



# Long term functional graft survival results of the 3<sup>rd</sup> stage single centre living and cadaveric donor transplants

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## Abstract

**Aim:** Kidney transplantation is the most optimal end stage renal disease (ESRD) treatment. It is more advantageous treatment regard to both its effect on the patient's life quality or mortality. The number of patients who underwent or followed after renal transplant is constantly increasing while their survival becomes a topic more frequently. Different centers therefore report different survival rates in the post-transplantation process. In this study, the transplantation progress and the functional graft survival rates of the patients who have received renal transplants and are followed in our center and the factors which influence the survival rates are explored.

**Materials and Methods:** The patients over 18 years old who applied to Inonu University Turgut Ozal Medical Center Nephrology Department Policlinics who received transplants retrospectively analyzed.

**Results:** While the median for the functional graft period of the patients were 60 months, the longest was found to be 240 months. The grafts of our 77% patients are functional, while 3.7% are exitus with functional graft due to various reasons. 5.3% of the patients received HD again, 3% started PD and 1.3% underwent retransplantation.

**Conclusion:** While the number of transplants are increasing day by day in Turkey, studies on the long term functional graft survival results and the patients' pre- and post-transplant characteristics are limited and there is not much literature data related to Turkey. We aimed to contribute to the literature with our data. Also, the duration of ESRD increases, the lower is the functional graft time significantly. The preferred ESRD treatment should, therefore, be renal transplantation. Renal transplants could be preferred in suitable patients or donors of advanced age, and transplant age spectrum could be extended.



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## Introduction

Kidney transplantation is the optimal end-stage renal disease (ESRD) treatment. It is advantageous with regard to its effect on the patient's quality of life and mortality [1, 2]. Because of this, the preferred ESRD treatment must be a kidney transplant, if possible [3]. In Turkey, 3871 renal transplants took place in 2018. According to National Kidney Foundation data, 17107 renal transplants were performed in the USA [4]. The number of patients who are followed after renal transplants is constantly increasing, and their survival becomes a topic more frequently [1, 3]. In a study performed in the USA, the survival rates of

93394 patients who underwent renal transplantation between 1988 and 1996 were evaluated. In cadaveric transplants, first-year survival was reported to be 87.7%; it was 93.9% in live-donor transplants [5]. According to other studies, for example, in a comprehensive study performed to evaluate the 45-year graft functions of 500 patients, the functional graft survival rate decreased to 79% in the tenth year [6]. In another study, the 20-year graft survival rate was found to be about 50% [7]. In Turkey, in a study performed with 286 patients, the five-year survival rate was 85%, the 10-year rate was 71%, and the 20-year rate was 33% [8]. Different centers report different post-transplantation survival rates. In this study, the transplantation progress and functional graft survival rates of patients who received renal transplants and were followed in our center and the factors that influence their survival

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rates are explored.

## Materials and Methods

Patients who received renal transplants in Turgut Ozal Medical Center were included in the study. The patients over 18 years old who applied to Inonu University Turgut Ozal Medical Center Nephrology Department Polyclinics from 01<sup>st</sup> January 2007 to 01 November 2020, followed with a functional graft for at least 3 months were included in the study. Disease activities and histories are available in follow-up files. In the Nephrology Clinics of our Center, renal transplants are performed since January 2007, while so far 326 patients received renal transplants. Furthermore, approximately 600 patients who received transplants in abroad or Turkey are followed. In the study, such sociodemographic features as age or sex as well as graft type, pre-transplantation dialysis and ESRD etiologies and periods, functional graft periods were examined. For the purposes of performing the study, ethical board approval was received from Inonu University Non-Invasive Clinical Research Board (Approval Number: 2020/900).

## Statistical analysis

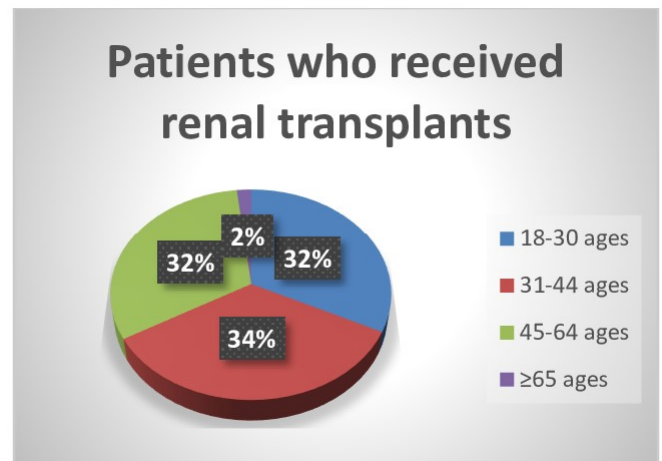
While evaluating the findings obtained in the study, the software (IBM SPSS Statistics (Version 22)) was used for statistical analyses. For the purposes of compliance of continuous variables to normal distribution, Kolmogorov – Smirnov test was employed while the functional graft period and ESRD period was found to be non-compliant to normal distribution ( $p < 0.05$ ). The categorical data was expressed as n (number) and % (percent). While considering the data in the study, median (min-max) was used in the variables not compliant with the normal distribution. Fisher Exact and Pearson chi-square test, observed frequencies, were used for statistical analyses while the significance level was accepted as  $p < 0.05$ .

ESRD period, functional graft function and post-transplantation minimum creatinine values were not found normal distribution ( $p < 0.05$ ). So we used Spearman Correlation to analyzed. This analysis was used to determine the relationship of continuous variables. Also, during the follow-up period, the number and percentage of deaths or survival in the respective year are presented as graphic.

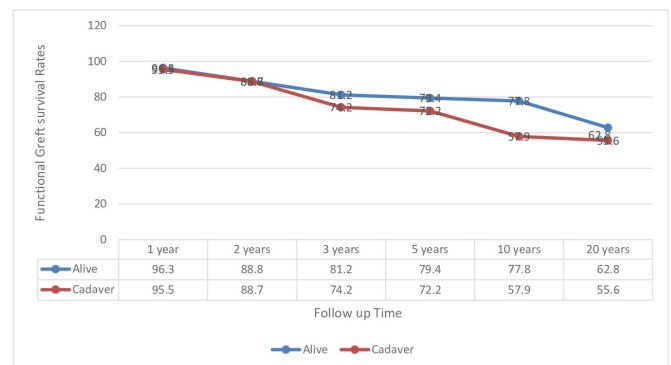
## Results

There is 300 patients included in the study, of these patients 65% are male. The average ages of the patients is  $31.7 \pm 13.2$  (10-70), 95.4% are below 60 years and 4.6% are older than 60 years (Figure 1). 79.7% of the patients received kidney from alive donor.

The ESRD median period of the patients in the study group is 48 months. Considering their ESRD etiologies, chronic renal deficiency with an unknown cause ranked first with 34.3%, the glomerulonephritis ranked second with 17%, and reflux nephropathy ranked third with 11%. These causes are followed by hypertensive patients with 10% and diabetics with 8.7%. While the patients were followed mostly for hemodialysis (HD) with 42.7%, the rate of preemptive patients was 34%, the rate of peritoneal dialysis (PD) receiving patient was 13% and the rate of the patients receiving both HD and PD was 10.3% (Table 1).



**Figure 1.** Age and sex distribution of the patients who received renal transplants.



**Figure 2.** Functional graft survival rates of the patients.

While the median for the functional graft period of the patients were 60 months, the longest was found to be 240 months. The grafts of our 77% patients are functional, while 3.7% are exitus with functional graft due to various reasons. 5.3% of the patients received HD again, 3% started PD and 1.3% underwent retransplantation (Table 1). Among the mortality reasons of the patients are infections (such opportunistic infections as mucor, COVID pneumonia, and septic shocks), malignity or cardiac insufficiency. According to Table 2, there is a strong, significant, negative correlation between the between ESRD time and functional graft period of the patients participating in the study ( $p = 0.04$ ;  $r = -0.56$ ). Hence, the longer ESRD period means that the less functional graft period ( $p < 0.05$ ). ESRD patients therefore must be referred to renal transplant as early as possible (Table 2).

Such parameters as the renal calculus, renal cyst, hematuria, proteinuria, hypomagnesemia, metabolic acidosis or developing in the short and long term post-transplantation follow-ups and are summarized in the below given table as urological complications. 2% of the patients developed post-transplantation renal calculus while renal cysts were observed in 16%. These values were examined in the spot urine. Again, hypomagnesemia was observed in 43% and metabolic acidosis in 35% of the patients. Considering the functional graft survival rates among the patients followed

**Table 1.** Various characteristics of the renal transplant patients included in the study.

	N	%
<b>Chronical Renal Deficiency caused by</b>		
Diabetes	26	8.7
Hypertension	30	10.0
Glomerulonephrite	53	17.7
Polycystic Renal Disorder	8	2.7
Renal Calculus	12	4.0
Amiloidosis	9	3.0
Vesikourethelial reflux	33	11.0
Hereditary Nephritis	15	5.0
Other	11	3.7
Unknown	103	34.3
<b>Chronic Renal Deficiency Period (Min-Med-Max) (months)</b>		
	1-48-360	
<b>Pre-Transplantation</b>		
Preemptif	102	34.0
Pre-emptive		
Hemodialysis	128	42.7
Peritone dialysis	31	13.0
Hemodialysis + Peritone Dialysis	39	10.3
<b>Graft Type</b>		
Cadaveric	53	17.7
Alive relative	219	73.0
Alive non-relative	20	6.7
Unknown	8	2.7
<b>Functional Graft Period (Min-Med-Max) (month)</b>		
	3-60-240	
<b>Functional Status of the Graft</b>		
Functional	232	77.3
Non-Functional	36	12.0
Unknown	32	10.7
<b>Patient's Condition</b>		
Retransplantation	4	1.3
Hemodialysis	16	5.3
Peritoneal dialysis	9	3.0
Living with functional graft	225	75.0
Exitus with functional graft	11	3.7
Unknown	35	11.7
<b>Patient's Final Status</b>		
Living	261	87.0
Exitus	15	5.0
Unknown	24	8.0

in our center, while in the first year, functional graft survival rates were 96% in case of transplants from live-donors and 95.5% in cadaveric transplants, they dropped as the years have passed. In the 20<sup>th</sup> year, the survival rates were determined as 62% in the grafts received from alive donor and 55% in the ones received from cadaver (Figure 2). This graphic was created according to the death or survival status of the patients in the relevant year during the follow-up process.

**Table 2.** The ESRD periods, functional greft period and post-transplantation minimum creatinine values correlation of the renal transplant patients.

	ESRD period	Functional Graft Period
<b>ESRD time</b>		
r	1	-0.56
p		0.04
<b>Post-transplantation minimum creatine value</b>		
r	0.03	-0.15
p	0.62	0.10

**Table 3.** Comparison of the post-transplant urological complications of the renal transplant patients with regard to the graft type.

	Total n(%)	Alive n(%)	Cadaver n(%)	p
Urological Problem	100 (38.2)	83 (83.0)	17 (17.0)	0.579*
Renal Calculus	6 (2.3)	5 (83.3)	1 (16.7)	0.680**
Renal Cyst	43 (16.3)	33 (76.7)	10 (23.3)	0.418**
Hematuria	74 (28.5)	54 (73.2)	20 (27.0)	0.033**
Proteinuria	92 (35.2)	74 (80.4)	18 (19.6)	0.809*
Hypomagnesemia	113 (43.3)	93 (82.3)	20 (17.7)	0.698**
Metabolic Acidosis	93 (35.8)	75 (80.6)	18 (19.4)	0.970**

\*Fisher Exact Test \*\* Pearson Chi-square.

## Discussion

Renal transplants have been performed worldwide since 1954 and in Turkey since 1975 [1,4]. According to 2018 data, 3871 renal transplants took place in Turkey [1]. With regard to transplants in Turkey, contrary to the global data, 78% of all transplants were from living donors and 22% were from cadavers [1]. In our hospitals, 79% of the transplants were from living donors, revealing outcomes correlated with those of other Turkish transplant centers.

In an extended study performed in Turkey, it was found that individual knowledge levels were low, and people mostly did not consider donating their organs. However, when their relatives require transplants, they donate their organs [9]. Being uninformed about how other patients can be treated through organ donation and transplantation after brain death could be the reason for the small proportion of transplants from cadavers in Turkey.

The rate of transplants in patients over the age of 65 years was determined to be 3.9% in Turkey [1]. The median age of the patients included in our study was 36 years, and the proportion of patients aged >60 years who received transplants was 4.6%. According to the literature, the average age of transplant recipients in Europe was 36 in 1990, which rose to 53 in 2013. In the last 15 years, transplants in patients >65 years have increased and studies on advanced-age transplants are increasing [10]. Advanced-age kidney transplants are becoming more common because survival and quality of life are better with transplant than dialysis, donor acceptance criteria have been

expanded, and more kidneys from older donors are being used [11].

In our study, the proportion of transplant patients over 60 years of age was approximately 5%, and their five-year functional graft survival rate was 71.4%. These data are above the national average in Turkey. In a randomized controlled study performed by Nikodimopoulou et al., in recipient transplants from individuals 65 years or older, five-year survival was reported to be 50%, and it was significantly lower compared to the control group (<65 years) [12]. In our study, graft survival rates in this age group may have been higher due to the lower age group and younger donor ages.

In the renal transplants taking place in our center, anti-thymocyte globulin (ATG) is administered from 5 to 7 days as induction therapy. In the maintenance phase, a combination of oral prednisone, mycophenolate mofetil, and tacrolimus is administered unless there are contraindications. Patient survival depends on the source of the transplant and the patient's age, comorbidities, race, sex, and immunosuppressant dosage [13, 14]. In the literature, there are insufficient data on the long-term survival results of renal transplantation in Turkey.

The median functional graft time followed up in our center was 60 months. With regard to functional graft survival rates, grafts from living donors have higher survival rates than those from cadavers. These rates decrease as the time after transplantation increases; this decrease accelerates, especially after the 10<sup>th</sup> year. For the first year, the functional graft survival rate in transplants from living donors was 96%, and 95% in cadaveric transplants. The functional graft rates decreased to 62% in grafts received from living donors and 55% in cadaveric grafts in the 20<sup>th</sup> year.

Different survival rates have been reported by different centers. For example, in a comprehensive study carried out in Ireland on 500 patients with regard to 45-year graft complications, functional graft survival rates dropped to 79% (6) in the 10th year. In another study, 20-year graft survival was found to be about 50% [7].

In Turkey, according to dialysis and transplantation data in 2018, first-year survival rates were reported to be 94% in the case of living donors. Another single-center study in Turkey of 286 patients between 1993 and 2014 indicated that the graft survival rate in the 5<sup>th</sup> year was 85%, which became 71% in the 10th year and 33% in the 20<sup>th</sup> year [8]. Our survival rates have been found to be higher than in similar centers in Turkey. This could be associated with immunosuppressive treatments, more predictable post-transplant complications, and increasing experience of the centers in Turkey.

Finally, as specified in our study, as the duration of ESRD increases, the lower is the functional graft time significantly. The preferred ESRD treatment should, therefore, be renal transplantation. Renal transplants could be preferred in suitable patients or donors of advanced age, and transplant age spectrum could be extended.

While the number of transplants are increasing day by day in Turkey, studies on the long term functional graft survival results and the patients' pre- and post-transplant

characteristics are limited and there is not much literature data related to Turkey. We aimed to contribute to the literature with our data.

#### Ethical approval

Ethical board approval was received from Inonu University Non-Invasive Clinical Research Board (Approval Number: 2020/900).

#### References

1. Türkiye 2018 Yılı Ulusal Nefroloji, Diyaliz ve Transplantasyon Kayıt Sistemi Raporu. Türk Nefroloji Derneği. İstanbul. 2019.
2. Wolfe RA, Ashby VB, Milford EL, Ojo AO, Ettenger RE, Agodoa LY, ve ark. Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *N Engl J Med.* 1999;341(23):1725-30.
3. KDIGO clinical practice guideline for the care of kidney transplant recipients. *Am J Transplant.* 2009;9 Suppl 3:S1-155.
4. National Kidney Foundation, 2014 Organ Donation and Transplantation Statistics. The US Renal Data System. USA. 2015.
5. Hariharan S, Johnson CP, Bresnahan BA, Taranto SE, Mcintosh MJ, Stablein D. Improved graft survival after renal transplantation in the United States, 1988 to 1996. *N Engl J Med* 2000;342(9):605-612.
6. Sexton DJ, O'Kelly P, Williams Y, Plant WP, Keogan M, Khalib K, Doyle B, Dorman A. Progressive improvement in short-, medium- and long-term graft survival in kidney transplantation patients in Ireland – a retrospective study. *Transplant International* 2019; 32: 974–984.
7. McCaughan JA, Courtney AE: The Clinical Course of Kidney Transplant Recipients After 20 years of Graft function. *American Journal of Transplantation* 2015; 15: 734–740.
8. Çoban Ş, Yıldız S, Bozkaya E, Derici ZS, Ünlü M, Çelik A, Sifil A, Çavdar C, Çamsarı T: Böbrek Nakli Alıcılarının Morbidite, Hasta ve Greft Sağkalımı Yönünden Değerlendirilmesi: Dokuz Eylül Üniversitesi Hastanesi Deneyimi. *Turk Neph Dial Transpl* 2017; 26 (1): 41-47.
9. Akbulut, S., Ozer, A., Gokce, A., Demyati, K., Saritas, H., & Yilmaz, S. (2020). Attitudes, awareness, and knowledge levels of the Turkish adult population toward organ donation: Study of a nationwide survey. *World journal of clinical cases*, 8(11), 2235.
10. Rahmel A, editor. Eurotransplant annual report. Leiden: Eurotransplant International Foundation; 2013.
11. Pippias M, Jager KJ, Kramer A, et al. The changing trends and outcomes in renal replacement therapy: data from the ERA-EDTA Registry. *Nephrol Dial Transplant* 2016;31:831e41.
12. M. Nikodimopoulou, K. Karakasia, M. Daoudakib, A. Fouzaa, L. Vagiotsa, G. Myserlisa, N. Antoniadisa, N. Salveridisa, and I. Fouzasa, Kidney Transplantation in Old Recipients From Old Donors: A Single-Center Experience. *Transplantation Proceedings*, 51, 405e407 (2019).
13. Cai J, Terasaki PI. Induction immunosuppression improves long-term graft and patient outcome in organ transplantation: an analysis of United Network for Organ Sharing registry data. *Transplantation.* 2010;90(12):1511-5.
14. Peddi VR, Whiting J, Weiskittel PD, Alexander JW, First MR. Characteristics of long-term renal transplant survivors. *Am J Kidney Dis* 1998; 32: 101–106.