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KIDNEY TRANSPLANT PROGRAM IN IRKUTSK REGION

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Introduction. Kidney transplantation (KT) is often considered the best option for renal replacement therapy (RRT), significantly improving patient outcomes. Post-transplant, life expectancy doubles, and mortality decreases more than 4-fold compared to other RRT modalities. This article presents KT outcomes in Irkutsk Region from 2018 to 2023. All procedures were performed at a single center – the Irkutsk Regional Clinical Hospital. **Objective:** to analyze the immediate and long-term outcomes of KT in Irkutsk Region. **Material and methods.** A retrospective analysis was conducted on the treatment outcomes of 125 patients with kidney failure (KF). Among them, 74 were men with a median age of 42 (35–49) years, and 51 were women with a median age of 46 (37–55) years. The median transplant waitlist time was 15.5 (range: 6–32) months. The leading cause of KF was chronic glomerulonephritis, observed in 60 patients (48%). There were no HLA matches in 36 patients (28.8%), while 38 patients (30.4%) had one match. Arterial anastomosis was primarily performed end-to-end with the external iliac artery in 121 cases (96.8%), while in 3 cases (2.4%), the internal iliac artery was used due to external iliac artery spasm. Cold ischemia time was 222 minutes (range: 162–360), and warm ischemia time was 39 minutes (range: 30–46). **Results.** Length of hospital stay was 16 (range: 13–25) bed days. Primary renal function was achieved in 95 patients (77%), while 25 patients (20%) experienced delayed graft function. Blood tacrolimus reached target levels by postoperative days 9–12. Creatinine level at discharge was 120 μmol/L (range: 97–165). Surgical complications occurred in 24 patients (19.2%), while urinary tract infections were observed in 36 patients (28.8%), with 17 cases (13.6%) presenting clinical symptoms. Immunosuppressive therapy was initiated in 124 patients (99.2%) using a standard triple-drug regimen (calcineurin inhibitors, mycophenolates, and glucocorticoids). One patient (0.8%) succumbed to complications from COVID-19. One-year graft survival was 94.1%. **Conclusion.** The immediate outcomes align with national averages. There is a consistent upward trend in the number of kidney transplants performed. Further development of the regional transplant program will enhance access to this high-tech medical service, meeting the needs of the local population.

Keywords: chronic kidney disease, kidney transplantation, donor resource, kidney transplant complications, Irkutsk Oblast.

INTRODUCTION

Transplantation of human organs and tissues is a rapidly advancing, high-tech, and resource-intensive clinical field aimed at saving lives and restoring health in patients at the end stages of certain diseases [1, 2]. Kidney transplantation (KT) is considered the most favorable form of renal replacement therapy (RRT). In contrast, chronic hemodialysis (or peritoneal dialysis) should be regarded as a temporary bridge to transplantation, as KT has been shown to double life expectancy and reduce mortality by more than four times compared to other RRT modalities. Moreover, transplantation enables optimal social rehabilitation, evidenced by a significant improvement in quality of life and a marked increase in the recipient's ability to work within a relatively short period after surgery [3–6].

The average annual cost of post-transplant medical care per patient is about four times lower than that of chronic hemodialysis. However, the primary hurdle to expanding KT for end-stage chronic kidney disease (CKD) is the shortage and inefficient use of available donor organs [7, 8].

Irkutsk Oblast is the second-largest region in Siberian Federal District by area but has a low population density (3.03 people per square kilometer). As of 2024, the total population is 2,330,537, with approximately 1.804 million residing in large cities. The Irkutsk agglomeration, defined by a 2–3-hour transport radius, includes around 1.082 million people [9].

In 2024, 1,024 patients in the region received maintenance hemodialysis. Each year, about 50 individuals are placed on the waiting list for deceased-donor KT, while the estimated annual need is about 60 transplant procedures.

The KT program in Irkutsk Oblast began in 2003 at Irkutsk Regional Clinical Hospital (IOCH), with the region's first living-related transplant. In 2008, the region developed and implemented protocols for brain death certification. However, over the following decade, kidney transplant procedures remained sporadic and limited

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in number, highlighting the urgent need to reorganize the regional donation and transplantation system.

To address this, a collaboration agreement was signed in 2018 between Shumakov National Medical Research Center of Transplantology and Artificial Organs, the region's Ministry of Health, and IOCH. As part of this initiative, a roadmap for the development of organ donation and transplantation in Irkutsk Oblast was established. This included updates to regulatory and legal frameworks, creation of an independent structural unit within IOCB – the Organ Donation Coordination Department – and implementation of specialized personnel training.

These measures significantly increased the number of effective donors and the total number of transplant procedures, particularly kidney transplants.

Over the past 20 years, over 263 transplantations, including procedures for patients with diabetic nephropathy, have been performed. Additionally, one simultaneous liver–kidney transplantation was carried out (Fig. 1).

Since 2019, the number of transplantations has increased, primarily due to improved organization of the regional organ donation coordination service (Fig. 2). However, the number of procedures remains below target levels, reaching only 16.9 per 1 million population in 2023.

The **objective** of this study is to analyze both the immediate and long-term outcomes of KT in Irkutsk Oblast.

MATERIALS AND METHODS

A retrospective analysis was conducted using medical records of patients who received inpatient care at IRCH between 2018 and 2023. A total of 125 recipients – 74 men and 51 women – with end-stage CKD underwent KT during this period.

Statistical data processing

Statistical analysis was performed using the software package Statistica for Windows, version 10.0. Numerical data are presented as medians (Me) with interquartile ranges (25%–75%).

The overall median age of recipients was 44 years (35–51); 46 years (37–55) for women, and 42 years (35–49) for men (Table 1). The median time on the KT waiting list was 15.5 months (6–32).

The underlying causes of CKD were as follows: glomerulonephritis in 60 patients (48%), tubulointerstitial nephritis in 4 (3.2%), hypertension in 7 (5.6%), congenital anomalies of the kidney and urinary tract in 12 (9.6%), diabetes mellitus in 10 (8%), polycystic kidney disease in 5 (4%), other causes in 16 (12.8%), and unspecified etiology in 11 patients (8.8%).

Table 1

Patient distribution by age

Age (years)	Number	%
20–29	18	14.4
30–39	33	26.4
40–49	42	33.6
50–59	26	20.8
60–69	6	4.8

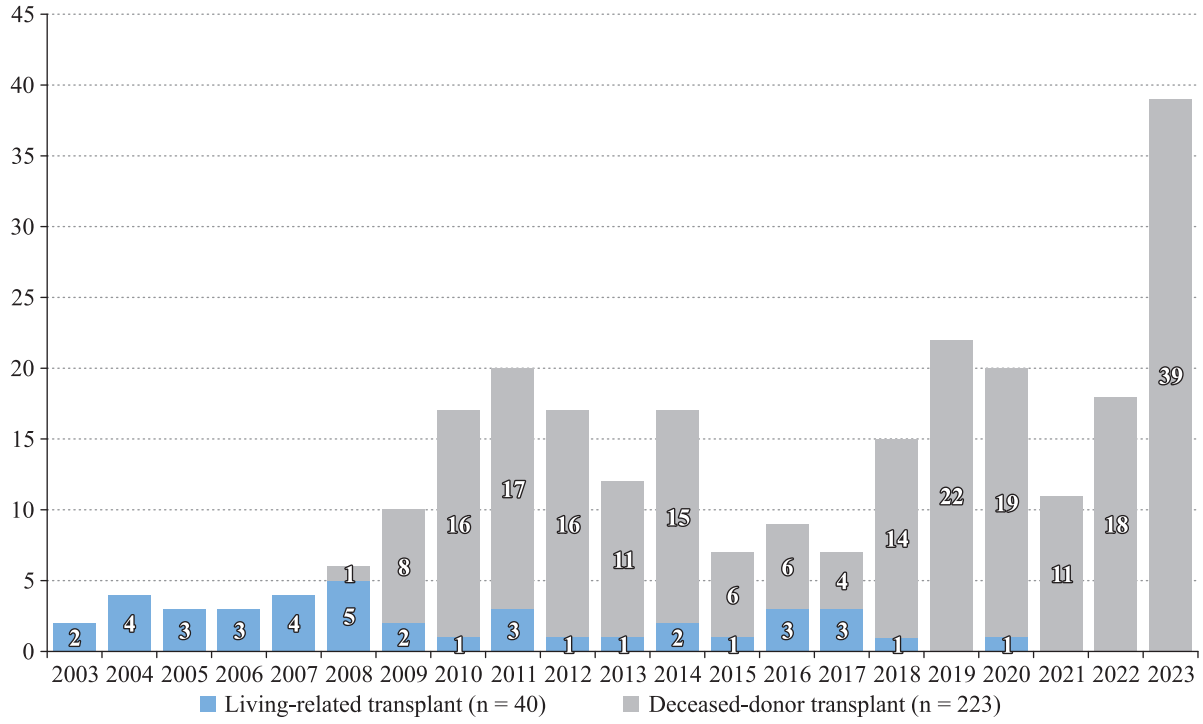

Fig. 1. Trends in the total number of kidney transplants (2003–2023)

Comorbid conditions included anemia in 80 patients (64%), hypoparathyroidism in 14 (11.2%), hyperparathyroidism in 13 (10.4%), type 2 diabetes mellitus in 2 (1.6%), hepatitis C in 3 (2.4%), and epilepsy in 1 patient (0.8%). Nine patients (7.2%) were on peritoneal dialysis at the time of transplantation.

A total of 114 kidneys were transplanted from 57 deceased donors, with each donor contributing two kidneys. In 7 cases, only one kidney was retrieved. Three transplants were performed using organs from living related donors. The median age of deceased donors was 50 years (interquartile range: 41–59), with the youngest donor aged 22 and the oldest aged 71. Data on HLA (human leukocyte antigen) matching are presented in Table 2.

Cold ischemia time was 222 minutes (IQR: 162–360), which can be attributed to the fact that, in most cases, organ retrieval was performed at IRCH in an operating room adjacent to the transplant suite. Warm ischemia time was 39 minutes (30–46). Intraoperative blood loss was minimal – 100 ml (20–100).

The graft was most frequently implanted in the right iliac fossa. Arterial anastomosis was performed predominantly end-to-side with the external iliac artery (EIA) in 121 cases (96.8%). In three cases (2.4%), anastomosis was performed with the internal iliac artery due to EIA spasm. One case (0.8%) involved anastomosis with the common iliac artery following two previous failed transplant attempts in the iliac fossa, necessitating kidney implantation into the abdominal cavity.

A single arterial anastomosis was performed in 122 patients (97.6%), while two were required in 3 cases (2.4%). Venous anastomosis was performed once in

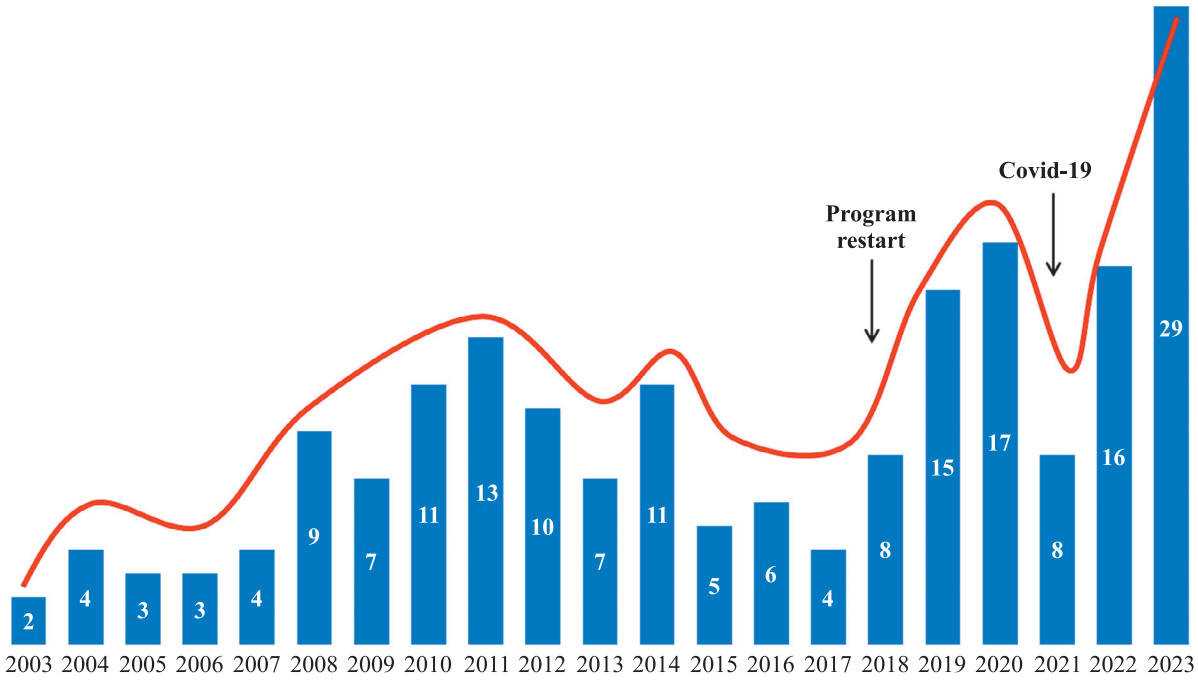

Fig. 2. Trends in the total number of effective donors (2003–2023)

Table 2

Number of HLA matches

HLA match	Number
0	36 (28.8%)
1	38 (30.4%)
2	24 (19.2%)
≥3	27 (21.6%)

Table 3

Postoperative hemodialysis

Number of sessions	Number of patients
1	4
2–3	14
>3	19

124 patients (99.2%) and twice in 1 case (0.8%). To minimize the number of anastomoses, standard angiosurgical techniques such as single-site suturing and side-to-side angioplasty were used.

RESULTS

Hospitalization lasted for 16 days (IQR: 13–25), including 3 days (IQR: 1–4) spent in the intensive care unit (ICU). Surgical drainages were typically removed on day 5 (IQR: 4–8), and urethral catheter on day 7 (IQR: 6–8).

Primary renal function was observed in 83 patients (66.4%). In 37 cases (29.6%), RRT was initially required, followed by recovery of graft function (Table 3) [there was a mistake]. Graft removal was necessary in 4 patients (3%) during the early postoperative period. One

patient (0.8%) experienced primary non-function of the graft, which did not necessitate nephrectomy.

Target blood tacrolimus levels were achieved between postoperative days 9 and 12 (Fig. 3).

Serum creatinine levels decreased significantly by day 10, reaching 120 μmol/L (IQR: 97–165) at the time of discharge (Fig. 4).

The dynamics of serum urea reduction during the postoperative period are illustrated in Fig. 5.

Surgical complications occurred in 24 patients (19.2%). In 4 cases (3.2%), graft removal was required due to the following causes: renal vein thrombosis (1 patient, 0.8%), postoperative infection (1 patient, 0.8%), non-functional arterial anastomosis (initial pathology of the vessel wall, graft removal during the first operation) (1 patient, 0.8%), and graft rupture due to superacute rejection (1 patient, 0.8%).

Repeat surgery was performed in 8 patients (6.4%) due to bleeding in 5 cases (4%), vesicoureteral anastomosis failure in 2 cases (1.6%), and paranephric hematoma in 1 case (0.8%).

Complications requiring minimally invasive intervention occurred in 8 patients (6.4%). X-ray endovascular stenting for arterial anastomosis stenosis was performed in 4 (3.2%) observations, ultrasound-guided lymphocele drainage in 3 cases (2.4%), and nephrostomy due to ureteral anastomosis stricture in 1 case (0.8%).

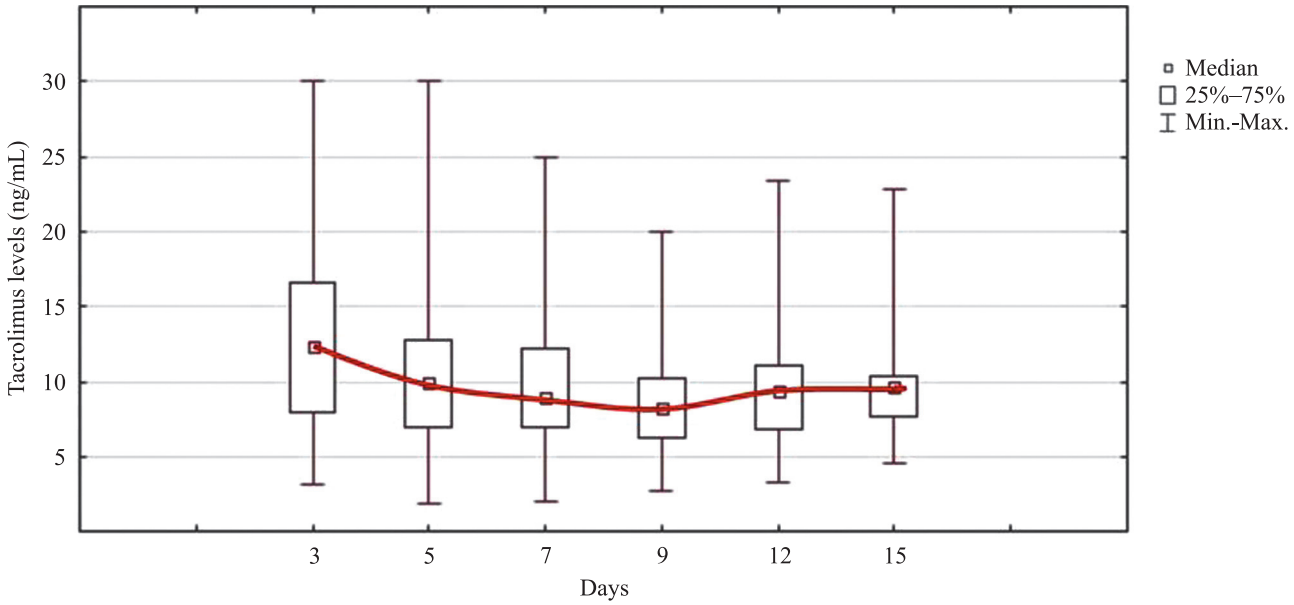

Fig. 3. Tacrolimus blood levels

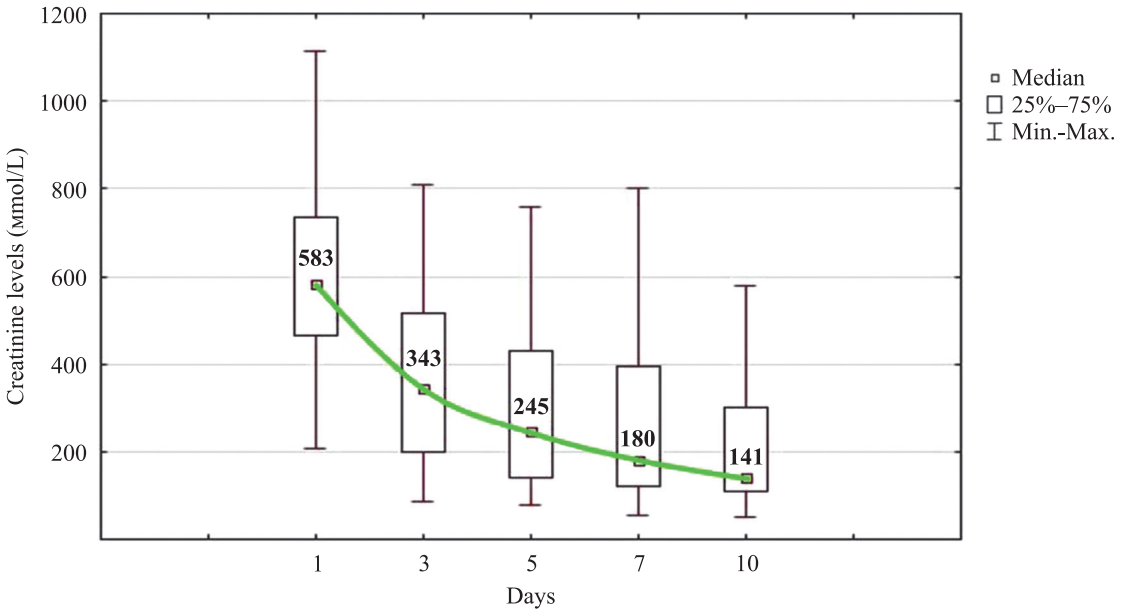

Fig. 4. Creatinine levels

Ischemia of the graft pole, confirmed by Doppler ultrasound and angiography, was identified in 2 patients (1.6%) (Fig. 6). However, no surgical or interventional correction was necessary in these cases.

One patient (0.8%) died as a result of COVID-19. Urinary tract infections were diagnosed in 36 patients (28.8%), of which 17 (13.6%) presented with clinical symptoms and 19 (15.2%) were asymptomatic. The primary causative agents are illustrated in Fig. 7.

Immunosuppressive therapy was initiated using a standard triple-drug regimen – calcineurin inhibitors, mycophenolates, and glucocorticoids – in 124 patients (99.2%). One patient (0.8%) received azathioprine instead of tacrolimus due to drug intolerance.

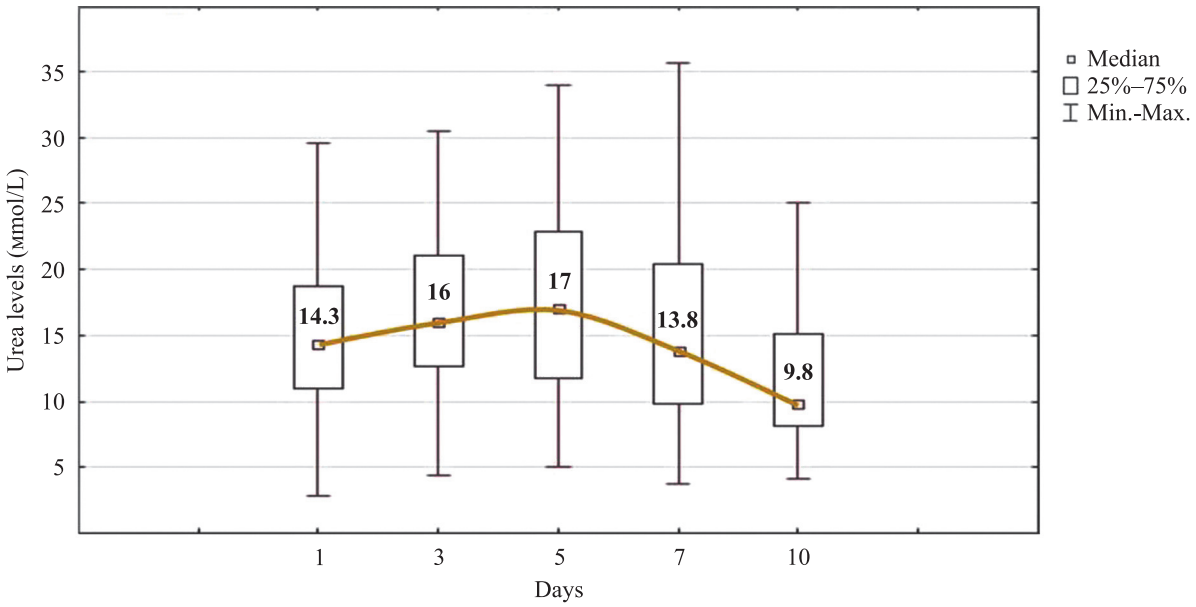

Fig. 5. Blood urea levels

Fig. 6. Selective angiogram of the graft showing the ischemic zone

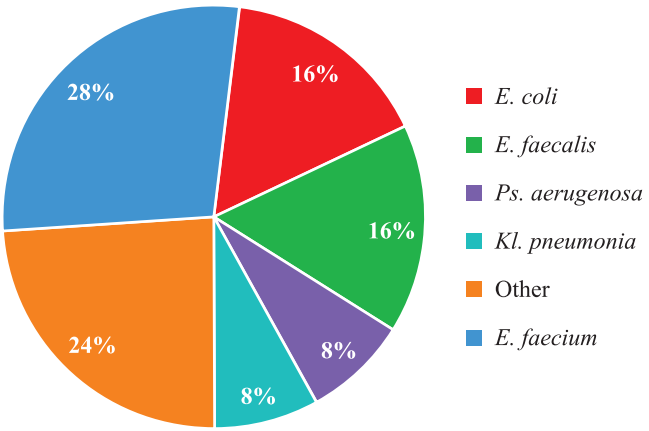

Fig. 7. Urinary tract infection pathogens

Acute humoral rejection occurred in 4 patients (3.2%), necessitating graft removal in 2 of these cases (1.6%). Acute cellular rejection, managed successfully with conservative treatment, was observed in 3 patients (2.4%).

The one-year graft survival rate was 94.1%.

DISCUSSION

KT outcomes depend on many factors, one of the most critical being organ preservation time. In our series,

the median cold ischemia time was about 220 minutes. This relatively short duration was achieved due to the organizational structure of the transplantation process: the majority of donor organ retrievals and subsequent transplantations were performed within a single institution – IRCH. This logistical advantage significantly minimized anoxic time and contributed to improved immediate postoperative outcomes.

Primary graft function was observed in 66.4% of recipients, while delayed graft function was seen in others and typically resolved after 2–3 sessions of hemodialysis.

Most postoperative complications were addressed promptly. Graft removal was necessary in 6 cases (4.8%), including 2 due to vascular complications (1.6%), 3 due to immune-mediated rejection (2.4%), and 1 due to postoperative infection (0.8%). One graft was removed intraoperatively during the initial transplant procedure and was therefore excluded from the graft survival analysis.

Interestingly, in two cases, ischemia affecting a segment of the graft – confirmed via imaging – did not lead to functional impairment and did not require any corrective intervention.

In most urinary infection cases, asymptomatic bacteriuria was detected and managed with targeted antibacterial therapy. These findings underscore the critical importance of rigorous infection surveillance, particularly in the early postoperative period.

One patient (0.8%) died; however, this was unrelated to the surgical procedure; it was attributed to COVID-19.

The timely prevention and management of both early and late post-transplant complications play a decisive role in graft function and long-term survival. Therefore, continuous monitoring of the recipient's clinical status and graft function is essential – not only during the inpatient period but also throughout the outpatient follow-up.

CONCLUSION

Thus, the current need for KT in Irkutsk Oblast is only partially met, primarily due to inefficient use of available donor pool and the absence of a well-structured system for forming and managing the waiting list.

The immediate KT outcomes in the region align with national averages. There is a steady upward trend in transplant numbers. Continued development of the regional transplant program will will enable the healthcare system to better meet the growing demand for this high-tech medical service in the region.

The authors declare no conflict of interest.

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