Multivariate Analysis of Health-related Quality of Life in Donors After Live Kidney Donation

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ABSTRACT

Background. Live-kidney donation has a low mortality rate. Evidence suggests that live-kidney donors experience a quality of life (QoL) comparable to or even superior to that of the general population. There is limited information on factors associated with a decrease in QoL in particular for baseline factors, which would improve information to the donor, donor selection, and convalescence.

Methods. QoL data on 501 live donors included in three prospective studies between 2001 and 2010 were used. The 36-item short form health survey (SF-36) was used to measure QoL up to 1 year after the procedure. Longitudinal effects on both the mental (MCS) and physical component scales (PCS) were analyzed with multilevel linear regression analyses. Baseline variables were age, gender, body mass index (BMI), pain, operation type, and comorbidity. Other covariates were loss of the graft, glomerular filtration rate, and recipient complications.

Results. After 1 year we observed a small decrease in PCS (effect size = −0.24), whereas the MCS increased (effect size = 0.32). Both PCS and MCS were still well above the norm of the general Dutch population. Factors associated with a change in PCS were BMI (Cohen's d = −0.17 for 5 BMI points) and age (d = −0.13 for each 10 years older).

Conclusions. Overall, QoL after live-donor nephrectomy is excellent. A lowered PCS is related to age and body weight. Expectations towards a decreased postoperative QoL at 1 year are unjustified. However, one should keep in mind that older and obese donors may develop a reduced physical QoL after live-kidney donation.

THE BENEFITS of live-kidney donation for recipients are well documented [1–4]. The continuous demand for donor kidneys has led to an increase in live-kidney donation and to the inclusion of donors with comorbidities [5,6]. Live-kidney donation has been proven to be a safe procedure with a low mortality rate [7,8]. Furthermore, there is evidence suggesting that the majority of live-kidney donors experience a quality of life (QoL) comparable to or even superior to that of the general population [9–11]. Because of the development of new immunosuppressive drugs and minimally invasive surgical techniques, the selection of potential donors has changed. Eligibility criteria have become more flexible, and other factors, such as convalescence and QoL, have received more attention. QoL after transplantation is often measured, but almost always by time using small samples in a cross-sectional setting. Also, baseline data is often not present or it is collected retrospectively in an ad hoc manner; donors with pre-existing comorbidities are usually excluded [12]. These shortcomings hamper the analysis of the relationship

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between baseline variables and outcomes. Knowledge of such a relationship would be beneficial for the donor, donor selection, and convalescence. Given that the eligibility criteria have become more flexible, knowledge about such relationships has become more important. Indeed, some researchers have suggested that a minority of donors experience psychological distress or negative emotions after donation [13,14]. So far, there is only one study reporting on predictors of QoL [15]. Although this study comprises a large sample, it is lacking baseline data on QoL. QoL is a subjective concept; therefore, differences between baseline and follow-up are more informative than absolute numbers at follow up. This study aimed to identify factors associated with changes in QoL after live-kidney donation using a sufficient large numbers of observations.

METHODS

Study Population and Data Collection

In this study we included live-kidney donors of whom a preoperative and at least one postoperative measurement on QoL was available. These donors had been included in two randomized clinical trials (RCTs) and one prospective study conducted between May 2001 and October 2010 at the Erasmus Medical Centre in Rotterdam and the Radboud University Medical Centre in Nijmegen, both tertiary referral centers in the Netherlands. Data from all donors were prospectively collected [7,16,17]. For one RCT and the prospective study, all donors were eligible for inclusion provided they were capable of filling out the questionnaires [16,17]. For the other RCT, all left-sided donors were eligible for inclusion provided they understood the Dutch language and were capable of filling out the questionnaires [7]. All donors were preoperatively screened by a nephrologist, medical psychologist, anesthesiologists, and a cardiologist on indication. Obese donors or donors with a complex anatomy were not excluded. At the end of the surgical procedure, patients received patient-controlled analgesia enabling the donor to administer intravenous morphine from a 50-mL syringe (1 mg morphine/mL) by pressing a button. Furthermore, 2 500-mg acetaminophen tablets were offered 4 times daily until discharge. The patient-controlled analgesia device was removed when morphine had not been required for at least 6 hours. Donors were discharged when a normal diet was tolerated and mobilization was adequate. Re-admission, re-interventions, length of stay, and pre- and postoperative complications were scored prospectively. Comorbidity was determined with the classification of the American Society of Anesthesiologists (ASA). The institutional review boards and medical ethics committees, respectively, approved these studies.

Operative Techniques

Mini-incision open-donor nephrectomy (2001–2006), standard laparoscopic donor nephrectomy (from 1997), and hand-assisted retroperitoneoscopic donor nephrectomy (from 2007) were performed in the aforementioned period. These techniques have been described earlier [7,18].

Postoperative Data and QoL

The Short Form-36 (SF-36) is a validated and commonly used tool to measure health-related QoL [19]. This questionnaire has been reported to have good reliability and validity in the Dutch population [20]. The SF-36 consists of eight dimensions: physical function, role limitations due to physical health problems, bodily pain, general health, vitality, social function, role limitations due to emotional problems, and mental health. The first four dimensions are most sensitive to changes in physical performance and physical well-being. By using the scores on these four dimensions, a summary score can be computed, known as the physical component score (PCS). The latter four dimensions mainly attribute to mental functioning and emotional well-being. By using the scores on these four dimensions, a summary score can be computed, known as the mental component score (MCS). The component scores are computed by normative comparison and standardized to the Dutch population. A score of 50 is the reference score for the Dutch population of the same age and gender, indicating the average of the Dutch population. A score below 50 indicates inferior QoL, and a score above 50 indicates superior QoL. The eight dimensions of the SF-36 can also be analyzed separately. In this study, this would lead to a surplus of data, not aiding to the comprehensibility. Moreover, multiple tests would have been necessary. For this reason, only the component scores were used.

Donors were asked to complete the SF-36 questionnaire preoperatively and at 1, 3, 6, and 12 months postoperatively. Pain was quantified using a visual analogue scale (VAS) questionnaire. Donors had to indicate a point on a 10-cm line which best corresponded with the experienced pain. The distance on the line corresponds with pain and ranges from 0 (no pain) to 10 (severe pain). VAS questionnaires were completed at baseline and at days 1, 3, 7, and 14. For our analyses, pain scores at days 7 and 14 were used.

Statistical Analysis

Mixed modelling, also known as multilevel linear regression analyses, was applied for longitudinal analyses of the data. Mixed modelling can efficiently handle data with missing and unbalanced time points. First, saturated models were postulated with the PCS and MCS as dependent variables. The saturated models included age, gender, body mass index (BMI), relationship, ASA classification, procedure type, postoperative complications, pain, kidney functioning (measured by glomerular filtration rate [GFR]), recipient and graft survival rates, linear and logarithmic–both also quadratic (four time effects are needed to model the sharp dip followed by the recovery after the operation), and all covariate-time interactions as fixed effects. For recipient and graft survival rates, only cases of directed donation could be analyzed. Also, the moment of loss of both recipient and graft with regard to the moment of follow-up was considered in the analyses. The deviance statistic [21] using restricted maximum likelihood [22] was applied to determine the covariance structure. The saturated model was reduced by eliminating insignificant fixed effects, considering that interaction effects ought to be nested under their respective main effects [23]. The significance of the difference between the saturated model and the parsimonious final model was determined with the deviance statistic using ordinary likelihood. Statistical analyses were performed with IBM SPSS Statistics for Windows, version 21.0.0.1 (IBM Corp., Armonk, NY, USA).

Effect sizes (Cohen's d) were computed using the equation noted below, in which the difference between the estimate at time point t and the baseline score was divided by the estimated baseline