.6% of the number of patients with urinary infection in this subgroup). The differences were not statistically significant (p=0.371).

Insufficient consideration of an aggravated urological history may lead to the development of more severe complications and accompanied by a high incidence of graft loss and mortality among recipients [22].

An important factor potentially affecting the efficiency of kidney transplantation is the development of complications in the early and late postoperative periods.

The analysis showed that in the early postoperative period in recipients of the 1st group, complications developed in almost all patients (80 complications in 64 patients, that is, in 92.8% of patients in this group), while in the 2nd group, complications developed only in 40% of patients (27 complications in 17 patients). At the same time, on average, the development of 1.2 complications per patient was noted in the 1st group, and 0.5 complications per 1 patient in the 2nd group.

It should be noted that a significant part of the complications occurred in a subgroup of patients with an aggravated urological history (subgroup 1A). Of 80 complications registered in all recipients of the 1st group, 59 (73.8%) developed in these patients, while 21 complications (26.2%) developed in recipients without concomitant urological pathology. Recipients in subgroup 1A developed an average of 1.4 complications per patient, while there were 0.8 complications per patient in subgroup 1B. This figure was slightly higher than in the group of younger recipients (Group 2), where it was 0.5 complications per patient.

Thus, a significant proportion of complications in the early postoperative period developed in elderly recipients with an aggravated urological history, which leads to a longer hospital length of stay.

Late complications also developed statistically significantly more often (by almost 2 times) in recipients with an aggravated urological history. The total number of complications developed in subgroup 1A made 68.3% of all complications; and in subgroup 1B, it was 31.7% ($p<0.001$, statistically significant).

In the spectrum of complications of the late postoperative period in patients of the older age group, urinary infection (73.8% compared with 40.7% in the 2nd group, $p<0.001$), pneumonia (in 39.3% of patients of the 1st group and 20.4% of recipients of the 2nd group, $p<0.05$), infravesical obstruction (14.8% and 3.7%, respectively, $p=0.048$) and urinary leakage (4.9% and 0%, respectively, $p=0.099$).

Thus, a significant proportion of complications in the early postoperative period develops in elderly recipients with an aggravated urological history, the presence of which significantly increases the risk of early and late postoperative complications.

Conclusions

1. A considerable part of the complications after kidney transplantation in the early postoperative period is statistically significant in patients with an aggravated urological history: of 80 complications registered in all recipients, 59 (73.8%) developed in these patients, while in recipients without concomitant urological pathology, only 21 complications developed (26.2%).

2. Late complications also develop statistically significantly more often (by almost 2 times) in recipients with an aggravated urological history. The total number of developed complications among them was

68.3% of all complications, while in recipients without an aggravated urological history it was 31.7% ($p<0.001$, statistically significant).

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