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ORIGINAL PAPER

Postoperative Complications in Kidney Transplant Patients at a Transplant Center in the South of Minas Gerais

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ABSTRACT

Introduction: Vascular, urological and clinical complications can occur in patients undergoing kidney transplantation. Several factors can influence the occurrence of these events and often require hospital readmissions. Transplant services are generally located in large urban centers. In the south of the state of Minas Gerais (MG), there is a city with a population of less than hundred thousand inhabitants that offers a transplant service. The prevalence of postoperative complications in patients operated on in a small population center is not available in the literature. **Objectives:** The objective of the study was to describe the postoperative complications of patients who underwent kidney transplantation in a service in a small city in the south of MG. **Methods:** Retrospective and descriptive study. We used the digitalized medical records of patients who underwent kidney transplantation (n = 55) between 2015 and 2020. **Results:** Of the 55 patients analyzed, 28 (50.9%) were between 40-59 years old. The majority were white individuals (41 [74.5%]). The main etiology of chronic kidney disease was undetermined (40%). Complications occurred in 61.8% of patients, the majority of which were due to surgery (52.9%), especially of vascular origin. There was no significant difference in the rate of complications in relation to sociodemographic and clinical variables ($p > 0.05$), except for the hemodialysis variable ($p < 0.001$). **Conclusion:** Vascular surgical complications were more prevalent in the postoperative period of patients undergoing kidney transplantation in a service located in a small city in the south of MG.

Descriptors: Kidney Transplantation; Postoperative Complications; Chronic Renal Failure.

Complicações Pós-Operatórias em Pacientes Transplantados Renais em Centro de Transplantes do Sul de Minas Gerais

RESUMO

Introdução: As complicações vasculares, urológicas e clínicas podem ocorrer em pacientes submetidos ao transplante renal. Diversos fatores podem influenciar a ocorrência desses eventos, frequentemente demandando reinternações hospitalares. Os serviços de transplantes geralmente se encontram em grandes centros urbanos. No sul do estado de Minas Gerais (MG), há uma cidade com população menor que 100 mil habitantes que dispõe de serviço de transplante. Não há disponível na literatura a prevalência de complicações pós-operatórias em pacientes operados em pequenos centros populacionais. **Objetivos:** O objetivo do estudo foi descrever as complicações pós-operatórias de pacientes submetidos ao transplante renal em serviço de uma pequena cidade do sul de MG. **Métodos:** Estudo retrospectivo e descritivo. Utilizaram-se os prontuários digitalizados de pacientes submetidos ao transplante renal (n = 55) no período de 2015 a 2020. **Resultados:** Dos 55 pacientes analisados, 28 (50,9%) estavam na faixa etária de 40 a 59 anos. A maioria era de indivíduos brancos [41 (74,5%)]. A principal etiologia da doença renal crônica foi de caráter indeterminado (40%). As complicações ocorreram em 61,8% dos pacientes, sendo a maioria de causa cirúrgica (52,9%), especialmente de origem vascular. Não houve diferença significativa na taxa de complicações em relação às variáveis sociodemográficas e clínicas ($p > 0,05$), exceto quanto à variável hemodiálise ($p < 0,001$). **Conclusão:** As complicações cirúrgicas vasculares apresentaram maior prevalência no pós-operatório de pacientes submetidos ao transplante renal em serviço situado em pequena cidade do sul de MG.

Descritores: Transplante de Rim; Complicações Pós-Operatórias, Insuficiência Renal Crônica.

INTRODUCTION

Kidney transplantation is the kidney replacement therapy with the best benefits for patients with end-stage chronic kidney disease (CKD). However, the increasing number of patients with chronic renal failure requiring renal replacement therapy and the reduction in the number of donors lead to an extended stay of individuals on dialysis.[1,2]. Currently, Brazil has more than 33 thousand patients on the waiting list for kidney transplants[3].

The Brazilian Society of Nephrology (Sociedade Brasileira de Nefrologia-SBN) estimated that in 2019, more than 139 thousand patients were on dialysis, a number 5.34% higher than that reported in 2018[3]. The number of patients awaiting kidney transplantation tends to increase due to population aging and a higher prevalence of chronic non-communicable diseases (NCDs)[2].

The Brazilian Association of Organ Transplantation (Associação Brasileira de Transplante de Órgãos-ABTO) disclosed, in its 2021 Brazilian Transplant Registry, that Minas Gerais (MG) was the second state with the most active patients on the waiting list for kidney transplants, with 2,864 individuals, and the third on the list of states that performed the most kidney transplants in the country[4].

The patient undergoing kidney transplantation is subject to complications that may be immediate or late[5]. Surgical complications may be of vascular origin, such as graft thrombosis or anastomotic stenosis[6], and urological, such as urethrovesical anastomosis fistula[7]. Clinical complications are related to immunosuppression, graft rejection, and infections[2,5].

Studies on the quality of kidney transplant services in small and medium-sized centers are scarce. In the south of MG, the only kidney transplant service is located in a city with less than 100,000 inhabitants, established in 2015. This study aimed to describe the postoperative complications of patients undergoing kidney transplantation in a health service located in a small city in the south of the state of Minas Gerais.

METHODS

This retrospective and descriptive study was carried out using information obtained from the digitalized medical records of patients undergoing kidney transplantation in a hospital in the south of MG state. The project was approved by the Research Ethics Committee of the Faculty of Medicine of Itajubá, protocol 4,091,203, on June 16, 2020. The research is following Resolution nº 466/2012.

Location, population, and sample

The medical records of patients undergoing kidney transplantation at the Center for Organ, Tissue and Cell Transplantation (Centro de Transplantes de Órgãos, Tecidos e Células-CTOTC) from the South of Minas Gerais were analyzed. The sample consisted of medical records of all (n = 55) patients who underwent kidney transplantation from January 1, 2015, to May 31, 2020. and their postoperative complications and readmissions were evaluated for six months.

Data collection, inclusion, and exclusion criteria

Data collection was carried out from July 2020 to February 2021. The Medical Archive and Statistics Service (Serviço de Arquivo Médico e Estatística-SAME) from the CTOTC database was used. Medical records of multi-visceral recipients who necessarily received a kidney transplant (unilateral or bilateral; from cadaveric or living donors) and whose kidney transplants occurred from January 1, 2015, to May 31, 2020. were included in the research. Medical records that did not contain a description of the postoperative period and those who died during surgery were excluded.

Variables

Sociodemographic variables such as age, race, and gender were evaluated. The etiology, dialysis modality, residual diuresis, and dry weight of CKD were analyzed. Factors related to surgery included warm (WIT) and cold (CIT) ischemia time, the presence of postoperative complications, and their type—vascular, urological, or clinical—in addition to readmissions.

Statistical analysis

The data were managed by the Statistical Package for the Social Sciences (SPSS®) version 25. Descriptive analysis used mean, standard deviation (SD), and absolute and relative values. The Student's *t*-test was used to compare sociodemographic and clinical variables and types of postoperative complications to test the study's hypothesis. The non-parametric McNemar test was used to compare postoperative complications. $P < 0.05$ was adopted as significant, and a 95% confidence interval (95%CI)

The G*Power 3.1.9.7 software was used to calculate the power of the analyses with a sample of 55 patients[8] to compare sociodemographic and clinical variables with post-transplant complications. The post hoc analysis showed that for an alpha value of 5% ($\alpha = 0.05$) of significance, two-tailed *p*, and effect size of 0.5, the statistical power of the analysis was 95.3%.

RESULTS

Of the 56 patients whose medical records were evaluated, one was excluded because he had undergone transplantation at another institution. All patients received organs from deceased donors. Of the 55 analyzed, 50.9% were between 40 and 59. Regarding race, 74.5% were white, and 40% had an undetermined etiology for CKD. Alcoholism was present in 54.5% of cases, and 85.5% of the patients were diabetic. 61.8% of the individuals had surgical complications (52.9%), vascular or urological (Table 1). Of the 13 cases with vascular complications, six (46%) were due to renal artery thrombosis, one culminating in graftectomy, and seven (54%) were due to renal vein thrombosis, with two cases of graftectomy. Of the five cases of urological complications, two had urinary fistulas, one of which was treated expectantly due to the use of a double J catheter, and the other underwent surgical correction with catheter implantation. The other three cases were related to urethral trauma during probing and resolved endoscopically.

Table 1. Sociodemographic and clinical characteristics of individuals undergoing kidney transplantation (n = 55).

Variables	n (%)
Age (years)	
60 and over	9 (16.4)
40-59	28 (50.9)
20-39	15 (27.3)
< 20	3 (5.5)
Race	
White	41 (74.5)
Brown	9 (16.4)
Black	5 (9.1)
Etiology of CKD	
SAH and/or DM	19 (34.5)
Glomerulopathies and nephrosclerosis	12 (21.8)
Polycystic kidney disease	2 (3.6)
Undetermined and others	22 (40.0)
Alcoholism	
Yes	30 (54.5)
No	25 (45.5)
Diabetes	
Yes	47 (85.5)
No	8 (14.5)
Readmissions	
Yes	32 (58.2)
No	23 (41.8)
Presence of complication	
Yes	34 (61.8)
No	21 (38.2)
Types of complications	
Vascular	13 (38.2)
Urological	5 (14.7)
Clinicals	16 (47.1)

Source: Elaborated by the authors.SAH = systemic arterial hypertension.

There was no statistically significant difference between sociodemographic and clinical variables, with $p > 0.05$ (Table 2).

Table 2. Comparison of sociodemographic and clinical variables of people undergoing kidney transplantation (n = 55).

Variables	Mean (SD)	*p*-value
Age (years)		
Yes	45.89 (14.68)	0.894
No	45.33 (14.19)	
Dry weight		
Yes	67.54 (9.76)	0.701
No	66.30 (13.27)	

continue...

Table 2. Continuation...

Variables	Mean (SD)	*p*-value
WIT		
Yes	0.56 (0.17)	0.983
No	0.56 (0.19)	
CIT		
Yes	16.77 (5.71)	0.904
No	16.56 (6.07)	
Residual diuresis		
Yes	597.29 (566.90)	0.673
No	533.33 (422.87)	

Source: Elaborated by the authors

There were no statistically significant differences between the type of complication, with $p > 0.05$ (Table 3).

Table 3. Type of complications in the postoperative period of kidney transplantation (n = 55).

Variables	Type of complication	Mean (SD)	*p*-value
Age	Urological	46.23 (16.27)	0.792
	Vascular	48.40 (12.42)	
Dry weight	Urological	68.78 (8.44)	0.856
	Vascular	69.60 (7.46)	
WIT	Urological	0.60 (0.22)	0.297
	Vascular	0.50 (0.00)	
CIT	Urological	18.56 (450)	0.777
	Vascular	17.80 (5.77)	
Diurese residual	Urological	692.30 (666.41)	0.219
	Vascular	300.00 (158.11)	

Source: Elaborated by the authors

Table 4 compares postoperative complications, with no statistically significant difference between the variables analyzed.

Table 4. Comparisons of complications in the postoperative period of kidney transplantation (n = 55).

Variables	Postoperative complications n (%)		*p*-value
	Yes	No	
Gender			
Male	26 (70.3)	14 (77.8)	0.690
Female	11 (29.7)	4 (22.2)	
Alcoholism			
Yes	20 (541)	17 (45.9)	0.248
No	10 (55.6)	8 (444)	
Diabetes			
Yes	31 (83,8)	6 (16.2)	0.052
No	16 (88.9)	2 (11.1)	
Readmissions			
Yes	23 (62.2)	14 (37.8)	0.405
No	9 (50.0)	9 (50.0)	

Source: Elaborated by the authors

DISCUSSION

Most patients had an undetermined etiology for CKD, followed by hypertensive nephrosclerosis and/or diabetic nephrosclerosis. The Brazilian Society of Nephrology cites, as the leading cause, hypertensive nephrosclerosis followed by diabetic kidney disease[3]. In the United States and Europe, diabetes mellitus (DM) remains the leading cause of CKD[9,10]. It is noteworthy that, in the sample studied, records of the criteria applied to diagnose the underlying disease were not available, as well as there was no description of the criteria used to classify the origin of CKD and determine whether the diagnosis was made by clinical validation or cause presumed.

Knowledge of the etiology of CKD is essential for developing preventive and prognostic strategies[11-15]. However, Brazil still lacks a national registration system that provides reliable data from an epidemiological point of view[11]. Knowing the etiology of CKD is also crucial in determining the patient's treatment and prognosis[12].

Regarding the procedure, vascular complications have a significant influence on morbidity and mortality after kidney transplant surgery[16]. The incidence of vascular complications was approximately four times higher than that found in the literature, which ranged from 1 to 5%[16]. This high number of vascular complications may be associated with atherosclerotic disease in these patients, intensive postoperative clinical management, in addition to the recent implementation of the service and reduced number of transplants.

The literature shows renal artery thrombosis is more common than renal vein thrombosis among vascular complications[16]. The present study showed that vascular complications were mainly associated with renal vein thrombosis.

Although urological complications are the most frequent in the literature[17,18], this was not observed in the present study, given that the incidence of vascular complications exceeded the number of urological complications by more than twice. In the literature, hydronephrosis and ureteral stenosis are the most frequent urological complications, which were not present as complications in the service evaluated. However, urinary fistula and urethral complications, present in this study, were less frequent in other studies, occurring in 0.2 and 0.9%, respectively[19].

The data in this study show that the CIT varied from 3.5 to 24.4 hours. CIT must be limited to 20 hours[16,20]. and its prolongation can harm the organ's conservation and is associated with worse prognoses[5,16,20.21]. In this study, most individuals received the organ with the CIT within the limit recommended by the literature[16,20].

Despite its benefits and indications, renal replacement therapy can lead to complications generally related to the surgery itself or the immunosuppression required post-surgery, factors contributing to readmissions in the first year post-transplant[5,22,23]. Recent studies have shown that the majority of patients undergoing kidney transplantation required readmission in the first year post-transplantation due to infections, presumably facilitated by immunosuppression[22-24]. In the present study, most patients had one or more readmissions resulting from postoperative complications.

Urinary tract infections, systemic infections, and surgical wound infections are among the leading causes of readmissions, and immunosuppressants and invasive procedures are the main causal factors[22-24]. In this research, the number of women with an infection that required readmission was similar to a study carried out with 1,770 post-kidney transplant patients that compared the presence of local or systemic infection in men and women. It showed that women had more hospital admissions due to infection (23.7%) compared to men (18.5%)[25].

The results of this study reinforce that knowledge of factors that worsen the patient's prognosis is essential for the multidisciplinary team to seek improvement and qualification in health care and education. These results will enable the improvement of conduct and preventive measures. These actions may reduce the number of possible readmissions, length of hospital stay, and postoperative complications, improving the quality of care offered to transplant patients.

Among the study's limitations, we highlight the retrospective design, which makes it challenging to assess cause-and-effect relationships, and the small number of transplants performed at the institution, limiting the correlation of complications and their associated factors. Initially, the service had three vascular surgeons and a urologist, with vascular anastomoses performed mainly by a specific surgeon and vesicoureteral anastomosis by a urologist. The service also had four nephrologists on the kidney transplant team. The profile of peripheral vascular disease, commonly present in patients with CKD, together with the recent establishment of the service and the low number of transplants, may have contributed to the occurrence of a more significant number of vascular complications than found in the literature. We recommend implementing the study's longitudinal design to identify possible factors that influence the complications encountered and evaluate the experience the kidney transplant team gained over the years.

CONCLUSION

Vascular complications predominated over urological complications. Although the retrospective study and the small sample limit the statistical evaluation regarding cause and effect, the reduced number of procedures, the incipient service, and the vascular disease present in patients with CKD may have contributed to the findings.

CONFLICT OF INTEREST

Nothing to declare.

AUTHOR'S CONTRIBUTION

Conceptualization: Bonando BM, Torres JHG; Metodology: Vitorino LM, Torres JHG; **Investigtion:** Bonando BM, Freitas FSS, Gobbi V, Silva BSF; **Data curation:** Bonando BM, Freitas FSS, Gobbi V, Silva BSF, Vitorino LM; **Supervision:** Vitorino LM, Torres JHG; **Article writing:** Bonando BM, Freitas FSS; **Critical revision:** Vitorino LM, Torres JHG; **Final approval:** Torres JHG.

DATA AVAILABILITY STATEMENT

All dataset were generated or analyzed in the current study.

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Not applicable.

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Not applicable.

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