Self-rated health and mortality after kidney transplantation

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Part II

Self-rated health as a health outcome

Chapter 3

Self-rated health after kidney transplantation and the change in graft function

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Abstract

Objective

The aim of this study is to explore the relationship between self-rated health (SRH) in patients after kidney transplantation (KT) and patient graft function as well as graft function over time.

Methods

The sample consisted of 42 patients who were examined in the third month (T1) and the twelfth month after KT (T2). Sociodemographic data and data on glomerular function (GF) (Cockroft-Gault) were collected. Patients completed the SF-36 questionnaire measuring SRH. Linear regression was used to identify predictors of SRH at T2. Age, gender, change in GF, SRH at T1 were set as the independent variables.

Results

SRH and GF slightly improved over time. The first model consisting of age, gender, SRH at T1 and GF at T2 explained 49.9% of the variance in SRH at T2; GF at T2 did not significantly contribute to the model. The second model consisting of age (β=-0.26, 95%CI -1.087;-0.035, p≤0.05), change in GF between T2 and T1 (β=0.31, 95%CI 9.267;63.643, p≤0.01), SRH at T1 (β=0.5, 95%CI 0.247;0,68, p≤0.001) explained 54.6% of the variance in SRH at T2.

Conclusion

Although SRH after transplantation is not associated with absolute levels of GF, there is a significant association with the change in GF over time.

Key words

glomerular function, kidney transplantation, self-rated health, quality of life

Introduction

In evaluating outcomes in patients with end-stage kidney disease, the assessment of perceived health status (PHS) becomes as important as morbidity and mortality.[1] Among the different types of treatment for chronic kidney disease – hemodialysis (HD), peritoneal dialysis (PD) and kidney transplantation (KT) – kidney transplantation (KT) is the best choice in terms of longer survival, lower morbidity and lower cost.[2,3] Furthermore, patients with end-stage kidney disease after KT indicate better self-ratings of their health when compared to HD and PD.[1,4]

Health-Related Quality of Life, Perceived Health Status and Self-Rated Health (SRH) are all umbrella terms which encompass the correlations between an understanding of the physical, psychological and also social domains, and which also protect these correlations. These terms have been defined in different ways over the years.[1] Substantial evidence has been presented in support of the hypothesis that SRH has a relationship to mortality that is independent of the subject's level of objective health status.[5] That is, independent of the patient's objective health status, asking a relatively simple question on how somebody rates his or her health in general helps identify persons at risk, irrespective of their clinical status.[5] Benjamins et al., in a longitudinal sample of 689,710 respondents, found that SRH has a significantly predictive power for mortality risk.[6] Burstrom et al. analyzed data on mortality rates and risk ratios of death during a 22-year follow-up study among 170,223 respondents, and their results show a strong association between "poor, or fair" self-rated health and an increased risk of mortality.[7] SRH is a personal understanding of someone's own position in life and is a subjective, valid and reliable factor associated with mortality and morbidity;[1,5-11] worse self-rated health is connected with higher morbidity and mortality.

SRH has been included in many population-level studies as a conversational way to open the topic of health status when it is to be covered in the interview in more detail.[8] The determinants of SRH are sociodemographic characteristics (age, education, employment and socioeconomic status), social support (family and living status), health promoting behavior (physical activity) and chronic health problems, including comorbidity. Poor self-rated health is more pronounced among people of higher age, women, the less educated and among the unemployed with low socioeconomic status; furthermore, poor self-rated health is associated with a lack of social support, higher functional disability, lower physical activity and the existence of multiple chronic conditions.[11]

Glomerular function is a physical factor reflecting survival and vitality of the kidney, but surprisingly there is only limited evidence of its association with SRH.[4,12-15] Fujisawa et al. administered the SF-36 to 117 renal transplant patients who had undergone KT and examined which items affected their Perceived Health Status (PHS) after KT. They showed that the most important factor affecting health-related quality of life was the current serum creatinine level.[12] Also, in 2006 Rosenberger et al. explored predictors of PHS in 138 respondents after KT. They found that better kidney function is associated with better perceived health status, but only in the younger population.[4] In addition, Saracino et al. in 2008 confirmed that loss of renal function is associated with the deterioration of health-related quality of life in kidney transplant patients.[16]

Therefore, the aim of this study is to explore the relationship between self-rated health (SRH) in patients after kidney transplantation (KT) and their graft function. We studied not only the association of the absolute level of glomerular function with SRH, but also the impact of a change in glomerular function over time on SRH.

Subjects and materials

Sample and procedures

A group of 88 incident kidney transplant recipients from the eastern region of the Slovak Republic were invited to participate three months (T1) after transplant surgery. Data collection took place from February 2006 to January 2009 in Kosice. All patients with a functional graft who agreed to participate were included. The only exclusion criterion was the inability to answer questions during the interview due to severe dementia or mental retardation; thus, at the start (T1) three patients were excluded, and at follow-up twelve months after transplantation (T2) two more patients were excluded due to their having had a stroke. Patients completed a questionnaire measuring self-reported health and socio-demographic variables at T1 and T2. All participants were interviewed by trained personnel. Medical data were retrieved from medical records.

The local Ethics Committee approved the study. Only patients who signed informed consent prior to the study were included.

Measures

Self-rated health was measured using the first question of the Short Form Health Survey (SF-36), which was originally designed for use in population surveys as a generic indicator of health status.[6,8,17] The SF-36 is explained as a valid questionnaire, having eight subscales: physical functioning, social functioning, physical role limitations, emotional role limitations, mental health, vitality, pain and general health perception.[12,18-22] All of the items as well as all of the eight subscales are coded and transformed into a scale of 0 (poor health) to 100 (excellent health) in which they are presented as the standard SF-36, scores between 0 and 100, with higher scores indicating better health status.[18] In addition, the single item question of the SF-36 on self-rated health can also be computed in this way. The validity and reliability of the SF-36 have been confirmed in patients with renal disease, including those after kidney transplantation.[12,19-22] Skalská et al. validated the questionnaire in the Czech population.[21] The reason for only reporting the first item instead of a broader description of perceived health status in patients after kidney transplantation is that self-rated health has been generally used in health studies as a reliable indicator of mortality and morbidity.[6,8,17]

Demographic data included age, gender, education, occupation, family status and living status. Information about serum creatinine, weight, comorbidity, immunosuppression treatment and primary diagnosis of kidney failure were retrieved from medical records. Glomerular function was calculated using the Cockroft-Gault formula.[23]

Statistics

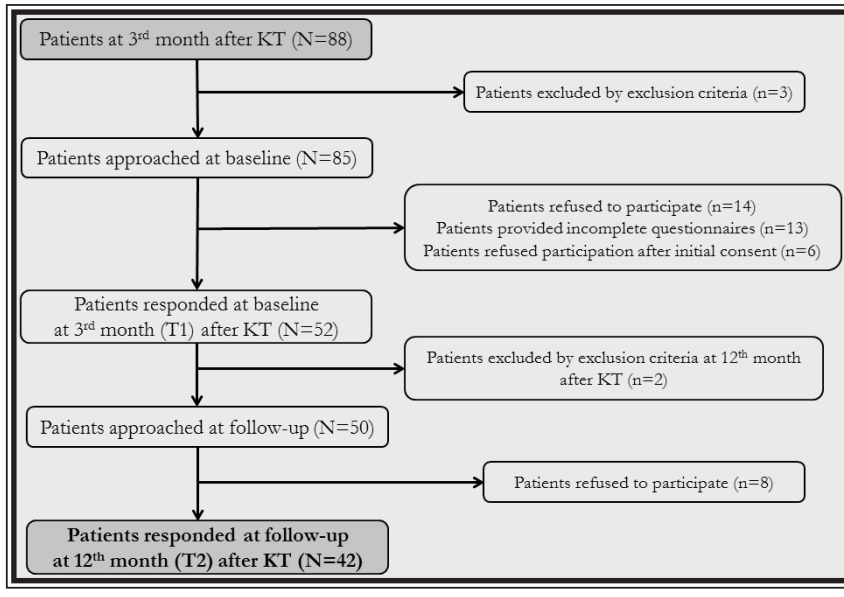
Frequencies, means, medians, minimum, maximum and standard deviations were calculated for the sample description. Next, the Wilcoxon signed-rank test and the sign test were used to detect changes in GF and SRH. Finally, stepwise linear regression was performed in order to identify predictors of self-rated health at T2; independent variables were age, gender, education, occupation, family status, living status, primary diagnosis of kidney failure, comorbidity, self-reported health at T1, glomerular function at T2 and change in glomerular function over time. Sociodemographic and medical factors were set as independent variables,

including glomerular function (GF) at T2 in the first model. The second model analyzed the change in glomerular function between T2 and T1 (ΔGF) instead of the absolute level of glomerular function. SPSS 16.0 was used for statistical analyses.

Results

From the initial 88 patients, 3 were excluded, 14 refused to participate, 13 provided incomplete questionnaires and 6 refused to participate after initially consenting. Thus, 52 patients were analyzed at T1 (a response rate of 61.2%). At follow-up, 2 more were excluded and 8 refused further participation, meaning 42 patients remained (a response rate of 84.0%). Statistically, nonrespondents did not significantly differ from participants in either age or in gender. See Figure 3.1 for more detailed information.

Figure 3.1. Flow chart diagram of the participants of the study



The mean age of participants at T1 was 46.9 ± 13.2 and age at T2 was 49.6 ± 12.2 years. The mean SRH at T1 (45.7 ± 28.8) did not differ significantly from SRH at T2 (51.7 ± 26.5). The mean GF significantly improved from 1.0 ± 0.27 ml/s at T1 to 1.11 ± 0.29 ml/s at T2 ($p \leq 0.001$). See Table 3.1 for more detailed information.

The associations between family status, living status, education, occupation, as well as the primary diagnosis of kidney failure and self-rated health at T2 in both of models were not significant. The first regression model, consisting of age, gender, SRH at T1 and the current GF at T2, explained 49.9% of the variance in SRH at T2. Age and SRH at T1 contributed significantly to this model, but the current GF at T2 did not. The second regression model, consisting of age, gender, SRH at T1 and ΔGF (GF at T2 minus GF at

T1), explained 54.6% of the variance in SRH at T2. The ΔGF contributed significantly to this model (β=0.308, p≤0.01), while age contributed less but remained significant, and SRH at T1 contributed similarly as in Model 1. See Table 3.2 for more detailed information.

Table 3.1. Characteristics of the sample at baseline (3 months) and at follow-up (12 months)

		3 months (N=52)		12 months (N=42)	
		N or mean	% or SD	N or mean	% or SD
Age	Mean ± SD	46.9	13.2	49.6	12.2
Gender	Male	32	61.5	27	64.3
	Female	20	38.5	15	35.7
Education	Elementary	26	50.0	23	54.8
	Secondary	25	48.1	18	42.8
	University	1	1.9	1	2.4
Occupation	Employed	11	21.6	10	24.5
	Disability	30	58.8	24	58.5
	Unemployed/retired	10	19.6	7	17.0
Family status	Single	8	15.4	6	14.3
	Married	42	80.8	34	81.0
	Widowed	2	3.8	2	4.8
Living	Alone	2	3.8	2	4.8
	Together	50	96.1	42	95.2
Self-rated health	Poor (0)	5	9.6	3	7.1
	Fair (25)	17	32.7	12	28.6
	Good (65)	22	42.4	17	40.5
	Very good (85)	6	11.5	10	23.8
	Excellent (100)	2	3.8	0	0
	Mean ± SD	46.4	26.7	51.7	26.5
Glomerular function	Mean ± SD	1.0	0.27	1.11	0.29
Comorbidity	Coronary artery disease	24	46.2	19	45.2
	Hypertension	44	84.6	38	90.3
	Renal osteodystrophy	27	52	23	54.8
	Diabetes mellitus	12	23.1	10	23.8
	Other comorbidity: one	15	28.8	13	31.0
	Other comorbidity: ≥2	9	17.3	7	16.7
Immunosuppression treatment	CsA+MMF+P	40	76.9	35	83.3
	Tac+MMF+P	10	19.2	7	16.7
	Tac+MMF	2	3.8	0	0
Primary diagnosis of kidney failure	Glomerulonephritis	28	55.8	22	52.4
	Tubulointerstitial nephritis	12	23.1	12	28.5
	Polycystic kidneys adult type	2	3.8	1	2.4
	Diabetic nephropathy	9	17.3	7	16.7

N– Number, SD – Standard deviation, CsA – Cyclosporin A, MMF – mycophenolate mofetil, P – Prednison, Tac – Tacrolimus

Table 3.2. Regression models of predictors of SRH at T2 in Model 1 with GF; and in Model 2 with ΔGF

Model	Variables	B(Std. Error)	β	95%CI
1	constant	41.764(22.32)		-3.501;87.028
	age	-.799(.26)	-.365*	-1.328;-.270
	gender	5.321(6.62)	.098	-8.102;18.745
	SRH at T1	.443(.11)	.481***	.214;.671
	GF at T2	20.051(10.10)	.213	-2.238;42.341
	adjusted R^2	**49.9%**		
2	constant	47.416(18.32)*		10.256;84.576
	age	-.561(.26)	-.257*	-1.087;-.035
	gender	5.616(6.20)	.103	-6.968;18.199
	SRH at T1	.463(.11)	.503***	.247;.680
	Δ GF	36.455(13.41)	.308**	9.267;63.643
	adjusted R^2	**54.6%**		

*B – nonstandardized coefficient, β – standardized β coefficient, CI - Confidence interval, T1 – 3 months after kidney transplantation, T2 – 12 months after kidney transplantation, SRH – Self-Rated Health, GF – Glomerular function, ΔGF = (GF at T2)-(GF at T1), p-value of significance: * - p < 0.05, ** - p < 0.01, *** - p < 0.001*

Discussion

The aim of this study was to explore the relationship between self-rated health (SRH) in patients after kidney transplantation (KT) and their graft function. We studied not only the association of the absolute level of glomerular function with SRH, but also the impact of a change in glomerular function over time on SRH. We found that perceived health status at follow-up is influenced not by the success of the transplantation shortly after transplant surgery, but rather by the change in glomerular function (ΔGF) over time. In our first model of SRH at twelve months after KT, the absolute level of glomerular function was set as an independent variable. In this model the absolute level of GF did not contribute significantly to the explanation of the variance in SRH. However, in the second model the change in GF over time contributed significantly to the explanation of the variance in SRH at twelve months after KT.

In accordance with our findings, Bohlke et al.[24] found in their 2008 study evaluating employment status and its predictors among kidney transplant recipients that the absolute level of creatinine did not contribute significantly to post-transplantation employment status. Economic productivity after a successful transplantation for patients after KT seemed to depend more on social determinants and less on the specific clinical situation of the patients.[24] Karam et al. in 2003 asserted that respondents more than 10 years after kidney transplantation had unpleasant mental and general health perceptions, but their quality of life is quite similar to the general population in terms of social and role function.[25]

On the other hand, in 2005 Overbeck et al. showed that patients after KT had better health-rated quality of life compared to other patients with end-stage renal disease (ESRD) on dialysis and suggested that after KT, patients with higher levels of serum creatinine on the day of questioning had a significantly greater impairment of their cognitive abilities.[26] Rosenberger, however, pointed out that this finding might be due to selection for the comparison and by not taking into account that not all patients on dialysis are on a waiting

list for transplantation, as there is no significant difference in health-rated quality of life (HRQoL) between those patients on the waiting list and those after KT.[27] Saracino et al.[16] in 2008 explained renal function by using creatinine clearance, which was estimated using the Modification of Diet in Renal Disease (MDRD) formula. Their study demonstrated a direct correlation between better creatinine clearance and better HRQoL (physical function, role physical, vitality and general health) among patients after KT. In addition, they found that a loss of renal function was associated with a deterioration of HRQoL in patients after KT.[16] Fujisawa et al. found a significant positive correlation between serum creatinine and HRQoL. However, their study population was younger than ours.[12] Our previous research found that kidney function is a predictor of self-perceived health status, but only in a younger sub-population.[4] In the current study, age was a significant predictor of SRH at T2, but its influence decreased in the presence of a change in GF over time.

Serum creatinine was identified as one of the other clinical measures which was a significant predictor of self-rated health in a longitudinal study of a community-based sample, consisting of 4,065 respondents.[28] We were able to identify three studies on the relationship between serum creatinine or kidney function and the self-rated health of patients after successful KT, and all of these were cross-sectional in design.[12,16] We did not find any other longitudinal studies on the relationship between the change in the absolute level of creatinine or kidney function over time and SRH, PHS or HRQoL. This study is thus the first longitudinal study using the relationship between measurements of patients´ graft function and subjective well-being to identify a change in the graft function over time in order to provide a significant predictor for SRH.

Strengths and limitations

The strength of this study is its longitudinal design, which enabled us to explore the role of the change over time of some variables and to compare them with their absolute levels. The limitations of this study are the number of participants and a fair response rate; however, there were no differences in age and gender between respondents and nonrespondents. On the other hand, all patients originating from one major transplant center in Slovakia over a number of years were asked to participate in the study to prevent selection bias. Our future research should focus on better educating patients in order to prevent a lower response rate at baseline. In addition, we need early recognition of the problematic issues on the questionnaire for the patients during the individual investigation. We must be able to better explain to them the meaning of our research to improve their motivation to participate.

Recommendations

Results must be verified in a larger sample to allow for generalization. In addition, we only studied patients shortly after transplantation; therefore, prolonging the study to a period longer than 12 months is necessary. We could then verify if the progress of subjective self-rated health remains dependent on the change in glomerular function, or if this applies only during the period shortly after KT. Furthermore, the relationships between psychological, physical and medical determinants associated with self-rated health should be studied.

Conclusion

Although self-rated health twelve months after transplantation is not associated with absolute levels of glomerular function, there is a significant association with the change in glomerular function over time. Improvement of the function of the transplanted kidney is connected with an improvement in self-rated health. When treating a patient, a positive or negative change in glomerular function may have consequences for the patient's self-rated health and well-being.

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