

Graft Nephrectomy in the Modern Transplant Era: Case Series

Modern Nakil Çağında Greft Nefrektomi: Vaka Serisi

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ABSTRACT Objective: Graft nephrectomy is one of the most important operations in urology with its high morbidity and mortality rates. In particular, it carries up to 15% early and late surgical morbidity. We aimed to present the results of the patients who underwent graft nephrectomy in our organ transplant center and the experiences of the operation. **Material and Methods:** Data of 10 patients who underwent graft nephrectomy between 2011 and 2020 in Health Sciences University, Bakırköy Dr. Sadi Konuk Training and Research Hospital, Organ Transplantation Center were evaluated retrospectively. **Results:** Ten graft nephrectomy patients out of 237 renal transplant patients were included in the study. The mean age of the patients was 34.1±13.1 years. The indications for graft nephrectomy were chronic rejection in 5 (50%), to reduce the recipient's human leukocyte antigen sensitization due to the functional loss in graft kidney in 1 (10%), hyperacute rejection in 2 (20%), and acute rejection in 2 (20%) patients simultaneous incisional hernia repair was performed in 1 patient. In 2 patients, postoperative wound infection was treated conservatively. Mortality was not observed in any patient. One patient underwent renal transplantation from a living donor to the same side (right) one month after graft nephrectomy. **Conclusion:** Graft nephrectomy is a surgery with high morbidity rates. It should be applied in safe and experienced hands with transplantation experience.

Keywords: Graft nephrectomy; renal transplantation; end stage renal failure

ÖZET Amaç: Greft nefrektomi, yüksek morbidite ve mortalite oranları ile ürolojinin en önemli operasyonlarından biridir. Özellikle erken ve geç cerrahi, morbiditeyi %15'e varan oranlarda taşır. Organ nakli merkezimizde, greft nefrektomi yapılan hastaların sonuçlarını ve operasyon deneyimlerini sunmayı amaçladık. **Gereç ve Yöntemler:** Sağlık Bilimleri Üniversitesi Bakırköy Dr. Sadi Konuk Eğitim ve Araştırma Hastanesi Organ Nakli Merkezinde, 2011-2020 yılları arasında greft nefrektomi yapılan 10 hastanın verileri retrospektif olarak değerlendirildi. **Bulgular:** Çalışmaya 237 böbrek nakli hastasından, 10 greft nefrektomi yapılan hasta dâhil edildi. Hastaların ortalama yaşı 34,1±13,1 yıl idi. Greft nefrektomi endikasyonları 5 (%50) hastada kronik rejeksiyon, 1 (%10) hastada greft fonksiyonunun azalması nedeniyle alıcının insan lökosit antijeni duyarlılığını azaltmak, 2 (%20) hiperakut rejeksiyon ve 2 (%20) hastada akut rejeksiyon idi. Bir hastada, eş zamanlı kasık fitiği onarımı yapıldı. İki hastada, postoperatif yara enfeksiyonu konservatif olarak tedavi edildi. Hiçbir hastada ölüm görülmedi. Bir hastaya, greft nefrektomiden 1 ay sonra canlı donörden aynı tarafa (sağ) renal transplantasyon yapıldı. **Sonuç:** Greft nefrektomi, morbidite oranları yüksek bir cerrahidir. Transplantasyon tecrübesi olan, güvenli ve tecrübeli ellerde uygulanmalıdır.

Anahtar Kelimeler: Greft nefrektomi; renal transplantasyon; son dönem böbrek yetersizliği

Renal transplantation (RT) has been used as the gold standard treatment with low morbidity and high quality of life as a better alternative to dialysis in the treatment of end-stage renal disease.^{1,2} According to the data of the Turkish Organ, Tissue Transplantation and Dialysis Services Department, 3,418 RTs

were performed in our country in 2016.³ Despite the increasing number of RTs and improved graft survival, graft failure still continues.^{4,5} Graft failure rates are approximately 12-22% in 3 years, and 44-59% in 10 years after transplantation.⁶ In addition, 4.5-8.4% of the failed grafts are removed after trans-

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plantation.⁷ Indications for graft nephrectomy (GN) include immunological causes (acute, chronic and hyperacute rejection), vascular complications (aortic thrombosis), tumors, infections and other causes.⁸ GN is one of the most important operations in urology with elevated morbidity and mortality rates.⁸ Especially in the late period, important morbidities such as blood loss, wound infections, and surgical complications are observed in approximately 15% of the patients.⁹

In this study, it was aimed to present the outcomes and the experiences regarding the surgical operations performed in patients, who underwent GN in our organ transplantation center.

MATERIAL AND METHODS

This retrospective study protocol was approved by the Local Ethics Committee of Bakırköy Dr. Sadi Konuk Training and Research Hospital, and the study was conducted according to the tenets of the Declaration of Helsinki (date: 19 April 2021, number: 2021-08-07). All subjects were informed about the study protocol, and their written consent was obtained (2021-222). Our retrospective study was composed of 237 patients who underwent RT be-

tween September 2011 and November 2020 in our Organ Transplantation Center. Ten patients, who underwent GN, were included in the study. Demographic data, preoperative, perioperative, and postoperative clinical features, immunological treatment protocol, and pathological findings were recorded.

Presence of symptomatic (pain, recurrent infection, reflux, hydroureteronephrosis etc.) non-functional graft and decreased sensitization for subsequent RT were determined as indications for GN. Pathological and anatomical outcomes were categorized as rejection, ischemia, inflammation and other causes. Rejection includes acute, vascular, and chronic rejection. Ischemia, renal artery and renal vein thrombosis along with other causes of ischemia were recorded.

SURGICAL TECHNIQUE

The whole operation was performed by an experienced transplantation surgery team (SK, AFG). All graft nephrectomies were performed over the previous transplantation incision. Extracapsular method was preferred in 9 patients, and the intracapsular method was preferred in 1 patient. In the extracapsu-

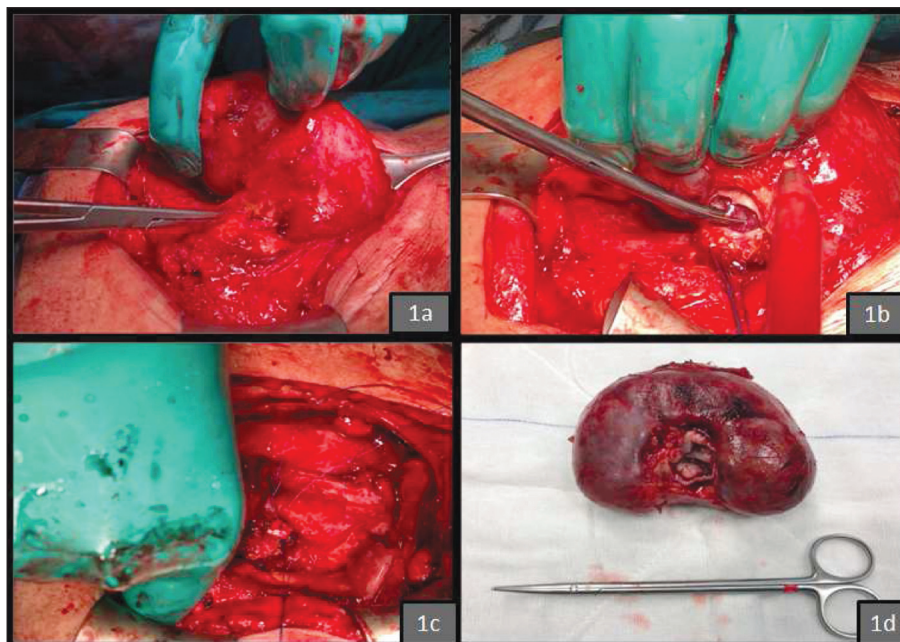


FIGURE 1: a. Dissection of the transplanted kidney pedicle; b. Cutting the transplanted kidney pedicle with scissors; c. Suturing the transplanted kidney pedicle; d. Allograft nephrectomy specimen.

lar approach, the kidney capsule and graft were extracted and the ureter and renal vessels were ligated. Renal artery and vein roots were left in place (Figure 1). In the intracapsular method, the capsule of the graft was cut and the graft was dissected and opened. The kidney was removed from the capsule and pedicle, the renal vessels were tightened and ligated with non-absorbable sutures. In all operations, a silicone drain was placed in the operation site.

RESULTS

Among the 237 patients, who underwent RT in Organ Transplantation Center between 2011-2020, 10 patients were evaluated retrospectively. Among the patients, 3 (30%) had a history of RT from a cadaver, and 7 (70%) had a history of RT from a living donor. All patients were adults, and their mean age was 34.1±13.1 years (18-60). GN was performed within a mean of 28.3±32.6 months (0-96 months) after the transplantation. During the GN, 6 (60%) patients were undergoing immunosuppression therapy, and 4 (40%) patients were undergoing corticosteroid therapy. The male/female ratio was 3/2. The indications for GN were caused by chronic rejection in 5 (50%) patients, by the reduction of the human leukocyte antigen (HLA) sensitization of the recipient due to the functional loss in graft kidney in 1 (10%), by hyperacute rejection in 2 (20%) cases, and acute rejection

in 2 (20%) cases. Right GN was implemented in 8 patients, and left GN was implemented in 2 patients. The external iliac artery injury occurred in one patient during the operation was repaired end to end with the internal iliac artery. No complications were observed in the patient, who used antiplatelet drugs for 6 months after the operation. In one case, incisional hernia repair was performed simultaneously with the right GN. One patient underwent RT from a living donor to the same side (right) one month after GN. The mean follow-up period of the patients after the operation was found as 17.5±9 (6-36) months. The clinical characteristics of the cases were summarized in Table 1.

DISCUSSION

The advances in surgical techniques and especially in transplantation immunology since the first successful RT performed in 1954 have reduced undesired factors that may cause graft failure. The rate of graft failure occurring within 1 year in patients who underwent RT used to be 40% in the 1970s; however, it has recently decreased to 5%, following the developments in immunosuppressive treatments. The 1-year survival of the graft is 89% in transplants from cadavers, and 95% in transplants from living donors.¹⁰ Renal dysfunction may occur from the moment the graft is transplanted to the recipient in RT. While

TABLE 1: Demographic, preoperative-postoperative features.

Age	Gender	Transplantation type	Rejection type	Indication of graft nephrectomy	Time between transplant and allograft nephrectomy (months)	Graft size	Complications	Follow-up period (months)
18	Male	Live	Chronic	Cellular rejection	48	Right		22
27	Female	Live	Chronic	Humoral rejection	60	Right		6
31	Male	Cadaveric	Hyperacute	Renal artery thrombosis	0	Right		12
51	Male	Live	Chronic	Calcineurin inhibitor toxicity	50	Left		18
26	Female	Live	Chronic	Cytomegalovirus infection	18	Right		15
60	Male	Live	Chronic	Human leukocyte antigen desensitization	96	Right	Wound infection	24
28	Female	Cadaveric	Acute	Acute tubular necrosis	2	Right	External iliac artery injury	21
25	Male	Live	Hyperacute	Renal artery thrombosis	0	Left		36
42	Female	Cadaveric	Chronic	Recurrent glomerulonephritis	36	Right	Wound infection	9
33	Male	Live	Acute	Graft intolerance syndrome	3	Right		12

renal dysfunction that occurs immediately after the graft is placed in the recipient suggests hyperacute rejection and surgical causes, dysfunction occurring 3 months after transplantation would lead us to acute rejection and drug toxicity. Graft failure may occur, and GN may be necessary for these patients. GN is an invasive operation with significant potential of morbidity and mortality because of comorbidities, chronic immunosuppression, and technical difficulty.¹¹ Today, GN is still a matter of discussion, and no clear consensus has yet been reached. Common indications include acute arterial or venous thrombosis, graft intolerance syndrome, uncontrolled hypertension, graft infection, bleeding, malignant tumor in the transplanted kidney, and severe or recurrent sepsis.¹² GN may also reduce the HLA sensitization of the recipient.¹³ On the contrary, it has been reported that anti-HLA antibodies and panel-reactive antibody (PRA) levels increase afterward GN.¹⁴ On the other hand, hyperacute rejection is irreversible, and GN should be performed rapidly to prevent the graft leading to necrosis from causing systemic complications.¹⁵ In our series of patients, hyperacute rejection occurred in 2 cases and acute rejection occurred in 2. One of the cases with acute rejection had graft intolerance syndrome, and an improvement was observed in the patient after GN in terms of anemia, hematuria and sepsis.

In terms of duration, grafts that fail within the first year after transplantation are usually removed prophylactically, as they will become symptomatic after reduction of immunosuppressive therapy. Late graft failure may also be due to non-immunological causes. In case there is a late graft failure, discontinuation of immunosuppressive therapy usually does not cause rejection signs, and the graft is removed only when it gets symptomatic.¹⁶ GN was performed prophylactically in only 1 of our 6 patients, who developed chronic rejection. In their study comparing the clinical and pathological results of 88 patients who underwent GN, Panahi et al. found that the pathology was consistent with necrosis in approximately half of the patients. The authors concluded that if the PRA test was negative before surgery and there were no absolute symptoms for the operation, GN could be avoided by monitor-

ing the patient in order to preserve morbidity and even mortality of the operation. They also stated that leaving the graft in situ had some advantages, which included the production of erythropoietin, hydroxylation of calcidiol, and the presence of maintenance diuretics.¹⁷ In the light of all these data, the traditional approach requires performing GN only when clinical symptoms occur.¹⁸ In our study, GN was performed due to the development of symptoms in 5 of 6 patients (hematuria, deep anemia, hypoalbuminemia, recurrent urinary tract infection), who developed chronic rejection. It was observed that the clinical conditions of the patients improved after GN was performed.

Technically, non-elective conditions for GN are associated with higher morbidity and mortality. In addition, GN can be a very challenging technique, especially when there are densely inflamed tissues surrounding the transplantation. In the recent GN series, morbidity was observed in 10-40% of patients and most of these morbidities was bleeding or infection.^{8,16,19,20} In our series, 9 patients underwent extracapsular surgery, and 1 patient underwent surgery using the intracapsular method due to the adhesion of surrounding tissues. Our patient, who underwent intracapsular GN, had a history of recurrent urinary tract infection, and it was considered to be highly adherent to surrounding tissues due to pyelonephritis attacks.

The most common complications of GN are known to be bleeding, sepsis, wound infection and hematoma, lymphocele, hematuria, and urinary fistula.²¹ On the other hand, important injuries to surrounding structures such as bladder, colon, and iliac vessels have also been reported.^{8,16,19,20} In our series of patients, wound infection developed in 2 patients in the postoperative period, and wound infection was treated conservatively with daily dressing and antibiotic therapy. External iliac artery injury occurred during the operation in 1 patient, and the complication was controlled by performing primary repair.

The total mortality ratio associated with GN varies between 3% and 9%, and it is mostly attributed to septic complications developing after the operation.¹⁹⁻²² In their series evaluating urological

complications after RT, Demir et al. performed GN in 15 patients, including 10 patients due to chronic rejection and 5 patients due to acute rejection. There was a history of clinically uncontrolled hypertension and infection in 15 patients, and 1 patient was reported as a 9-year-old child with spontaneous renal rupture due to acute rejection after transplantation from a cadaver.²² In the series, Yakupoğlu et al. reported performing GN in a patient with multiple renal arteries and veins in the donor kidney obtained from a living donor, in a patient with primary functional dysfunction due to renal vein thrombosis, in a patient, who underwent en bloc RT from a pediatric cadaver due to renal artery thrombosis. It was observed that GN was associated with vascular complications in all patients.²³ Similarly, in a study evaluating 13 patients who underwent surgery for vascular complications, among a series of 462 transplantations in our country, GN was reported in 5 (38.5%) patients due to uncontrolled vascular complications (renal vein in 3 patients, renal artery thrombosis in 2 patients).²⁴

In their study investigating the surgical risk in GN, Albert et al. evaluated 157 patients who underwent GN. Surgical complications developed in 32 (20%) patients after GN and surgical intervention was reported in 16 (10%) patients. Hemorrhage and infection (14%) were reported as the most common causes of surgical complications. In their series, the mortality ratio was 3.2%. No important difference was observed in the characteristics and timing of the group with and without surgical complications of GN.¹⁶ In the series of Ayus et al., the perioperative mortality rate during GN was found to be much lower compared to the expected rate (6-37% versus 1.5% in the literature).¹⁰ No mortality occurred in our series during an average follow-up of 17.5 months.

The effect of time after RT on the complications of GN is contradictory. In a study conducted about 70 GN, Mazzucchi et al. defined that major surgical complications requiring operation were significantly higher if GN was performed 60 days after transplantation.⁹ In other studies, no important difference was found in complication rates between early and late graft removal.²⁵ In our series, all pa-

tients had long-term medical histories of transplantation, except for the 4 patients who underwent GN in the early period.

They found that removal of failed allograft in patients with failed graft function after RT was associated with improved survival in patients referred to long-term dialysis.²⁵ In a retrospective study conducted by Ayus et al., 3,451 (31.5%) of 10,951 transplantation patients were exposed to GN during the follow-up. Transplantation recipients who underwent GN had a 32% lower risk of mortality due to all causes, compared to the patients, who did not undergo nephrectomy. In addition, they reported that patients who underwent GN were more likely to undergo 2nd transplantation compared to the patients, who did not undergo a nephrectomy during follow-up.¹⁰ In the literature, Mulloy et al. reported that robotic GN could be performed in selected patients in experienced centers to reduce complications caused by open transplantation nephrectomy.²⁶

Our study had some limitations. First of all, it had a retrospective design. Secondly, the study was performed as a single-center, and the number of our patients was low.

CONCLUSION

GN is a surgery with high morbidity rates. The most important phases of surgery include being very careful with surgical dissection, and revealing especially vascular and anatomic landmarks whenever possible. It should be performed in safe and experienced hands with transplantation experience.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Serdar Karadağ, Ahmet Faysal Güler; **Design:** Yusuf Arıkan, Kamil Gökhan Şeker, Mithat Ekşi; **Control/Supervision:** Taner Kargı, Serdar Karadağ, İsmail Evren, Hakan Polat; **Data Collection and/or Processing:** Yusuf Arıkan, Ali Ayten, Ahmet Hacıslamoğlu, Mithat Ekşi; **Analysis and/or Interpretation:** Ahmet Faysal Güler, Yusuf Arıkan, Mithat Ekşi, Serdar Karadağ,

İsmail Evren; **Literature Review:** Ahmet Hacıslamoğlu, İsmail Evren, Yusuf Arıkan, Serdar Karadağ; **Writing the Article:** Yusuf Arıkan, Mithat Ekşi, Kamil Gökhan Şeker; **Critical Review:** Serdar Karadağ, Taner Kargı, Hakan Polat, İsmail Evren; **References and Findings:** Ahmet Hacıslamoğlu, Ali Ayten, Serdar Karadağ, Kamil Gökhan Şeker, Yusuf Arıkan; **Materials:** Ahmet Faysal Güler, Serdar Karadağ, İsmail Evren.

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