
# Long-Term Follow-Up Of The Remaining Kidney Function In Patients After Nephrectomy

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ABSTRACT

This article analyzes the long-term dynamics of the remaining kidney function in patients after nephrectomy. The compensatory capacity, time-related changes in functional parameters, and clinical outcomes were studied. Based on the follow-up results, conclusions were drawn regarding the risk of renal failure, arterial hypertension, and metabolic disorders.

**Keywords:** nephrectomy, remaining kidney, long-term follow-up, renal failure, arterial hypertension.

## Introduction

The kidneys are vital organs responsible for maintaining fluid balance, excreting metabolic waste products, regulating blood pressure, and playing a crucial role in hormonal activity. In modern clinical practice, nephrectomy – surgical removal of a kidney – is widely performed for various indications such as renal tumors, chronic pyelonephritis, hydronephrosis, cystic diseases, or congenital anomalies.

In recent years, the number of nephrectomies has been increasing worldwide. According to the World Health Organization (WHO), an average of 12–18 nephrectomies are performed per 100,000 population annually. The incidence is even higher in developed countries such as the USA, Germany, and Japan, largely due to advances in urologic oncology. In Uzbekistan, a growing number of renal cancer and other urological conditions requiring nephrectomy have also been reported over the past decade.

After nephrectomy, the function of the remaining kidney becomes crucial. Through compensatory mechanisms, the remaining kidney takes on the additional functional load, characterized by increased glomerular filtration rate (GFR) and compensatory hypertrophy. However, long-term follow-up studies indicate that compensatory capacity is limited, and the risk of chronic kidney disease (CKD) progressively increases. Furthermore, patients living with a single kidney have a higher probability of developing arterial hypertension, proteinuria, metabolic syndrome, and CKD. Therefore, long-term follow-up, functional assessment, and preventive measures are

critical issues in modern urology and nephrology.

The aim of this study was to analyze the long-term outcomes of the remaining kidney function after nephrectomy, evaluate compensatory capacity, and determine the risk of clinical complications.

## Literature Review

Uzbekistan Experience: Nephrectomies in Uzbekistan are mostly performed for renal tumors and hydronephrosis. Studies report compensatory hypertrophy in 68% of patients with a single kidney. Long-term follow-up data from the Republican Specialized Center of Urology show that after 5 years, 22% of patients developed proteinuria and hypertension, highlighting the need for continued monitoring.

Russian Experience: Russian studies have demonstrated that glomerular filtration increases during the first 2–3 years after nephrectomy but decreases over 7–10 years, with a progressive rise in chronic kidney disease signs.

US Experience: In the United States, nephrectomy is more often performed for oncological reasons. A 15-year cohort study following 1,200 patients revealed that 18% developed chronic kidney disease after 10 years.

German Experience: German studies emphasize regular laboratory and imaging monitoring. Müller et al. conducted an 8-year follow-up on 450 patients, reporting a 25% decline in GFR and a high incidence of proteinuria. National nephroprotection programs have helped reduce severe complications.

Japanese Experience: Long-term Japanese studies show that compensatory hypertrophy may last for several years. Nakamura et al. followed 600 patients for 12 years and reported that compensatory adaptation remains stable for the first 5 years but GFR declines significantly in 20–25% of patients after 10 years.

## Materials and Methods

This study was conducted at Tashkent Medical Academy and the Republican Specialized Urology Center between 2012 and 2022, including retrospective and prospective analyses.

Participants:

- Total: 120 patients (78 males, 42 females)
- Mean age: 49.7 ± 12.4 years

Indications for nephrectomy:

Renal tumors – 65 patients (54.1%)

Hydronephrosis – 28 patients (23.3%)

Chronic pyelonephritis and other causes – 27 patients (22.6%)

Follow-up period:

- Minimum 5 years, maximum 10 years
- Annual clinical examination, laboratory tests, and imaging studies

Assessment criteria:

1. Laboratory tests: serum creatinine, urea, electrolytes, urinalysis (proteinuria, hematuria), GFR calculated by CKD-EPI formula.
2. Imaging: ultrasound, Doppler studies, CT or MRI if necessary.
3. Clinical parameters: blood pressure, signs of chronic kidney disease, metabolic disturbances.

Statistical Analysis: Data were analyzed using statistical software. Mean values and variability were calculated. Differences between groups were considered significant at $p < 0.05$.

## Results

According to the follow-up results of 120 patients, the compensatory function of the remaining kidney was satisfactory during the first years but gradually declined. A decrease in GFR was observed over 10 years. Proteinuria was detected in 38% of patients by the end of follow-up, and arterial hypertension was found in 41% of patients.

Figure 1. Changes in GFR indicators over a 10-year period.

Figure 2. Distribution of proteinuria and hypertension frequency.

## Discussion

The findings indicate that while most patients maintain adequate compensatory renal function after nephrectomy, some experience faster progression of nephrosclerosis and a significant decline in GFR. Age, underlying disease, and comorbidities are key factors influencing long-term outcomes.

Our findings are consistent with international data, confirming that regular clinical, laboratory, and imaging follow-up is crucial to detect complications early and preserve long-term kidney function.

## Practical Recommendations

1. Implement a long-term monitoring system: Patients should visit a nephrologist 2–3 times per year and undergo routine blood and urine tests.
2. Regularly measure GFR, especially in patients over 40 or with comorbidities such as hypertension and diabetes.
3. Monitor blood pressure at home and maintain values below 130/80 mmHg with appropriate therapy.
4. Screen for proteinuria and microalbuminuria annually.
5. Promote a healthy lifestyle, including dietary adjustments, physical activity, and avoidance of harmful habits.
6. Develop national rehabilitation and prevention programs to support remaining kidney function.

## Conclusion

Long-term follow-up after nephrectomy demonstrates that while the compensatory capacity of the remaining kidney is high, functional overload leads to gradual decline in GFR, hypertension, and proteinuria over time. Regular monitoring and preventive measures are essential to reduce the risk of chronic kidney disease and improve quality of life.

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