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Output Characteristics of the Living Donor of the Operative Time and Length of Hospitalization with Mini Open Donor Nephrectomy (MODN) in Renal Transplant: A Single Centre Report

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Abstract— Kidney transplantation is the choice to improve the quality of life of patients. Open Donor Nephrectomy (ODN) is defined as a retroperitoneal procedure performed via a long flank incision on the patient in the lateral decubitus position. The disadvantages of this technique are large scars, relatively long immobilization of the donor, and the risk of muscle relaxation of the flank in patients. Mini-incision Donor Nephrectomy (MODN) has been adopted as a less invasive modification of classic ODN and has proven to be as safe as conventional lumbotomy for donor nephrectomy with visible advantages. Recent studies suggest that longer operation time in MODN may increase hospitalization. The aim of this study is to evaluate the long of operative time of MODN, to access its contribution for the length of hospitalization, and also to evaluate another variable characteristic outcome in MODN. This is an observational and cross sectional study. The data was collected from medical record of patient who underwent kidney transplantation from January 2016 to December 2019 at Kariadi General Hospital Semarang, Indonesia. There were 20 patients which consisted of 15 men and 5 women. Total family-related donor were 15 patients and 5 were not related at all. Mean ischemic time was 38.65 ± 1.81 min (range 36-42). All patients did not undergo transfusion after having the kidney transplantation. Mean operative time was 58 ± 95 min (range 55-63). Mean length of hospitalization was 3.45 ± 0.51 days (range 3-4). Operation time was compared with the length of hospitalization. Data was analyzed by using Spearman test in SPSS version 23. The study showed that operation time was significantly correlated with hospitalization time ($p < 0.001$). In conclusion, operation time has a significant correlation with hospitalization time. Mini Open Donor Nephrectomy had several characteristics such as shorter hospital stay, better cosmesis, and cost-effective than Open Donor Nephrectomy. Other variable outcome characteristics such as gender - which must be related between donor and recipients, age - which should be under 60 years, and ischemic time which MODN is shorter than ODN.

Keywords: Operation time, length of hospitalization, kidney transplantation, mini open donor nephrectomy, open donor nephrectomy

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1. Introduction

Chronic Kidney Disease (CKD) is a health problem in Indonesia because of the number of the sufferers continues to increase.¹ Riskesdas data 2013 shows the prevalence of CKD in Indonesia is 0.2 percent, or about 359,164 Indonesian residents suffer from CKD2. Kidney transplantation becomes a choice of existing

kidney replacement therapy.³ Kidney transplantation is a kidney replacement therapy which involves kidney transplantation from the living or dead people to those who are in need. Kidney transplantation treatment still becomes the choice for a small proportion of patients with kidney failure and end-stage renal diseases. Kidney transplantation is the choice to improve the life quality of the patients³. The first kidney transplant in Indonesia was conducted at the RSCM Jakarta in 1977. However, during the past three years (2012-2014), kidney transplantation in Indonesia started increasing. The number of transplantation grows to 63 transplantation each year.¹ However, the growth of kidney transplantation in Indonesia is somehow still left behind compared to developing countries, such as the United States, which conducts more than 190,000 kidney transplantation in 2013.⁴ There were 623 recorded kidney transplantation performed in 12 centers in the United States, yet it is reported that there are only on 239 cases in Indonesia.⁵ There were 42 kidney transplantation in Dr. Kariadi Hospital, Semarang, Indonesia from January 2012 to January 2018. The number has been growing significantly within the past 5 years.⁶ Surgical techniques to transplant kidneys consists of open donor nephrectomy, mini open donor nephrectomy, hand assisted laparoscopic, laparoscopic living donor nephrectomy, and robotic assisted kidney transplantation. Traditionally, the kidney was removed through a flank incision. This often included the rib resection to allow sufficient access. This resulted in major postoperative pain, incisional hernias, and chronic neuralgia.⁷ Open donor nephrectomy (ODN) was defined as a retroperitoneal procedure performed via a long flank incision on the patients in the lateral decubitus position. An incision is made at the twelfth rib, with or without any resection, until the renal fossa is reached. First, the ureter is identified and dissected to the junction of the iliac veins, and then sectioned.

Subsequently, the dissected vascular pedicle with the artery is bound and then the vein.⁸ The disadvantages of this technique are large scars, relatively long immobilization of the donor, and the risk of muscle relaxation of the flank in patients. To minimize these side effects, minimal invasive open retroperitoneal approaches - which looks like the vertical mini incision - have been established with excellent result.⁸ Mini open donor nephrectomy (MODN) was defined as a procedure using an incision of 6-8 cm in length anterior to the eleventh or twelfth rib without rib resection and using a retroperitoneal approach.^{9, 10} Mini- incision donor nephrectomy (MODN) has been adopted as a less invasive modification of classic ODN and has proven to be as safe as conventional lumbotomy for donor nephrectomy with clear advantages including less post-operative pain, early recovery and lesser chances of wound complications and incisional hernia later. When conducting this open donor nephrectomy surgical technique, carefulness must be prioritized for a long period of time when creating access to avoid injuring the peritoneum and the pleura. This approach is a major assault on the abdominal wall since it sections the three muscles which form it. It can result in significant postoperative pain, a longer hospital stay, and poor cosmetic results. The aim of this study is to evaluate the length of operative time MODN, to access its contribution for length of hospitalization, and also to evaluate another variable characteristic outcome in MODN.

2. Material and Method

This is an observational and cross sectional study. The data is collected from medical record of the patients who underwent kidney transplantation from January 2016 to December 2019 at Kariadi General Hospital Semarang Indonesia. We evaluate 20 data patient MODN. The extracted data include recipients' age, gender, body mass index (BMI), body weight, incompatibility of human leukocyte antigen (HLA), relation to the donor, surgery date, length of stay, comorbid factors (diabetes mellitus, hypertension, heart disease, stroke, depression, tuberculosis chronic gastritis and others), left ventricle ejection fraction (LVEF), blood laboratory (hemoglobin, leukocytes, platelets, urea, creatinine, Na, K, Cl), culture (blood, urine, drainage fluid), the number of arteries and veins in the donor, and ischemic time

Operative time is defined as elapsed time from skin incision to placement of the final skin suture.¹¹ On another hand, the length of stay during hospitalization means a long period of time of the patients who still stay in hospital who received any treatment after conducting the kidney transplantation. The operative is recorded and evaluated whether it affects the length of stay.

2.1 Inclusion Criteria

The subject of this study are the patients who underwent kidney transplantation that recorded in medical record from January 2016 to December 2019.

2.2 Exclusion Criteria

Exclusion criteria are the patients who canceled renal transplants; patients with previous renal or adrenal surgery, and ipsilateral retroperitoneal surgery were previously contraindicated MODN.

2.3 Surgical Procedure

Patients are brought to general anesthesia and positioned in right lateral decubitus. The table is flexed at the level of the iliac crest and the kidney is rest elevated. The left arm is rested over a hand rest. An oblique incision, 7–9 cm in length, is made from the tip of the 11th rib to the lateral border of the rectus abdominis muscle. Skins, subcutaneous tissues, three muscular layers, and lumbar fascia are incised. The peritoneum is reflected with blunt dissection and the retroperitoneal space is entered reflecting the peritoneum medially. The colon is reflected medially. Gerota's fascia is entered from the lateral side and the kidney is dissected from the lateral and posterior attachments. Upper pole is then freed from the adrenal gland. Dissection is then taken caudad with special care to avoid injury on the gonadal vein. Ureter is identified medially to the gonadal vein and dissected up to the iliac artery bifurcation. The renal vessels are carefully dissected up to their origins and freed from the lymphatic tissue. Lasix and mannitol are administered to the donor. When the recipient team is ready, the ureter is divided after clipping the distal end with Hem-o-lok clips. The renal artery is then double ligated near its origin. The renal vein is then distal clamped to the origin of the adrenal and gonadal veins with a vascular clamp, and divided sharply proximal to that. The kidney is taken off the field and placed on ice. The renal vein stump is then sewn with continuous prolene stitch. Hemostasis is achieved and closure of the abdominal wall is done. As a note, we do not use a fixed retractor system for this procedure; handheld retractors are used by assistants instead.¹⁰

2.4 Statistical Analysis

Data are analyzed with Saphiro wilk in a distribution based on its normality or not. Then, it will be processed in correlation with another variable which used Spearman test in SPSS version 23 (significant if $p < 0.05$).¹²

3. Result

The data are collected from medical record of patients who underwent kidney transplantation from January 2016 to December 2019 at Kariadi General Hospital Semarang, Indonesia. The data shows that there were 20 patients. Mean age is 35.90 ± 11.32 year (range 15-50). The total number of respondents were 20 patients with 15 men and 5 women. The total number of family-related donor were 15 patients and 5 patients were not related. Mean ischemic time was 38.65 ± 1.81 min (range 36-42). All patients did not conduct transfusion after having the kidney transplantation. Mean operative time was 58 ± 95 min (range 55-63). Mean length of hospitalization was 3.45 ± 0.51 days (range 3-4).

Table 1. Donor demographics and outcome

Variable	F	%	Mean ± SD	Median (min – max)
Age			35,90 ± 11,32	39,5 (15 – 50)
Gender				
Male	15	75,0		
Female	5	25,0		
Donor relationship				
Related	15	75,0		
Not related	5	25,0		
Ischemic time			38,65 ± 1,81	38,5 (36 – 42)
Transfusion				
Positife	0	0		
Negatife	20	100		
Operation time			58,95 ± 2,54	59 (55 – 63)
Length of hospitalization			3,45 ± 0,51	3 (3 – 4)

Table 2. Correlation between operation time and length of hospitalization

Variable	p	r	Result
Operation time			
Length of hospitalization	of 0.011	0.554	Significant, positife, medium hospitalization

4. Discussion

4.1 The Operation time related to the length of hospitalization

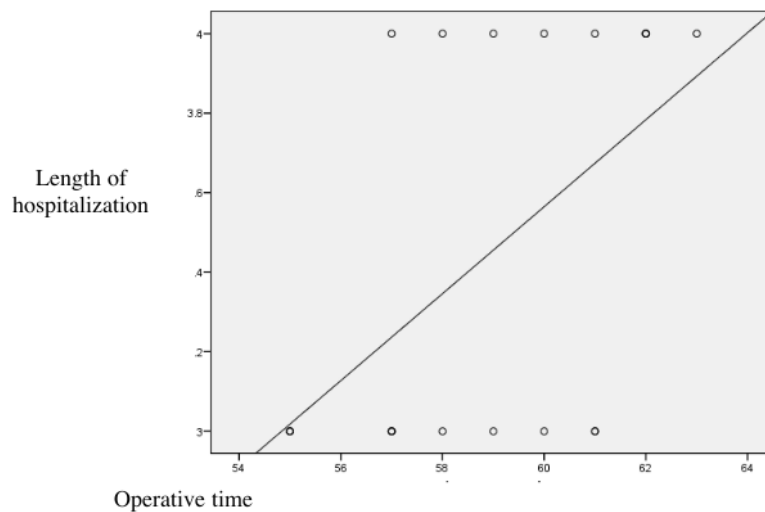


Figure 1. This chart shows the correlation operation time related to length of hospitalization

In our analysis with Spearman test, there is a significant result between the operation time and the time resulted in longer length of hospitalizations. In a study, the average age mean operation time was $58,95 \pm 2,54$ minute (55-63) has a mean length of stay $3,45 \pm 0,51$ days (3-4). Another study shows that the mean operation time of MODN 53.9 minute has a mean length of stay 2.44 days¹⁰ and mean operation 171 minute has the mean length of stay 6.5 days.⁸ This result is in line with our finding which shows that the decrease of operation time is associated in the longer time of hospitalization. It can be compared to open nephrectomy which has mean operation time 180.5 ± 26.2 minute with duration 3 days¹³ and another research such as open nephrectomy which has operation time 246.3 ± 24.4 minute with duration 10.3 ± 1.1 days.¹⁴ This can be concluded that the decrease of operation time is associated with the longer time of hospitalization. Time operation of MODN and ODN are significantly shorter - with operative time 55 minute - when compared to open donor nephrectomy⁸. Although the operation on donors with ODN certainly increases the pressure of the surgeon, it does not take longer operative time, does not increase operative complications, or does not need any technical modifications in our series.¹³ The mini-flank incision provides a small working space and limited view of the hilar vessels, which likely contributed to the increased number of vascular injuries. Of the 11 complications that occurred in the MODN cohort within our analysis, 10 were vascular in nature, as opposed to none in the LDN group (1 deep venous thrombosis/pulmonary embolism (treated with Coumadin)).¹⁵ Also of importance is the perceived cosmesis of each procedure. This was not directly addressed in this study but it may be that the single short incision of MODN has better cosmetic results than the long incision of SODN or the multiple incisions, including the kidney extraction incision, of LDN. ⁸

² Similarly, the apparently shorter time to return to work of MODN when compared with SODN has economic implications with less sick leave and greater productivity. The included studies were performed in different continents, America, Europe and Asia. The different socioeconomic conditions of these continents may have had a direct effect on some of the donor outcomes. For example, depending on methods in place for healthcare funding, there may be a propensity for longer or shorter durations of hospital stay, this may account for the significant degree of heterogeneity seen with this variable.⁸ Restoring quality of life is the most important step after the living kidney donation. Other series have reported that this increasing cost of the procedure is offset by shorter hospital stay and convalescence.¹⁰ The advantage of the decreasing duration of the stay and improved cosmesis, both of which can have a positive impact on potential living donors.¹⁶

4.2 CHARACTERISTIC VARIABLE IN MINI OPERATION DONOR NEPHRECTOMY

In terms of gender of the mini open donor nephrectomy in this research, there are 18 men and 10 women in total. Another study shows that MODN has 19 women and 11 men⁸ as well as 26 women and 24 men⁷. We can conclude that there are more women than men who undergo the kidney transplantation. However, in this research, the number of the men is more than the number of the women because the donor must have any criteria. One of them is they must be related with the recipient. In a study, the average age of donors is $35,90 \pm 11,32$ years. As the age of the donor increasing, the kidneys also have fewer functional reserves. Therefore, this intense initial inflammatory response can accelerate the damage to these kidneys.¹⁷ In another research, the average age of the kidney transplantation is 42.3 ± 11.8 year¹¹ and 44 year.¹² This is in line with our finding which showed that average age under 60 years is geriatric. The older ages are associated more with complication during the operation due to the function of the body has gotten weaker.¹⁸ Then, another variable is ischemic time. In a study, the average age mean of the operation time is $38,65 \pm 1,81$ minute. In another research which applied open donor nephrectomy, the needed ischemic time is about 85.95 ± 23.55 12. That means the ischemic time in MODN is shorter than ODN.

The total ischemic time is defined during the interruption of the donor renal artery or aortic clamp, until the time of the clamp's release on the renal artery in the recipient (in hours). The total ischemic time is the combination of cold ischemic time (CIT) and warm ischemic time (WIT).⁵ Many studies have shown that CIT is an independent risk factor of delayed graft function (DGF). The longer CIT is associated with the increasing of DGF and the longer length of stay which consequently increase the cost of transplantation.¹⁹ Warm ischemia time is defined as the period starting from organ withdrawal from ice storage and ending with initiation of graft reperfusion, depending on the time of renal vessel anastomosis. A prolonged WIT does not only have a detrimental effect on renal allograft outcome immediately after transplantation, but it also has effects on long-term graft.²⁰ Prolonged WIT is also associated with longer time of hospitalization after transplantation and long-term graft survival disruption after donations from the living donor on a kidney transplant.²¹ Prolonged ischemia can increase the risk of delayed graft function (DGF), reduce allograft function at 12 months after transplantation, and increase the risk of overall graft loss and death.²²

5. Conclusion²¹

In this study, we found a significant correlation between operation time and the length of hospitalization after the surgery on the kidney transplantation patients. Mini open donor nephrectomy has the characteristic of a shorter hospital stay, better cosmesis, and cost-effective than Open donor nephrectomy. There are other variable outcome characteristics such as the gender must be related between the donors and recipients, the average of the age must be under 60 years, and the ischemic time in MODN is shorter than ODN.

6. Acknowledgment

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