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# Outcome of renal transplantation with right versus left donor nephrectomy: a retrospective comparative study

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## *ABSTRACT*

**Introduction**: Renal transplantation is considered to be an appropriate choice of therapy for patients with end-stage renal failure. There is a continuous discussion on the safety, efficacy, and main advantages for selecting between the left and right renal transplant. In this regard, our aim is to evaluate the role of left and right renal transplantation on possible complications and outcomes in a case-control study.

**Methods**: The recipient patients who received the donated kidney from the right (n=28) and left side (n=24) were matched in age, gender, and BMI and included in this retrospective case-control study. The patients who were included in this study underwent donor nephrectomy between July 2018 and August 2020 in two hospitals in Erbil city.

**Results**: The patients who received the left or the right-sided kidney were similar in operative time, 122.32 vs. 118.92 (P=0.3207), warm ischemic time/min; 1.39 vs. 1.46 (P=0.6417), graft function (P=0.5030), and preoperatively HB, 8.97 vs. 8.42 gm/dL (P=0.0913), respectively. The patients had similar postoperative hospital stays (5.5 days; P=1.000). The study found that 35.71% and 20.83% of patients required intraoperative blood transfusion. The incidence rate of postoperative hematoma in patients who received left or right donor kidney was 3.58% and 4.17%, and the incidence rate of readmission was 7.14% and 8.33% and allograft rejection was 0.0%% and 4.17%, respectively. No other complications were observed in both groups after one year.

**Conclusions**: This study showed that the patients who received left and right-sided kidneys had similar outcome and complications.

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## Introduction:

Renal transplantation is considered to be an appropriate choice of therapy for patients with end-stage renal failure. Several factors affect renal transplantation such as age, gender, race, body size, comorbidities, and end stage renal function [1].

The evidence about the technical complications originating from the disparity in the lengths of the left and right renal veins is limited [2, 3] and the renal left or right grafts [4]. But, the literature has raised questions on the possible complications of left versus right kidney transplantation in terms of mortality [1]. There is a continuous discussion on the safety, efficacy, and main advantages for selecting between the left and right kidney for renal transplantation. Many urologist prefer to use the left kidney for live kidney donation due to the longer renal vein [5]. This trend of left donor nephrectomy has become more prevalent since the advent of laparoscopic donor nephrectomies. The right living donor nephrectomy is related to shorter vessel lengths and renal vein thrombosis in recipients [6, 7]. In some rare cases, some surgeons prefer to choose the right kidney because it is easier to recover than the left kidney owing to the splenic laceration risk [8]. The left-sided kidney has quite a more complicated vascular anatomy. Therefore, using multiple arteries for transplantation may result in more complications [8, 9].

The right-sided kidney may be technically easier due to the absence of gonadal and adrenal

veins. Some investigations have approved that right-sided kidney is contributed to a substantially shorter operative time [10]. However, some researchers have shown no difference in the operative time between choosing the left and right-sided kidneys [11]. The right-sided kidney can be performed if there is a remarkable discrepancy in the volume of the two kidneys to leave the donor with the larger kidney.

A previous study of 35625 renal transplants that reported to the United

Network for Organ Sharing Registry between 1988 and 1991 confirmed that the three-month graft surgical rates were higher in recipients of left-sided kidneys compared to those patients who received the right-sided kidneys; 90.4% vs. 85.0%, respectively. But one and two-year graft survivals were comparable between the patients who received the right and left-sided kidneys [4, 12]

In this regard, we aimed to examine the role of left and right donor nephrectomy on possible complications and outcomes in a case-control study.

## Patients and methods

### Study design and sampling

The patients who received the allograft on the right and left sides were included in this **retrospective case-control study**. The outcomes and complications of both study groups after one year were recorded and compared retrospectively. In this regard, the patients were matched for age, gender, and BMI between left (n=28) and right renal transplantation (n=24). The patients who were included in this study were males and females aged 18-65 years old. The patients who were included in this study underwent renal transplantation between July 2018 and August 2020 in two hospitals in Irbil city (Rizgary Teaching Hospital and Zheen Hospital).

### Inclusion and exclusion criteria:

The patients with left and right donor nephrectomies either single or double renal arteries were included in this study. The patients with triple renal arteries or double moiety were excluded from the study.

### Outcome measurements

The general and outcomes of the patients were recorded in the first and second parts of the questionnaire. The general information was age, gender, comorbidity, and the number of the artery (single or double artery). The clinical and outcomes of the surgery were recorded in the second part of the questionnaire. The clinical information was operative time, warm ischemic time, graft function, and preoperative Hemoglobin. The graft function was recorded in immediate or delay. The

complications and outcomes of transplantations were postoperative hospital stays, intraoperative blood transfusion, postoperative peri allograft hematoma, renal artery injury of the donor, renal vein injury of the donor, recipient arterial thrombosis, recipient venous thrombosis, recipient ureteric leak, recipient ureteric stricture, re-admission, and allograft rejection were recorded in the questioner. The outcomes of the surgery were recorded before discharge, after one month and one year follow-up.

**Statistical analysis**

The general and clinical characteristics of the patients were presented in mean (SD) or no. (percentage). The comparisons of general information and outcomes of interest between the patients who underwent left and right kidney transplantation were examined in an independent t-test or Pearson's Chi-squared test. The significant level of difference was determined in a P-value of less than 0.05. The statistical calculations were performed in JMP Pro 14.3 statistical software.

**Ethical considerations**

The ethical approval of the present study was obtained from the Kurdistan Board for Medical Specialties in Erbil city. The confidentiality of the personal information of the patients in both study groups was protected throughout the study steps.

**Results**

The study found that patients who received left and right allograft were similar in age; 35 vs. 38 years (P=0.152), gender (P=0.695), BMI; 32.09 vs. 32.56 (P=0.8128), comorbidity (P=0.1937). Diabetes mellitus and hypertension were common in both study groups. In addition, the patients had a similar number of the artery (P=0.8508). Most of the patients received single artery, 85.71% vs. 87.50%, respectively. The patients had similar operative time, 122.32 min vs. 118.92 min (P=0.3207), warm ischemia time/min; 1.39 vs. 1.46 (P=0.6417), graft function (P=0.5030), and preoperatively Hemoglobin, 8.97 vs. 8.42 gm/dL (p=0.0913), see Table 1.

**Table 1: Comparison of general information between right and left renal transplant patients.**

| Characteristics | Study groups | | p-value (two-sided) |
|---|---|---|---|
| | The patients who received left allograft (n=28) | The patients who received Right allograft (n=24) | |
| Age | 31.2 (5.4) | 33.6 (6.5) | 0.152 |
| **Gender**<br>Male<br>Female | <br>16 (57.14)<br>12 (42.86) | <br>15 (62.5)<br>9 (37.5) | <br>0.695 |
| BMI mean (Sta. Deviation)<br>Range | 32.09 (7.37)<br>21.22-49.08 | 32.56 (6.77)<br>19.03-44.63 | 0.8128[a] |
| **Comorbidity no (%)**<br>Diabetes mellitus<br>Hypertension<br>Multi-comorbidity | <br>13 (46.43)<br>12 (42.86)<br>3 (10.71) | <br>15 (62.50)<br>9 (37.50)<br>0 (0.00) | 0.1937[b] |
| **Number of arteries no (%)**<br>Double artery<br>Single artery | <br>4 (14.29)<br>24 (85.71) | <br>3 (12.50)<br>21 (87.50) | <br>0.8508 [b] |
| Operative time mean (Sta. Deviation) | 122.32 (10.52) | 118.92 (13.92) | 0.3207[a] |
| Warm ischemic time/min mean (Sta. Deviation) | 1.39 (0.50) | 1.46 (0.51) | 0.6417[a] |
| **Graft function no (%)**<br>Delay<br>Immediate | <br>4 (14.29)<br>24 (85.71) | <br>2 (8.33)<br>22 (91.67) | <br>0.5030[b] |
| Preoperative HB (gm/dL) mean (Sta. Deviation) | 8.97 (1.100) | 8.42 (1.19) | 0.0913[a] |

[a] An independent t-test and [b] Pearson' Chi squared tests were performed for statistical analyses.

The study showed that the patients who received right and left allograft had similar postoperative hospital stays (p-value=1.000). The study found that 35.71% and 20.83% of patients required intraoperative blood transfusion. The incidence rate of postoperative hematoma in left and right renal allograft was 3.58% and 4.17%, respectively. The incidence rate of readmission was 7.14% and 8.33% and allograft rejection was 0.0 % and 4.17%, respectively. The patients had similar mean Serum creatinine at discharge. The patient of both groups did not develop any case of renal artery injury of the donor, renal vein injury of the donor, recipient arterial thrombosis, recipient venous thrombosis, recipient ureteric leak, and recipient ureteric stricture (Table 2).

**Table 2: Comparison of outcomes and complications of renal transplantation between right and left donor nephrectomy**

| **Characteristics** | **Study groups** | | **P-value (two-sided)** |
|---|---|---|---|
| | **The patients who received left allograft(n=28 )** | **The patients who received Right allograft(n= 24)** | |
| Post-operatively hospital stay (day) mean (SD) | 5.5 (0.79) | 5.5 (0.72) | 1.000 |
| **Intra-operative blood transfusion no (%)**<br>No<br>Yes | <br>18 (64.29)<br>10 (35.71) | <br>19 (79.17)<br>5 (20.83) | <br>0.2377 |
| **Post-operative hematoma no (%)**<br>No<br>Yes | <br>27 (96.42)<br>1 (3.58) | <br>23 (95.83)<br>1 (4.17) | <br>0.5935 |
| Renal artery injury of donor **no (%)**<br>No | <br>28 (100) | <br>24 (100) | <br>NA |

| | | | |
|---|---|---|---|
| Renal vein injury of donor **no (%)** No | 28 (100) | 24 (100) | NA |
| Recipient arterial thrombosis **no (%)** No | 28 (100) | 24 (100) | NA |
| Recipient venous thrombosis **no (%)** No | 28 (100) | 24 (100) | NA |
| Recipient ureteric leak **no (%)** No | 28 (100) | 24 (100) | NA |
| Recipient ureteric stricture **no (%)** No | 28 (100) | 24 (100) | NA |
| **Re-admission no (%)** | | | |
| No | 26 (92.86) | 22 (91.67) | 0.8724 |
| Yes | 2 (7.14) | 2 (8.33) | |
| **Allograft rejection no (%)** | | | |
| No | 28 (100%) | 23 (95.83) | 0.8724 |
| Yes | 0 (0.0%) | 1 (4.17) | |
| **Recipient Mean Serum creatinine at discharge (mg/dl)** mean (SD) | 0.86 (0.10) | 0.81 (0.12) | 0.1114 |

[a] An independent t-test and [b] Pearson' Chi squared tests were performed for statistical analyses.

## Discussion

Historically, most surgeons favored to do most doner nephrectomy surgeries on the left side due to technical challenges and renal vessel length. It has been claimed that the shorter length of the right renal vein may make venous anastomosis more complex in right kidney live renal transplantation, particularly in obese individuals with deep iliac arteries, resulting in an increased risk of surgical consequences [2, 13].

In our study, demographic data

including age, gender, BMI, comorbidities such as hypertension, diabetes, and multiple comorbidities were similar between two groups.

This study found that the donor kidney side (left Vs right) had no effect on early post-operative outcomes such as vascular problems, ureteric insults, blood transfusion, early or delayed graft function. Furthermore, receivers of left donor kidneys had equivalent renal allograft function and death-censored graft survival rates as those who received right donor kidneys.

Our findings are consistent with those of Roodnat and colleagues [14] and Johnson and colleagues [1], who found no difference in transplant outcomes between left and right kidney recipients at their respective institutions. Similar results have been reported for laparoscopic live donor kidney transplant surgeries [13, 15].

These findings contradict the findings of two earlier UNOS Registry investigations, both of which found a graft survival advantage associated with transplanting left kidneys. One possible reason for the apparent difference in results is that the kidney transplant outcomes reported in the UNOS Registry studies were from the late 1980s/early 1990s [12, 16] and were significantly worse than those seen in our research of transplant outcomes over the past decade. Possibly recent advances in transplant outcomes are likely to have negated any benefit linked with donor kidney side. Surgeons have the option of extending the right renal vein via the attached inferior vena cava (Carrel patch), this allows for a longer and more resilient vein to be used for the anastomosis [1].

In our research, the surgical times or warm ischemia times were similar between both groups. Similar findings have been observed for laparoscopic live donor kidney transplant surgeries [1, 15].

It has been proposed that the technical challenges caused by the relatively short length of the right renal vein may be partially offset by the difficulties addressed by the more frequent anatomical variations in the left renal

vein, particularly the greater frequency of additional renal veins and circum-aortic left renal veins [1, 3].

Our study found that early and late post-transplant renal allograft function, as measured by serum creatinine concentration at discharge were nearly comparable between left and right kidney recipients. Like our study, David et al. have also shown that postoperative kidney allograft function and serum creatinine were comparable between left and right renal transplantations [1].

## Conclusions

This study showed that the patients who received left and right-sided kidneys had similar outcomes and morbidities.

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**Conflicts of interest**: The authors do not declare any conflict of interest.

**Ethical views**: The ethical approval of this study was obtained from the Kurdistan Board for Medical Specialties.

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