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# Clinicopathological Results of Percutaneous Transplant Kidney Biopsies: Single Center Nine Years' Experience

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***Abstract***

*Based on clinical criteria alone, the cause of graft dysfunction cannot be accurately predicted in 40-70% of cases. Therefore, renal allograft biopsy is still the gold standard for accurate diagnosis. We performed this study to evaluate the causes of renal graft dysfunction detected in renal allograft biopsies in our center.*

*The results of 90 patients who underwent renal allograft biopsy between May 2013 and June 2022 were evaluated retrospectively. It was determined that 92 biopsies were performed from 90 patients and all were ''cause'' biopsies. The mean age was 40.03±14.29 years. 82 of the kidney transplants were from living donors. 21 patients had preemptive transplantation. The type of renal replacement therapy before transplantation was hemodialysis in 52 patients, PD in 3 patients, PD and HD in 3 patients. The reason for biopsy was high creatinine in 67 patients, proteinuria in 23 patients, and BK virus viremia in 2 patients. The mean discharge creatinine value was 1.64±1.11mg/dl, and the mean creatinine before biopsy was 3.06±2.07mg/dl. In one*

*biopsy, although kidney tissue was detected, there was no glomeruli. The mean number of cores taken was 2.94±0.61, and the number of glomeruli was 21.33±11.64. In one biopsy bleeding that required transfusion developed. No other biopsy-related complications were observed. Graft loss was observed in 46 of 90 patients during the follow-up period.*

*Conclusions: Evaluation of serum creatinine and urinalysis may be useful in predicting histological graft diagnosis, but an allograft biopsy is necessary for definitive diagnosis.*

***Key words:*** *Kidney transplantation, allograft biopsy, acute rejection.*

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## Introduction

Renal transplantation is the best treatment option for end-stage renal disease. Kidney transplant outcomes have improved due to advances in immunological treatments and surgical techniques (1). However, renal allograft dysfunction may occur due to acute rejection, chronic rejection, calcineurin inhibitor toxicity, infections, and recurrence of the original kidney disease. Each of these causes requires a different therapeutic approach (2). However, based on clinical criteria alone, the cause of graft dysfunction cannot be accurately predicted in 40 to 70% of cases (3-7). Therefore, renal allograft biopsy is still the gold standard for accurate diagnosis (3,8,9). The causes of graft dysfunction may differ from center to center. We performed this study to evaluate the causes of renal graft dysfunction detected in renal allograft biopsies in our center and to compare our findings with the literature.

## Methods

The results of patients who underwent renal allograft biopsy between 13.05.2013 and 22.06.2022, among the kidney transplant patients followed in the Group Florence Nightingale Hospital Kidney Transplantation Center, were evaluated retrospectively. It was determined that 92 biopsies were performed from 90 patients. Renal allograft biopsies were performed in the

presence of unexplained graft dysfunction (≥25% increase in serum creatinine from baseline) and/or proteinuria (>1 gr/day). The procedure was performed by a radiologist under ultrasound guidance with a 16G automatic biopsy needle.

Demographic data such as transplantation age, gender, dialysis type, post-transplant biopsy time, donor type (living, cadaveric), laboratory data such as posttransplant and before biopsy creatinine, presence of proteinuria were recorded from the files.

The patients were evaluated in terms of hemoglobin values before and after biopsy, biopsy-related complications, number of cores and glomeruli taken by biopsy, biopsy diagnoses, and graft loss.

**Statistical Methods**

Statistical analysis was carried out using the Statistical Package for the Social Sciences (SPSS) software, version 21.0 (IBM Corp, New York, NY, USA). Descriptive statistics of mean ± standard deviation (SD) were used for normally distributed continuous variables, such as age and clinical and laboratory data. For categorical data, such as biopsy diagnoses, numbers (percentages) were used.

**Results**

It was determined that 92 biopsies were performed from 90 patients between May 2013 and June 2022 in group Florence Nightingale Hospital Kidney Transplantation Center. All were "cause" biopsy. The mean age of the patients was 37.32±14.34 at the time of kidney transplantation. The mean age was 40.03±14.29 years at the time of biopsy. The males were predominant among recipients (76.7 vs. 23.3%). Eighty-two (91.1%) of the kidney transplants were from living donors and 8 (8.89%) from cadaveric donors. Twenty-one (23.3%) patients had preemptive transplantation. The type of renal replacement therapy before kidney

transplantation was hemodialysis (HD) in 52 (57.8%) patients, peritoneal dialysis (PD) in 3 (3.33%) patients, PD and HD in 3 (3.33%) patients. The type of renal replacement therapy in 11 (12.2%) patients was unknown. The mean biopsy time after kidney transplantation was 2.84±3.02 years. The reason for biopsy was high creatinine in 67 (72.8%) patients, proteinuria in 23 (25%) patients, and BK virus viremia in 2 (2.5%) patients. The mean creatinine value at the time of discharge from the hospital after transplantation was 1.64±1.11mg/dl, and the mean creatinine before biopsy was 3.06±2.07mg/dl. Although there was kidney tissue in one of the allograft biopsies, there was no glomeruli. The mean number of cores taken was 2.94±0.61, and the number of glomeruli was 21.33±11.64. Histopathologically, focal segmental glomerulosclerosis (FSGS) (21 patients), BK virus nephropathy (BKVN) (13 patients), T-cell mediated rejection (11 patients) and antibody-mediated rejection (ABMR) (10 patients) were in the top four ranks. The biopsy results of the patients are given in table 1. In one of the 92 biopsies performed, bleeding requiring transfusion developed. No other biopsy-related complications were observed. Graft loss was observed in 46 of 90 patients during the follow-up period. The distribution of pathological diagnoses of patients with graft loss is shown in Table 1.

**Table 1.** Pathological diagnoses of the patients and the number of graft loss.

| **Diagnosis** | **Number (n)** | **Graft loss (n)** |
|---|---|---|
| ABMR | 5 | 4 |
| CABMR | 5 | 3 |
| T-cell-mediated rejection | 3 | 2 |
| Bordeline changes | 6 | |
| ABMR+ T-cell-mediated rejection | 3 | 2 |
| BKVN+ T-cell-mediated rejection | 2 | 2 |
| Toxicity results of Calcineurin Inhibitor | 1 | 1 |

| | | |
|---|---|---|
| BKVN | 10 | 8 |
| FSGS | 20 | 4 |
| **Diagnosis** | **Number (n)** | **Graft loss (n)** |
| BKVN+FSGS | 1 | 1 |
| IgAN | 4 | 3 |
| IgAN+T-cell- mediated rejection | 3 | 3 |
| IgAN+CABMR | 1 | 1 |
| Amyloidosis | 3 | 1 |
| C3 glomerulopathy | 2 | 2 |
| Membranoproliferative glomerulonephritis | 2 | 2 |
| Membranous Glomerulonephritis+ABMR | 1 | 1 |
| Thrombotic Microangiopathy | 1 | 1 |
| ATN | 2 | - |
| Nonspecific changes | 8 | - |
| Tubulointerstitial nephritis | 3 | 3 |
| IF/TA | 5 | 2 |
| ABMR+ATN | 1 | - |

ABMR: Antibody-mediated rejection, CABMR: Chronic active antibody mediated rejection, BKVN: BK virus nephropathy, FSGS: Focal segmental glomerulosclerosis, IgAN: IgA nephritis, ATN: Acute tubular necrosis. IF/TA: interstitial fibrosis/ tubular atrophy.

## Discussion

Allograft biopsy is still used as a reliable method to evaluate transplant kidney function. Localization of the transplanted kidney in the inguinal fossa facilitates both the procedure and hemostasis (9). Nevertheless, hemorrhage is stated as the most important complication in the literature, and the complication rates related to transplant kidney biopsy are reported to be between 0.06% and 13% (10-15). In our study, we detected bleeding requiring transfusion in only 1 (1.1%) patient and no other biopsy-related complications were observed. This difference in complication rates can be explained by many factors such as the operator's experience, the use of the imaging guide, and the size of the biopsy needle. We used a 16 g biopsy needle in

our study group and the procedure was performed by an experienced radiologist. In our study, the rate of transplantation from cadaver was 8.89% (8 patients). This rate was similar to our country's 2020 data (10%) (16).

The primary indication for allograft biopsy is to differentiate between acute rejection and other causes of renal dysfunction. This indication is mainly established when the creatinine level, which indicates renal dysfunction, rises above the basal level. In our study, allograft biopsy was performed in 67 (72.8%) of the patients due to increased creatinine. Proteinuria, one of the indications for allograft biopsy, is an important marker and has been studied in many studies (17-20). Massive proteinuria after transplantation is common in the first three months and resolves spontaneously during follow-up (17). Persistent proteinuria occurs in 30% of transplants and is positively correlated with the presence of glomerular lesions. In the present study, proteinuria was used as an indicator for allograft biopsy in 25% of the cases and was present in 57.6% of the renal biopsies.

The sensitivity of the kidney biopsy depends on the biopsy size number of cores and amount of cortex sampled. The reported sensitivity of two core biopsies is close to 99% (21,22). Although the adequacy of the sample depends on the underlying pathology, at least 7 non-globally sclerotic glomeruli and 2 arterial sections must be present for accurate assessment. In our study group, less than 7 glomeruli were detected in 7.6% biopsies, and no glomeruli were detected in only one biopsy sample. The mean number of cores taken was 2.94±0.61, and the mean number of glomeruli was 21.33±11.64.

It has been stated that, in the early period of kidney transplantation the biopsy results are easier to interpret because the lesions are more specific. In the late period many lesions can be seen together and chronic damage makes the interpretation of existing lesions difficult. (23). In our population, the mean follow-up time between kidney transplantation and allograft biopsy was found 2.84±3.02 years. The shortest biopsy time was 5.7 days and the longest 11.9 years. When

the histopathological results of our patients were examined, single and combined diagnoses were detected. A combined result was found in twelve (13.04%) biopsies. Focal segmental glomerulosclerosis was observed in 21 patients, BKVN in 13 patients, T cell-mediated rejection in 11 patients, and ABMR in 10 patients. Graft loss developed in 46 (51.1%) of 92 biopsies performed on 90 patients. The diagnoses of patients with graft loss are shown in Table 1. In one study, they attributed about half of the causes of graft failure to ABMR and mixed rejection. In the same study, three other non-rejection causes were specified as glomerulonephritis, BKVN, and intercurrent disease. (24). In our study group, we found that graft loss was most common in the patient group accompanied by BKVN, T-cell- mediated rejection and ABMR. Other studies have also associated BKV nephropathy with early renal dysfunction, graft loss, and renal histology changes (25–28), and it has been observed that BKV nephropathy may cause graft dysfunction in >90% of affected individuals and graft loss in more than 50% (29). In our study, graft loss developed in 11 (84.6%) of 13 patients whose biopsy was accompanied by BKV nephropathy. This rate seems consistent with the literature. On the other hand, ABMR was detected in the biopsy of 10 patients, and graft loss developed in 7 patients. Graft loss developed in 2 of 3 patients with only T-cell-mediated rejection in histology, while graft loss developed in 9 out of 11 patients with combined T-cell-mediated rejection. Our study has limitations such as being retrospective and consisting small number of patients.

## Conclusion

The leading indication for allograft biopsy in our center is increased creatinine. Focal segmental glomerulosclerosis and BK virus nephropathy constitute an important part of biopsy diagnoses. These results do not require antirejection therapy. Performing allograft biopsy in patients with graft dysfunction is important to prevent unnecessary anti-rejection treatments.

## Conflict of interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.


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