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Practices for the safety of the kidney transplanted patient through their clinical evolution

Práticas para a segurança do paciente transplantado renal mediante sua evolução clínica

Prácticas para la seguridad del paciente renal trasplantado a través de su evolución clínica

RESUMO

Objetivo: associar as características relacionadas à preservação do enxerto e tempo de hospitalização do paciente transplantado renal mediante sua evolução clínica. Método: A pesquisa foi realizada com pacientes do ambulatório de pós-transplante renal do Hospital Geral de Fortaleza no período de julho a outubro de 2021. A amostra foi constituída por 565 pacientes maiores de 18 anos listados para Tx renal. Resultados: Verificou-se prevalência do sexo masculino entre os pacientes que receberam transplante renal (54,7%, n = 309), casados (36,1%, n = 204), com ensino fundamental completo (33,1%, n = 187), sem deficiência (85,8%, n = 485) e do interior do Estado (40,9%, n = 231). Os pacientes que evoluíram com Função Imediata do Enxerto (FIE) alcançaram melhores resultados na função renal em curto prazo, considerando o período de 14 dias. Conclusão: Concluiu-se que o monitoramento da creatinina é fator fundamental para avaliação da função do enxerto, podendo auxiliar na tomada de decisões no manejo de pacientes submetidos a transplante renal.

DESCRIÇÕES: Transplante de Rim; Creatinina.; Hospitalização; Segurança do Paciente.

ABSTRACT

Objective: to associate the characteristics related to the preservation of the graft and hospitalization time of the renal transplant patient according to their clinical evolution. Method: The research was carried out with patients from the post-kidney transplant outpatient clinic of the Hospital Geral de Fortaleza from July to October 2021. The sample consisted of 565 patients over 18 years of age listed for renal Tx. Results: There was a prevalence of males among patients who received kidney transplantation (54.7%, n = 309), married (36.1%, n = 204), with complete elementary school (33.1%, n = 187), without disabilities (85.8%, n = 485) and from the countryside (40.9%, n = 231). Patients who evolved with Immediate Graft Function (IEF) achieved better results in short-term renal function, considering the period of 14 days. Conclusion: It was concluded that creatinine monitoring is a fundamental factor for the assessment of graft function, and can help in decision-making in the management of patients undergoing kidney transplantation.

DESCRIPTORS: Kidney Transplantation; Creatinine; Hospitalization; Patient safety.

RESUMEN

Objetivo: asociar las características relacionadas con la conservación del injerto y el tiempo de hospitalización del paciente trasplantado renal según su evolución clínica. Método: La investigación se realizó con pacientes de la consulta externa de postrasplante renal del Hospital Geral de Fortaleza de julio a octubre de 2021. La muestra estuvo constituida por 565 pacientes mayores de 18 años enlistados para Tx renal. Resultados: Predominó el sexo masculino entre los pacientes que recibieron trasplante renal (54,7%, n = 309), casados (36,1%, n = 204), con primaria completa (33,1%, n = 187), sin discapacidad (85,8%, n = 485) y del campo (40,9%, n = 231). Los pacientes que evolucionaron con Función Inmediata del Injerto (FIE) lograron mejores resultados en la función renal a corto plazo, considerando el período de 14 días. Conclusión: Se concluyó que el monitoreo de la creatinina es un factor fundamental para la evaluación de la función del injerto, pudiendo ayudar en la toma de decisiones en el manejo de los pacientes sometidos a trasplante renal.

DESCRIPTORES: Trasplante Renal; Creatinina; Hospitalización; Seguridad del paciente.

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INTRODUÇÃO

Kidney transplantation has been presented as the first treatment option for End-stage Kidney Disease, as it improves patient survival and quality of life, reducing long-term costs⁽¹⁾, however, the results of the transplant fundamentally depend on the patients' adherence to the oriented care, such as the regular and daily use of immunosuppressants.⁽²⁾

According to data from the Brazilian Association of Organ Transplantation (ABTO - Associação Brasileira de Trans-

plante de Órgãos)⁽²⁶⁾, in absolute numbers, in 2019, Brazil was characterized as the second country in the world that performs the most kidney transplants. The data showed that in 2020 compared to 2019, there was a 24.5% drop in the rate of kidney transplants, mainly by living donors, which represented 59.6%, while transplants from deceased donors registered a drop of 17.2%.

It is important to mention that these data were influenced by the pandemic period, so much so that the rate of transplants performed with living donors in the last 36 years. COVID-19 also impacted the

kidney transplant waiting list, with a 5.8% growth, in addition to a 33% increase in list mortality. In 2021, in absolute numbers of transplants, 4,750 procedures were performed, of which 802 were performed in the northeast region, specifically 191 in the state of Ceará.⁽²⁶⁾

In the case of kidney transplantation, there are patients who demand multidisciplinary care from diagnosis, through the preoperative period and extending as long as it is able to preserve renal function, with creatinine presenting itself as one of the biomarkers that the health team needs to

monitor. ⁽²⁾ This follow-up is essential for a better prognosis and quality of life for the patient.

Some studies have identified low adherence to the proposed treatment after transplantation, with a prevalence ranging from 14.3% to 58.0% depending on the country and the transplant center. ⁽¹⁻³⁾ Monitoring and measuring adherence have implications for nursing practice and for the interdisciplinary team, both due to the high investment of the public health system and patient safety by monitoring the function of their graft. ⁽³⁾

Clinical and laboratory data for monitoring renal graft function should integrate behavioral, educational and psychosocial approaches, integrating the multidisciplinary team in the care process. ⁽⁴⁾ In this sense, the assessment and monitoring of serum creatinine as one of the markers of renal function has a solid purpose to guide care and intervene to obtain the expected results. ⁽⁵⁾

In the organizational context of work, patient preparation for hospital discharge represents a complex step for the continuity of treatment in all necessary spheres, since technological advances have led to a reduction in the patient's length of stay in the hospital. Added to this is the fact that nurses and their staff have many attributions in this context, which represent obstacles for health education and, consequently, for the discharge plan to not be prioritized. ⁽⁶⁾

Research reports that nurses form the basis of care during the post-transplant period, as they are responsible for, among other things: promoting water balance, monitoring organic responses, controlling diuresis, monitoring laboratory tests, evaluating, detecting and intervening early on possible complications. ^(7,8)

In nursing practice in a kidney transplant unit, it is possible to verify the need for frequent monitoring to promote patient safety, a factor that raised the interest in studying the subject, considering that the performance of the nursing professional must be focused on the evaluation, early detection and intervention in possible post-transplant complications. ⁽⁹⁾ Creatinine

monitoring is relevant for the assessment of post-kidney transplant graft function. ⁽¹⁰⁾

Thus, creatinine is a parameter of graft function, its postoperative monitoring may show the need for dialysis in the first seven days after transplantation, period in which regeneration of tubular cells occurs, making it important to correlate creatinine with the occurrence of complications after the first week. ⁽¹⁰⁾

In view of this, the relevance of this study is verified, as it can contribute to better care of post-kidney transplant patients, with creatinine monitoring promoting patient safety when evaluating graft function, reducing the risk of complications. The study is also relevant because it is possible to use it as a subsidy to expand the knowledge of health professionals and, consequently, improve care. The research provides an opportunity to review the care practices carried out by professionals, offering them professional training and qualification for the promotion, protection and rehabilitation of the health of their patients.

In this context, this study aims to associate the characteristics related to graft preservation and hospitalization time of renal transplant patients according to their clinical evolution.

METHODS

This is a descriptive, documentary and retrospective study, with a quantitative approach. The main objective of the descriptive study is to describe the characteristics of a given population through the use of standardized data collection techniques. Documentary research is restricted to written documents, constituting what are called primary sources. ⁽¹¹⁾

Descriptive studies in the area of Health make it possible to analyze, evaluate and determine the distribution of diseases according to certain conditions from a place and in a certain time scale, parameters that characterize certain groups of individuals may be added, allowing for a better characterization and specification of the population studied.

The research was carried out at the

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kidney transplant clinic of the General Hospital of Fortaleza, a reference center throughout the state in performing kidney, pancreas, liver and cornea transplants. This Health institution works in tertiary care in the State public network of Fortaleza). Specialized in kidney, liver and pancreatic transplantation and has an interdisciplinary team. Serves adults, children and teenagers. More than 3500 transplants have been performed so far.

The sample consisted of 565 listed patients who underwent renal TX at the Hospital Geral de Fortaleza. Patients over 18 years of age were included in the study. Patients who underwent double transplantation (liver-kidney or kidney-pancreas) were excluded.

Data collection was carried out from July to October 2021, through the forms used and filed in the medical records used by the Renal Transplant Center of the General Hospital of Fortaleza, through an instrument containing socio-demographic data, clinical and laboratory aspects, effectively contemplating the patients who were in full outpatient follow-up at that period.

The results were consolidated in the Microsoft® Excel 2015 spreadsheet, creating a database, whose analysis was presented in the form of tables, then exported to the Statistical Package for Social Sciences (SPSS) version 23.0 for statistical analysis.

For the sample calculation, a confidence interval of 95%, sampling error of 5%, P (approval level) and Q (disapproval level) of 50%, sample calculation for finite population with non-probabilistic sampling, since criteria established for convenience by the researcher were used according to the objectives of the study.

The results of continuous variables with normal distribution were expressed as mean, standard deviation and those with abnormal distribution were expressed as median and interquartile range. Categorical variables were presented in percentages or frequencies.

The Mann-Whitney tests were used to analyze the association (preservation of the graft with the length of hospital stay) and the Kruskal-Wallis test to obtain the mean

of the variables (retransplant correlation, induction and maintenance therapy, the use of antihypertensive and hypoglycemic drugs). For data analysis, a “p” value lower than 5% was considered statistically significant.

The research met the fundamental ethical and scientific requirements of Resolution 466/12 of the National Health Council - CNS (Conselho Nacional de Saúde) / Ministry of Health - MS⁽¹⁷⁾, uma vez que o estudo foi encaminhado ao Comitê de Ética e Pesquisa para ser apreciado e aguardou o parecer para o seu desenvolvimento. O projeto foi aprovado sob o

número de parecer 5.070.891 e CAAE: 46569921.7.0000.5040.

RESULTS

Data were collected for 565 patients. It was observed that the mean age was 46 years (standard deviation: 12.1; range: 23 to 74 years). There was a prevalence of males among patients who received kidney transplantation (n = 257, 54.7%), married (n = 204, 36.1%) and with complete elementary education (n = 187, 33.1%). The percentage of patients who had some type of disability (n = 80, 14.1%). Also noteworthy is the

Table 1 – Sociodemographic characteristics of kidney transplant recipients. Fortaleza, CE - 2022 (n = 565)

Characteristics	n	%
Age group (in years)		
18 to 39	193	34,2
40 to 59	221	39,1
≥ 60	151	26,7
Gender		
Male	309	54,7
Female	256	45,3
Deficiency		
Yes	80	14,1
No	485	85,8
Education		
Illiterate	91	16,1
Elementary School	187	33,1
High School	181	32
Higher education	106	18,8
Marital status		
Single	159	28,1
Married	204	36,1
Stable union	64	11,3
Divorced	72	12,7
Widowed	66	11,7
Origin		
Fortaleza	199	35,2
Interior of the state	231	40,9
Other state	135	23,9

Source: Prepared by the author.

prevalence of patients from the countryside (n = 231, 40.9%), as shown in table 1.

Assessing the initial serum creatinine level up to the fourteenth postoperative day among patients with immediate and slow graft function (Table 2), It is noted that the first group (Immediate Graft Function - IGF) showed a reduction of approximately 64% (mean = 2.33 mg/dL) on the fourth day, while the second group (Slow Graft Function - SGF) showed a similar reduction only on the 13th day (64.4%, mean = 2.80 mg/dL).

On the fifth day, the IGF group already had creatinine at acceptable levels for hospital discharge (1.92 mg/dL), while the SGF group still had elevated creatinine (6.9 mg/dL), evidencing a probable need for dialysis. However, it is important to point out that even slowly, creatinine continued to fall.

The results demonstrate that patients who evolved with IGF achieved better short-term results, considering the period of 14 days, while patients who developed SGF, despite having consecutive drops in creatinine levels, they reached the 14th day with creatinine values higher than the 5th day of patients with EIF (2.76 mg/dL).

When evaluating the characteristics related to graft preservation with hospitalization time (Table 3), it is possible to verify that the parameters of preservation solution and use of perfusion machine did not present significant results (p = 0.488 and p = 0.206, respectively), even so, it is identified that the use of Custodiol® brought a shorter hospitalization time for patients.

The non-use of an infusion machine also demonstrates a reduction in the time of hospitalization of patients when considering that 75% of the patients had a hospitalization time of less than or equal to 50 days (3rd quartile). In turn, the time of cold ischemia showed a significant result (p = 0.020), with patients who had an ischemia time of more than 12 hours having a longer hospital stay (Table 3).

Still analyzing Table 3, it appears that patients undergoing kidney transplantation were hospitalized for an average of 18 days, but it was found that this result

Table 2 – Evolution of the initial serum creatinine up to the 14th day after kidney transplantation in patients who had immediate and slow graft function. Fortaleza, CE - 2022.

Hospitalization days	FIE (n=313)		FLE (n= 252)	
	Mean Cr (mg/dL)	Reduction (%)	Mean Cr (mg/dL)	Reduction (%)
Inicial	6,54	0	7,85	0
D1	5,50	15,9	7,52	4,2
D2	4,16	36,3	7,50	4,5
D3	3,09	52,8	7,28	7,3
D4	2,33	64,3	6,75	14,0
D5	1,92	70,6	6,09	22,5
D6	1,78	72,8	5,41	31,0
D7	1,68	74,3	5,02	36,1
D8	1,65	74,8	4,52	42,4
D9	1,64	74,8	4,13	47,4
D10	1,62	75,2	3,62	53,9
D11	1,60	75,6	3,62	53,9
D12	1,59	75,7	3,14	60,0
D13	1,58	75,7	2,80	64,4
D14	1,51	77,0	2,76	64,9

Source: Prepared by the author

was quite dispersed (standard deviation = 11.0), ranging from 7 to 50 days of hospitalization. The results of creatinine at discharge were closer to the data (standard deviation = 1.30), with an average of 3.09 between patients, the variation was between 1.2 and 5.9.

Of the 565 patients analyzed, 7.4% (n = 42) underwent retransplantation. Regarding the time of induction therapy with thymoglobulin, it was found that 37.7% (n = 213) of the patients received a dose of 4.6 to 6.0 mg/kg. 67.8% (n = 383) of patients underwent maintenance therapy with Tacrolimus + Sirolimus. Important results show that 63.8% (n = 361) of the patients use antihypertensive drugs and 37.7% (n = 213) needed diabetes therapy, evidencing the need for attention to these comorbidities (Table 3).

DISCUSSION

The clinical profile of patients under-

going kidney transplantation analyzed in this study converged with that of other studies already carried out on the subject. Studies carried out in the South, Southeast and Northeast regions of Brazil found that the majority of kidney transplant patients were over 40 years of age (average of 45.4 years), with a predominance of males and married couples.^(12,13)

De acordo com o Ministério da Saúde, os homens são mais vulneráveis às doenças crônicas, especialmente hipertensão arterial sistêmica (HAS) e diabetes mellitus (DM), que se configuram como principais fatores de risco para Doença Renal Crônica (DRC). É possível observar que os homens em idade ativa de trabalho procuram menos atendimento que as mulheres, fato que pode estar relacionado à vulnerabilidade masculina com propensão a sugerir superioridade nas filas de espera para transplante renal.⁽¹²⁾

Age is an important factor in increasing the prevalence of CKD. Data from the

American National Health and Nutrition Examination Survey (NHANES) show a gradual increase in the prevalence of CKD with advancing age, from 10.6% in individuals aged 40 to 59 years to 32.6% in those aged 60 years and over.^(12,14) Additionally, a reduction in GFR is expected with increasing age, as a function of physiological aging.⁽¹⁵⁾

Regarding the presence of some type of disability in the patient undergoing transplantation, a survey carried out in the United States showed that one in three Americans with disabilities has nephrolithiasis, demonstrating that they have increased chances of developing the disease which, when not properly treated, can lead to progression to CKD.⁽¹⁶⁾ In turn, Chen et al.⁽¹⁷⁾ carried out a study on impaired kidney function in adults with disabilities, showing that these people tend to seek more health care than those without disabilities, which may explain the lower incidence of these patients in kidney transplantation.

The low level of education of patients, in general, makes it difficult to understand, which may compromise adherence to treatment.⁽¹³⁾ It is also important to highlight that low education and inequalities in access to information are determining factors when it comes to people with chronic non-communicable diseases.⁽¹³⁾ In the present study, 16.1% of the patients were illiterate and 33.1% had only elementary education. A higher percentage was verified in the research by Campos et al.⁽¹³⁾, with 55.6% (140) of patients on a single waiting list for kidney transplantation in Juiz de Fora - MG with elementary education.

In analyzing the evolution of creatinine among the patients who participated in this research, it was evidenced that patients with IGF presented faster normalization of the rate (D5), a similar result was verified in the research by Fraga et al.⁽¹⁸⁾ It is important to mention that creatinine is a crucial laboratory marker for the assessment and monitoring of the immediate and late function of the graft.⁽¹⁹⁾ The result verified in this study was also confirmed in other studies, which showed that the IGF has a better prognosis in the patient's recovery, in

Table 3 – Analysis of association of characteristics related to graft preservation with length of hospital stay and clinical and evolutionary characteristics of kidney transplantation in recipients of the study population. Fortaleza, CE - 2022 (n = 565)

	Hospitalization time (days)			p Value
	Median	1st quartile	3rd quartile	
Preservation solution				0,488 ²
Custodiol®	10	18	50	
SPS-1®	11,5	21	68,5	
IGL-1®	12	20	76	
Perfusion Machine (n=250)				0,206 ¹
Yes	11	18	64	
No	10	19	50	
Cold ischemia time (in hours)				0,020 ²
< 12	7	7	8	
12 to 24	10	7	20	
> 24	11	8	18	
	Mean + Standard Deviation		Variation	
Hospitalization time (days)	18,0 + 11,0		7-50	
High creatinine (mg/dl)	3,09 + 1,30		1,2-5,9	
Variables	N		(%)	
Retransplantation	42		7,4	
Induction therapy (Thymoglobulin in mg/kg)				
Up to 3	132		23,4	
3,1 to 4,5	124		21,9	
4,6 to 6,0	213		37,7	
> 6,0	88		15,6	
Pulse therapy	8		1,4	
Maintenance therapy				
Tacrolimus + Sirolimus	383		67,8	
Tacrolimus + Everolimus	27		4,8	
Tacrolimus + Mycophenolate Sodium	149		26,4	
Mycophenolate Sodium + Sirolimus	6		1,1	
Use of antihypertensives	361		63,8	
Diabetes therapy	213		37,7	

Source: Prepared by the author
¹ Mann-Whitney test; ² Kruskal-Wallis test.

addition to reducing the length of hospital stay.^(20,21)

The prevalence of graft SGF with 44.6% in the study is lower when compared to other studies, in which the percentage of the Brazilian population was between

50% and 70%.⁽²²⁾ A higher rate of SGF is associated with a longer hospital stay and a higher risk of complications during hospitalization, including acute rejection and infections.⁽²²⁾

Analyzing the association of characte-

ristics related to graft preservation with the length of hospitalization and clinical and evolutionary characteristics of the kidney transplant of the recipients of the study population, it was found that Custodiol® as a preservation solution was associated with a shorter hospitalization time of patients, although no significant results were found in this characteristic, which corroborates with studies already carried out on the subject, verifying, still, that the use of Custodiol® is considered an international standard for the preservation of the kidney to be transplanted.^(23,24)

The cold ischemia time was evaluated in a study carried out in Cascavel - PR, showing that it is directly related to the length of hospitalization insofar as it is associated with delayed graft function, verifying that every six hours of cold ischemia, the risk of delayed function increases by 23%.⁽²⁵⁾

Regarding the use of a perfusion machine, no significant differences were observed in relation to this characteristic, however, studies have shown that the perfusion machine is able to reduce the incidence of delayed graft function, the length of hospital stay and improve long-term graft survival.^(24,25)

It was evidenced that most patients used thymoglobulin in induction therapy, while 1.4% underwent pulse therapy. Thymoglobulin is an anti-human thymocyte immunoglobulin effective in inducing

immunosuppression and is associated with a lower incidence of graft dysfunction due to its anti adhesion molecules, which prevent leukocyte adhesion to cell surfaces.⁽⁸⁾ In a study that evaluated 1,000 kidney transplants performed at Hospital das Clínicas, Faculdade de Medicina de Botucatu, showed that the variable associated with a better renal outcome was the use of thymoglobulin as induction therapy.⁽²⁵⁾

Maintenance therapy for prophylaxis for organ rejection included tacrolimus in 98.9% of patients, mycophenolate in 27.4% and sirolimus in 68.8%. The 2018 United States Annual Renal Transplant Data Report demonstrated that, for adult recipients, T-cell depleting agents were the most common inducing agents and most patients continued on a tacrolimus and mycophenolate-based regimen⁽²⁵⁾, corroborating the clinical data found in the present study.

The use of antihypertensive drugs among patients showed an incidence of 63.8%, as well as hypoglycemic drugs with an incidence of 37.7%, confirming as predictor diseases of CKD in these patients.⁽¹⁴⁾ Research has confirmed this result, with the use of antihypertensive drugs being more prevalent than drug therapies for diabetes.⁽¹²⁾

CONCLUSION

By analyzing the clinical evolution, it

was found that patients who evolved with immediate graft function achieved good results in short-term renal function, considering the period of 05 days, while patients who evolved with slow graft function, despite having consecutive drops in creatinine levels, went up to the 14th day for an acceptable drop in creatinine for hospital discharge.

Through the association of characteristics related to graft preservation, it was observed that the longer the cold ischemia time, the longer the patients' hospitalization time. Patients spent an average of 18 days in hospital, but it was found that this result was quite dispersed, with a standard deviation of 11.0. Regarding maintenance therapy, the use of Tacrolimus + Sirolimus was prevalent, associated with the use of hypertensive drugs and diabetes therapy, highlighting the need for attention to these comorbidities.

In the end, it can be concluded that creatinine monitoring is a fundamental factor for the evaluation of graft function, and its results can help in decision-making about necessary interventions in patients so that a better prognosis and quality of life is possible.

It should be noted that the present study was limited by the exclusive use of creatinine for the analysis of renal function, suggesting that future studies be carried out considering other biomarkers.

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