Evaluating several clinical and subclinical characteristics of patients pre- and post-kidney transplant at 103 Military Hospital

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Summary

Objective: To describe several clinical and subclinical characteristics of patients before and after 6 months of kidney transplant at 103 Military Hospital. *Subject and method:* From March 2018 to April 2020, a prospective, descriptive study enrolled 75 recipients with 6 months after renal transplant at 103 Military Hospital. *Result:* Prior to transplantation, 80.3% of patients received dialysis with an artificial kidney, while 9.8% received medical treatment; more than 90% of patients had hypertension, anemia, and dyslipidemia, with 43.8% having residual urine loss. The prevalence of HBV and HCV infection were 24.1%, and 95.5% of patients having HLA compatibility from 1-6/6 AG. There was a significant difference in urea, creatinine, uric acid, cholesterol, triglycerides, LDL-C, HDL-C, and hemoglobin before and after transplantation. However, after transplantation, 17.3% and 41.3% of patients had increased urea and creatinine, respectively. There were a 9.3% decrease in glomerular filtration rate and a 5.3% increase in proteinuria. After 6 months of kidney transplantation, indicators such as hypertension, increased CRP, anemia, and left ventricular hypertrophy significantly improved. *Conclusion:* Six months after transplantation, patients with end-stage renal disease improved in several clinical and subclinical indicators. Patients may still experience several metabolic disorders after transplantation, such as diabetes, decreased glomerular filtration rate, and increased proteinuria.

Keywords: End stage renal disease, kidney transplant, kidney function, dialysis.

1. Background

End-stage renal disease (ESRD) is a growing global health issue that burdens the health-care system in many countries, particularly those with limited resources. As of 2017, 9.1% (697.6 million people) of the global population had end-stage chronic kidney disease, with China (132.3 million people) and India (115.1 million people) accounting for nearly one-third [1]. According to recent studies, patients with end-stage chronic kidney disease (CKD) are 10-100 times more likely to die than otherwise healthy people [2]. The number of cases of end-stage kidney disease increased by 29.3% between 1990 and 2017, and the 1.2 million deaths recorded in 2017 ranked twelfth among all causes of death worldwide.

Patients with ESRD are at risk of dying if they do not receive renal replacement therapy. ESRD treatment options include hemodialysis, peritoneal dialysis, and kidney transplantation, with kidney transplantation being the best alternative treatment because the patient can return to normal life. Prior to and after kidney transplant, changes in clinical

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indicators: glomerular filtration rate (GFR), blood pressure, diabetes, body mass index (BMI), lipids, anemia and subclinical indicators: Urea, creatinine, proteinuria, C reactive protein (CRP), Atherogenic Index of Plasma (AIP) can serve to evaluate the efficacy of the donated kidney. The number of individuals with end-stage renal illness is growing in Vietnam, yet only a tiny fraction of these patients have access to kidney transplantation. There are few studies that compare the changes in clinical and subclinical variables prior to and after kidney transplantation. On that premise, we conducted this study to determine several clinical and subclinical aspects of patients prior to and after kidney transplantation at 103 Military Hospital from 2018 to 2020.

2. Subject and method

2.1. Subject

75 patients who received a kidney were monitored for 6 months after transplantation at 103 Military Hospital.

2.2. Method

Study design: prospective, descriptive, and longitudinal follow-up study without intervention.

Research process:

Inquire about, analyze, and collect pre-transplant criteria such as age, gender, occupation, blood pressure measurement, hypertension therapy, renal failure treatment techniques, total, cardiovascular, respiratory, and HLA harmony.

Pre-transplant test results: Blood count (hemoglobin concentration, anemia status and levels), blood biochemistry (glucose, urea, creatinine, uric acid), and blood lipid indices (cholesterol, triglycerides, high density lipoprotein cholesterol-HDL-C, low density lipoprotein cholesterol- LDL-C, CRP plasma). Residual urine loss is defined as urine volume reduction to less than 500ml/day.

Atherogenic Index of Plasma-AIP: Formula for calculating AIP = Log (Triglycerid/HDL-C plasma), data entry, and automatic calculation on the website: http://www.biomed.cas.cz/fgu/aip/calculator.php.

Post-transplant patient follow-up includes:

Perform the same hematological and biochemical indicator tests as were done before kidney transplantation.

Calculate the glomerular filtration rate for each of the 75 patients.

Doppler echocardiography to re-examine the signs to assess cardiac function and shape.

Data input and processing: SPSS 20.0 software was used for data entry, while Stata 10.0 software was used for data processing.

3. Result

Talbe 1. Gender, age group and gender characteristics of patient

		Male (n, %)	Female (n, %)	Total (n, %)
Gender		52 (69.3)	23 (30.7)	75 (100)
Age group	≤ 30	14 (26.9)	7 (30.4)	21 (28.0)
	31-40	25 (48.1)	4 (17.4)	29 (38.7)
	4-50	8 (15.4)	7 (30.4)	15 (20.0)
	≥ 50	5 (9.6)	5 (21.4)	10 (13.3)
Median age		37.2 ± 9.9 (Min-Max: 18–60)		

The male/female was 2.27/1, mean ages was 37.2 years old. The patients aged 31-40 had the largest proportion (48.1%), while those over 50 had just 9.6%. Patients aged 30 accounted for 26.9%, while those aged 41-50 accounted for 15.4%. The youngest patient was 18 years old, while the oldest was 60 years old.

Table 2. Several clinical indicators of patients pre-transplant

Status		Patient number (n = 75)	Percentage (%)
Treatment	Internally medical treatment	6	8.0
	Hemodialysisdialysis	63	84.0
	Peritoneal dialysis	6	8.0
AVF	With AVF	52	82.5
	No AVF	11	17.5
Residual urine	Still	42	56.0
	Loss	33	44.0
Blood pressure	Normal	8	10.7
	Increase	67	89.3
Anemia	No	7	9.3
	With	68	90.7
Lipid	No	11	14.7
	With	64	85.3

Of 75 patients with end-stage chronic renal disease, 84.0% received hemodialysis, 8.0% had peritoneal dialysis, and 8.0% received conservative internal medical treatment. 82.5% of the patients had an arteriovenous fistula. Anemia impacted 90.7% of the patients, hypertension 89.3%, and dyslipidemia 85.3%. 44.0% of patients reported residual urine loss.

Table 3. Patient characteristics with HBV, HCV infection, and HLA compatibility pre-transplant

Status		Patient number (n = 75)	Percentage (%)
HBV, HCV infection	Non infection	56	74.7
	HBV (+)	4	5.3
	HCV (+)	11	14.7
	HBV and HCV (+)	4	5.3
HLA compatibility	Compatibility	72	96.0
	Not compatibility	3	4.0

The prevalence of HBV and HCV infection was 20.0%, with HCV infection (14.7%), HBV (5.3%), and HBV + HCV being 5.3%. 96.0% of patients had HLA compatibility.

Table 4. Biochemical and hematological characteristics of the patients pre-transplant

Status	Pre-transplant	Post-transplant	p
Hemoglobin (g/L), ($\overline{X}$ ± SD)	101.9 ± 17.0	134.7 ± 14.2	<0.001[a]
Ure (mmol/L), ($\overline{X}$ ± SD)	23.6 ± 7.8	5.7 ± 1.6	<0.001[b]
Creatinin (µmol/L) ($\overline{X}$ ± SD)	884.5 ± 253.9	102.5 ± 23.0	<0.001[b]
Acid uric (µmol/L), ($\overline{X}$ ± SD)	439.8 ± 147.3	395.1 ± 106.8	<0.001[b]
Cholesterol (mmol/L), ($\overline{X}$ ± SD)	4.02 ± 1.05	4.74 ± 1.20	<0.05[a]
TG (mmol/L), ($\overline{X}$ ± SD)	2.0 ± 1.78	2.46 ± 1.80	<0.05[b]
LDL-C (mmol/L), ($\overline{X}$ ± SD)	2.59 ± 0.84	3.10 ± 0.90	<0.05[a]
HDL-C (mmol/L), ($\overline{X}$ ± SD)	1.05 ± 0.31	1.15 ± 0.27	<0.005[a]

[a] student T-test; [b] Mann-Whitney U test.

There was a difference in hemoglobin, urea, creatinine, uric acid, cholesterol, TG, LDL-C, and HDL-C indices between the patient pre- and post- transplant (p>0.05). While the prior transplant recipient group's hemoglobin, cholesterol, LDL-C, and HDL-C indices were lower than the after transplant group's.

Table 5. Changes in several subclinical features in patients 6 months post- transplant (n = 75)

Characteristics		Patient (n)	Percentage (%)
Ure (mmol/L)	Increase	13	17.3
	Medium, ($\overline{X}$ ± SD)	5.72 ± 1.62	
Creatinine (µmol/L)	Increase	31	41.3
	Medium, ($\overline{X}$ ± SD)	102.50 ± 23.05	
GFR (ml/min)	Decrease < 60ml/phút	7	9.3
	Median (Quartile)	(65-86)	
Proteinuria	Positive	4	5.3
	Negative	71	94.7

After 6 months, 17.3% of patients still had uremia, 41.3% had higher creatinine, 9.3% had a lower glomerular filtration rate, and 5.3% had proteinuria.

Table 6. Changes in several clinical features in patients 6 months post-transplant

Indices	Pre-transplant (n = 75)	Post-transplant (n = 75)	p
Hypertension, n (%)	67 (89.3)	45 (60.0)	<0.001[a]
Diabetes, n (%)	0 (0)	3 (4)	N/A
Overweight and obesity, n (%)	15 (20)	15 (20)	>0.05[a]
Dyslipidemia, n (%)	59 (78,7)	65 (86.7)	>0.05[a]
Increase CRP > 2mg/l, n (%)	31 (41,3)	15 (20)	<0.01[a]
Anemia, n (%)	68 (90,7)	22 (29.3)	<0.001[a]
Left ventricular hypertrophy, n (%)	44 (58,7)	18 (24.0)	<0.001[a]
AIP > 0.11, n (%)	45 (60)	53 (70.7)	>0.05[a]

[a] *Mc Nemar test*

Indicators such as hypertension, elevated blood CRP, anemia, and left ventricular hypertrophy improved after 6 months of transplantation compared to previously. BMI, dyslipidemia, and increased AIP did not change between pre- and post-transplant. After the kidney transplant, there were three additional diabetic individuals.

4. Discussion

4.1. Patients' clinical and subclinical features prior to kidney transplantation

Renal replacement therapy was administered to all patients with ESRD in this study, hemodialysis was the most common, followed by peritoneal dialysis and medical treatment preservation. The measurement of residual renal function is the measuring of residual urine volume. In this study, approximately half of the patients (44.0%) lost residual urine, implying a decrease in renal function. Residual renal function loss is related to severe anemia due to reduced erythropoietin synthesis and diminished or loss of the body's capacity to filter toxins, overactivation of the sympathetic nervous system, the rein-angiotensin system, hypoalbuminemia.

In this study, approximately 90% of patients had hypertension, with just 10.7% having no hypertension. Ngo Thi Khanh Trang reported a prevalence of hypertension of more than 70% [3],

while Nguyen Hoang Thanh Van found a prevalence of hypertension of 71.21% [4] among dialysis patients. Because the prevalence of hypertension in patients with chronic renal disease is higher than in healthy persons, hypertension is the cause of kidney failure progression; the higher the blood pressure, the faster the danger of kidney failure, and the more patients with uncontrolled blood pressure frequently have a very bad prognosis. Only 9.3% of the patients in the study group were not anemic, whereas 90.7% had anemia. The rate of anemia in the Ngo Thi Khanh Trang study was 98.2% (not on dialysis), 78.6% (peritoneal dialysis), and 95.1% (cyclic dialysis) [3]. As a result, anemia is frequent in patients with renal failure; this long-term disease will lead to cardiovascular problems, including stroke, and an increased risk of mortality.

The findings revealed that whereas 85.3% of patients had at least one blood lipid component disorder (increased cholesterol, triglycerides, LDL-C, and reduced HDL-C), only roughly 14.7% of patients had no evidence of dyslipidemia. According to Nguyen Thi Huong, the rate of dyslipidemia in peritoneal dialysis patients was 57% [5], while in CKD patients it was 55.5% [6]. Dyslipidemia is widespread in patients with ESRD and patients on peritoneal or hemodialysis, and it is a risk factor for increased mortality. Cardiovascular mortality is also a key cause of renal failure progression in people with CKD. Increased cholesterol, increased triglycerides, increased LDL-C, and reduced HDL-C were the dyslipidemia indicators in the patient.

Because of the associated therapeutic approaches, hepatitis B and C virus infection is also one of the primary concerns in the treatment of end-stage chronic renal disease. In this study, there were only approximately 30% of patients infected with HBV, HCV the patient must be treated prior to kidney transplantation to lower the virus level below the detection threshold owing to the patient's post-transplantation. If the virus is not managed, it will produce an epidemic of viral hepatitis, resulting in abrupt liver failure and hepatic coma.

The HLA test results indicated that only 3 people generated wrong results out of 6 AG, while 72 people were compatible 1-6/6 AG. Finding a kidney donor with a high level of HLA compatibility is extremely challenging in the situation of relatively limited sources of transplant kidneys, unless the donor is blood related. With the emergence of various innovative immunosuppressive drugs that selectively inhibit activated T-lymphocytes, CD25... with high efficacy, the problem of poor HLA compatibility between donors and recipients, particularly in non-blood related couples, can still be effectively overcome [7].

4.2. Changes in several clinical and paraclinical parameters pre- and post-kidney transplantation

The higher the concentration of urea and creatinine in the blood, the worse the kidney function, hence the glomerular filtration rate is used to measure kidney function after transplantation by measuring urea and creatinine levels in the blood. When these markers were compared six months after transplantation, it was discovered that while the GFR had greatly improved, only a small number of patients exhibited an increase in urea and protein. Thus, the majority of patients' transplant kidney function has been performing well after 6 months; nevertheless, there is still a fraction of patients after kidney transplant who have a drop in glomerular filtration rate and slightly higher urea and creatinine indexes in the blood. Proteinuria affects a tiny percentage of patients and may be caused by immunosuppressive medication overdose, metabolic dysfunction, or hypertension, all of which are major causes of impaired kidney function. According to Nguyen Thi Thuy Lien, the GFR increased from 11.3mL/min to 81.0ml/min aftertransplant [8]. Clear KJ demonstrated that the eGFR index improved considerably after 3 and 12 months compared to post-transplant [9]. Thus, monitoring blood urea and creatinine levels post-transplant is an efficient way to measure changes in renal function, with creatinine being more typically employed because it is unaffected by diet.

Hypertension, elevated blood CRP, anemia, and left ventricular hypertrophy were identified as cardiovascular risk factors in patients with end-stage chronic renal disease in this study. When these indicators were compared pre- and post-transplant, it was discovered that there was a significant improvement in hypertension, anemia, increased blood CRP, and left ventricular hypertrophy. There were three patients who developed diabetes post-transplant, and certain indications, including overweight and obesity, dyslipidemia, and elevated AIP, showed minimal change before and post-transplant. Nguyen Thi Thuy Lien observed that up to 68.9% of patients with hypertension were transplanted, although this percentage dropped to 47.4% after 6 months [8].

5. Conclusion

All patients had significant improvement in some indicators after 6 months of kidney transplantation, including hypertension (pre-transplant 89.3% reduced to 60% post-transplant), anemia (pre-transplant 90.7% reduced to 29.3% after transplantation), left ventricular hypertrophy (before transplantation 58.7% reduced to 24% after transplantation), and CRP (pre-transplant 41.3% reduced to 20% after transplantation). However, the patient still has several metabolic disorders, diabetes, a lower glomerular filtration rate, increased proteinuria, and an increased atherogenesis index six months after the kidney transplant.

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