

## CORRELATION BETWEEN EARLY VASCULAR POSTTRANSPLANT COMPLICATIONS AND THE TYPE AND AGE OF A KIDNEY DONOR AND A RECIPIENT

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The aim of this research was to determine the correlation of early vascular posttransplant complications with the type and age of the kidney donor and the recipient. Kidney transplantation is a method of choice in the treatment of terminal renal failure which enables patients to return to a healthy, productive way of life. Nowadays, a kidney is transplanted from a live donor and frequently often from cadavers. The most important early postoperative vascular complications are: renal artery thrombosis, renal vein thrombosis and bleeding. The aim of the study was to examine the correlation of early vascular posttransplant complications with the type and age of the kidney donor and the recipient. The research was performed on 43 patients who had undergone a kidney transplantation at the Clinic of Vascular Surgery, Clinical Centre Niš, within the period from 2009 to 2012. There was not a significant difference between live donors and cadavers ( $p < 0.5$ ) with regard to early vascular complications. The difference in occurrence of vascular complications in relation to age shows statistically significantly greater occurrence of complications when donors are persons older than 60 years ( $p < 0.05$ ) and recipients older than 40 years ( $p < 0.05$ ). The type of a kidney donor is not connected to the frequency of early vascular complications. Early post-transplant vascular complications occur more often in kidney recipients older than 40 years and donors older than 60 years. *Acta Medica Medianae 2014;53(1):28-33.*

**Key words:** early vascular complications, age, kidney transplant, type of donor

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### Introduction

Kidney transplantation is a method of choice in the treatment of terminal renal failure (TRF). It enables the patients a return to a healthy, productive way of life. The main advantages of transplantation compared to dialysis are: improved survival rate of patients, better quality of life of patients undergoing the transplantation and lower costs of treatment of critically ill patients with TRF (1).

Nowadays, a kidney is transplanted from a live donor and frequently often from cadavers. Criteria for selection of organ recipients are now less restrictive than in the past due to numerous factors among which are: reliable surgical technique, high quality anesthesia and effective immunosuppression (2).

The most important early postoperative vascular complications in kidney transplantation

are: renal artery thrombosis, renal vein thrombosis and hemorrhage (3-6). The rate of losing the graft due to rejection reaction is reduced by modern immunosuppression, and some centers nowadays present thrombosis as the most common cause of losing the graft. Early reports about vascular complications after kidney transplantation show 1% incidence of renal artery graft thrombosis almost always caused by technical problems (7-10).

There is not any data in literature about the correlation of early vascular posttransplant complications with the type and age of the kidney donor and the recipient; thus, the aim of this research was to determine this relationship.

### Patients and Methods

Prospective study of 43 patients who had undergone kidney transplantation at the Clinic of Vascular Surgery, Clinical Centre Niš were analysed in the period from 2009 to 2012.

Patients were divided into two groups according to the type of donor :

Group A - Patients who had had a kidney transplant from a live relative donor;

Group B - Patients who had had a kidney transplant from a cadaver.

In relation to age, patients were divided into two age groups:

- the group until the age of 40 years (including the patients who were 40 years old),
- the group over the age of 40 years.

In relation to age, donors were divided into two age groups:

- the group until the age of 60 years (including the patients who are 60 years old),
- the group over the age of 60 years.

Early vascular complications were monitored (<30 days after transplantation): renal artery thrombosis, renal vein thrombosis and hemorrhage.

All recipients were on a chronic program of hemodialysis. Evaluation and preparation for transplantation was performed in accordance with the standard diagnostic protocol of the Center for Transplantation. Monitoring of the recipients was done by consilium with the participation of a nephrologist, urologist and vascular surgeon.

#### Statistical Analysis

The data were analyzed by using commercial statistical programs (SPSS® for Windows, v. 9.0, Chicago, USA). For comparing nonparametric data, Chi-square test and Fisher's exact test were used depending on the number and characteristics of feature. Student's t-test was used to compare parametric data if there was a normality distribution, or Mann-Whitney U test unless there was no normal distribution of data. The results were presented in values  $\pm$ /SD. Value  $\leq 0.05$  was considered to be statistically significant.

#### Results

The structure of donors is shown in Graph 1.

Parents were live donors for the total of 34 patients who underwent transplantations (79.07%), two patients who underwent transplantations (4.66%) got kidneys from other live donors (brother or sister), and for seven patients (16.28%) kidneys were obtained from cadavers.

Age structure of the recipients is shown in Table 1.

Mean age of the recipients was 40.14 years ( $\bar{X}$  = 40.14, SD = 10.86), the youngest recipient was 19 years old and the oldest was 66 years old.

Age structure of the donors is shown in Table 2.

Mean age of the donors was 59.42 years ( $\bar{X}$  = 59.42, SD = 10.7), the youngest donor was 36 years old and the oldest was 75 years old.

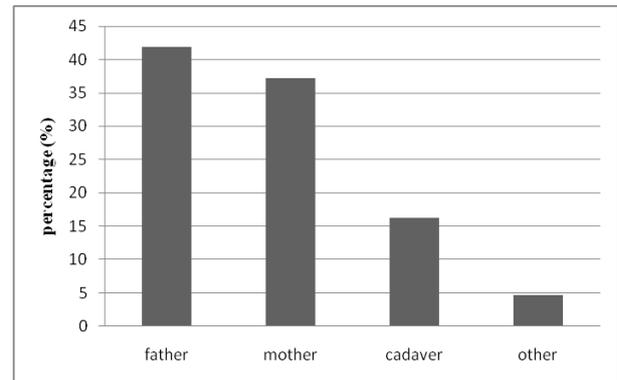
The vascular complications in relation to the type of donors are shown in Table 3.

Total of seven patients had vascular complications so that the incidence of vascular complications in relation to all patients was 9.3%. Fisher's exact test did not show a statistically

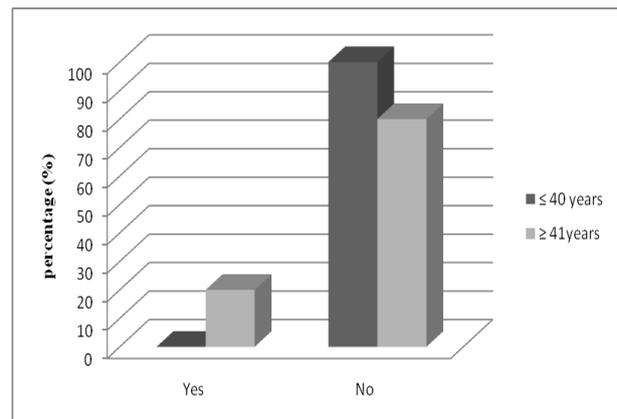
significant relation between the groups A and B ( $p < 0.5$ ) for the occurrence of complications after surgeries.

The vascular complications in relation to the age group of the recipients are shown in Graph 2.

Presenting data by the age of patients, vascular complications occurred in 20% of the cases of patients older than 40 years old, whereas in younger patients vascular complications were not recorded.

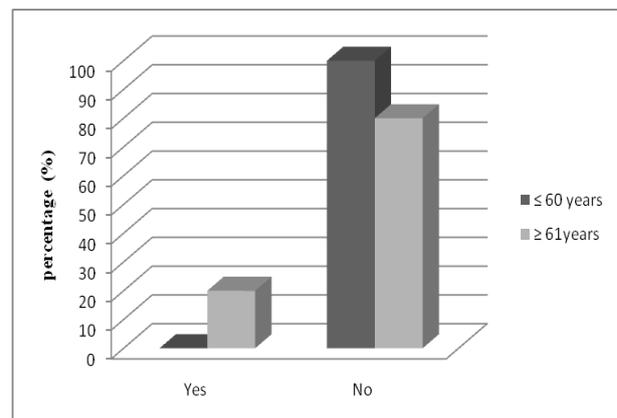


Graph 1. Structure of donors



$p < 0.05$

Graph 2. Vascular complications in relation to the recipients' age group



$p < 0.05$

Graph 3. Vascular complications in relation to the donors' age group

Table 1. Age structure of the recipients

	Number of respondents		Minimum (years)	Maximum (years)	$\bar{X}$ (years)	SD (years)
	N	%				
≤ 40 god.	23	53.49	19	40	31.57	5.56
≥ 41god.	20	46.51	41	66	50.00	5.79
In total	43	100	19	66	40.14	10.86

$$\bar{X} = 40.14, SD = 10.86$$

Table 2. Age structure of the donors

Years	Number of respondents		Minimum (years)	Maximum (years)	$\bar{X}$ (years)	SD (years)
	N	%				
≤ 60	23	53.49	36	60	51.57	7.19
≥ 61	20	46.51	61	75	68.45	5.71
Total	43	100	36	75	59.42	10.70

$$\bar{X} = 59.42, SD = 10.7$$

Table 3. Vascular complications in relation to the type of donors

Vascular complications	Group A		Group B		In total	
	N	%	N	%	N	%
Yes	3	8.33	1	14.29	4	9.30
No	33	91.67	6	85.71	39	90.70
Total	36	100	7	100	43	100

Fisher exact test ( $p < 0.5$ )

The difference in the occurrence of vascular complications in relation to the age of the recipients shows statistically significantly more frequent occurrence of complications in subjects older than 40 years of age ( $p < 0.05$ ).

The vascular complications in relation to the age group of the donors are shown in Graph 3.

Presenting data by the age of donors, vascular complications occurred in 20% of the cases when the donor was older than 60 years old, while in cases when donors were younger persons vascular complications were not recorded. The difference in the occurrence of vascular complications in relation to the age of the donor shows statistically significantly more frequent occurrence of complications when donors were persons older than 60 years ( $p < 0.05$ ).

## Discussion

In the presented series of 43 kidney transplantations, the transplantation from a live donor dominates with 83.7%, whereas the share of transplantations from cadavers is 16.3%. It has already been mentioned that the relationship between transplant activity from a live donor and cadavers shows great variations in the world. Namely, in the majority of developed countries kidney transplantation from cadavers dominates, while in the developing countries and underdeveloped countries where there is a transplant activity, transplantation from a live donor dominates (11).

In the conducted research, seven patients had vascular complications, so the share of vascular complications in relation to all patients was 9.3%. There was not a statistically significant difference between live donors and cadavers ( $p < 0.5$ ) in the occurrence of early vascular complications.

Literary data show that there is no significant difference in survival rate of the graft from a live donor in relation to live related donor and there is a positive trend of increasing the number of transplantations from a live non-related donor (4). Ischemic renal damage is reversible only in case when the ischemia lasts less than 30 minutes. Period of recovery and return of the renal function can last from 1 hour to 7 days from the moment of cessation of warm ischemia. The upper limit of tolerance for warm ischemia is 90 minutes; if it lasts longer, it causes irreversible loss of the renal function (12).

In our series, the average age of the recipients is 40.14 years ( $\bar{X} = 40.14$ ,  $SD = 10.86$ ), the youngest recipient was 19 years old and the oldest 66. The average age of the donors is 59.42 years ( $\bar{X} = 59.42$ ,  $SD = 10.7$ ), the youngest donor was 36 years and the oldest 75 years old.

It is evident that in developed countries the share of patients older than 60 years is increasing. In the USA, in 1995 this share was 28% and in 2001 it was 34% (13). The shortage of cadaveric donors, along with increasing numbers of potential recipients resulted in the greater use of kidneys of older cadaveric donors.

According to the age of the recipients, vascular complications occurred in 20% of the cases in persons older than 40 years of age, while in younger patients these complications were not recorded. The difference in representation of vascular complications in relation to age of the recipients statistically shows significantly more frequent occurrence of complications in persons older than 40 years ( $p < 0.05$ ). With aging, due to morphological organic changes because of atherosclerosis, hypertension and diabetes, kidney transplants in older recipients have the tendency to be less successful.

Kappes et al. (14) showed in their research that the survival rate of graphs after one, five and six years was significantly smaller in recipients younger than 60. Abou-Jaoude et al. (15) analyzed the influence of ageing of the recipients on complications after kidney transplantation in the form of: acute rejection of kidney, early vascular complications, post-operative complications, frequency of hypertensive crisis, disorder of lipid status (disruption of lipid) and nitrogen products. The recipients were divided according to the age into three groups in the following way: the group of recipients younger than 50 years, the group of recipients between 50 and 60 years of age and the group of recipients older than 60 years. Statistically there was not a significant difference among the monitored groups with the fact that the values of creatine and glycemia after one year were statistically significantly higher in the group of recipient who were between 50 and 60 years of age (15).

Data from literature about connections of the age of the recipients and donors with the lasting survival of the graph are different. Data from one research shows that the survival of the graft is longest in recipients younger than 17 years and it recedes exponentially with aging of the patients, thus, it is the shortest in recipients older than 60 years (13).

Observed according to the age of the donors, vascular complications occurred in 20% of the cases when the donor was older than 60 years, while in cases where the donors were younger persons, vascular complications were not recorded. The difference in representation of vascular complications in relation to the age of the donors statistically shows significantly more

frequent occurrence of complications when the donors are older than 60 years ( $p < 0.05$ ).

The literature data indicate the significance of the age of donors for the survival of the graft. The longest survival of the graft is after the transplantation from the donor between 14–44 years of age, and the shortest is after the transplantation from the donor over 60 years of age (13).

The study of Alexander et al. (17) showed that the recipients whose donors were from 6 and 15 years of age had significantly better annual (one year) survival of the graft in comparison to those who were 56–65 years old with the difference of 7%. The kidneys of the donors older than 65 years were more efficient for transplantation than the kidneys of the donors who were aged 56 to 65 years. Kidneys of older donors survive equally as kidneys from younger donors in patients with repeated transplantation, diabetes, in African-American patients and in patients older than 45 years old. The age of the recipient was less important than co-morbidity and the age of the donors (17).

The research of Alexander et al. (18) showed that there were no differences in the survival rate of the graft from donors aged between 56 and 65 years in comparison to donors older than 65 years; however, the donors older than 56 years had the graft survival rate of 10–14%, less than the donors from the age group between 16 and 45 years. These data indicated that the donors older than 55 years had a decreased renal functional reserve, which means that detail inquiries should be conducted during the selection of donors of this age group (18). The study of Lin et al. (19) also points out the meaning of the age of the donor in kidney transplantation. Potential donors with adequate glomerular filtration can be donor candidates. This parameter is not connected with the age of the patient and can be taken as one of the more important parameters when making a selection for donors (18).

## Conclusion

The type of a kidney donor is not connected with the frequency of early vascular complications. Early post-transplant complications occur more often in recipients older than 40 years of age and donors older than 60 years.

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## **POVEZANOST RANIH VASKULARNIH POSTTRANSPLANTACIONIH KOMPLIKACIJA SA VRSTOM I STAROŠĆU DONORA BUBREGA I RECIPIJENATA**

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Transplantacija bubrega je metoda izbora u lečenju terminalne bubrežne insuficijencije koja omogućava bolesnicima povratak zdravom, produktivnom načinu životu. Danas se bubreg transplantira od živog srodnog donora i sve češće od kadavera. Najvažnije rane postoperativne vaskularne komplikacije pri transplantaciji bubrega su: tromboza renalne arterije, tromboza renalne vene i hemoragija. Cilj ovog istraživanja bio je da utvrdi povezanost ranih vaskularnih posttransplantacionih komplikacija sa vrstom i starošću donora bubrega i recipijenata. Istraživanje je izvršeno na 43 bolesnika, kojima je urađena transplantacija bubrega na Klinici za vaskularnu hirurgiju Kliničkog centra u Nišu, u periodu od 2009. do 2012. godine. Nije bilo statistički značajne rezlike između živih donora i kadavera ( $p < 0.5$ ) u pogledu ranih vaskularnih komplikacija. Razlika u zastupljenosti vaskularnih komplikacija u odnosu na starost statistički pokazuje značajno češću pojavu komplikacija kada su donori osobe starije od 60 godina ( $p < 0.05$ ), a recipijenti stariji od 40 godina ( $p < 0.05$ ). Vrsta donora bubrega nije povezana sa učestalošću ranih vaskularnih komplikacija. Rane posttransplantacione vaskularne komplikacije češće se javljaju kod bubrežnih recipijenata starijih od 40 godina i donora starijih od 60 godina. *Acta Medica Medianae 2014;53(1):28-33.*

**Ključne reči:** rane vaskularne komplikacije, starost, transplantacija bubrega, vrsta donora