Clinical Assessment of Lipid Profiles in Live Kidney Donors

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ABSTRACT

Background. Abnormal serum lipid profiles are an issue in chronic kidney disease (CKD), but the clinical ramifications of dyslipidemia in live kidney donors are unclear. Thus, we explored the relationship between serum lipids and residual renal function in living donors post-nephrectomy.

Methods. Charts of living donors who underwent nephrectomy between January 2010 and March 2013 were reviewed, targeting those with 6-month follow-up examinations at minimum. Altogether, 282 donors were studied, examining total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL), and high-density lipoprotein (HDL) levels assayed before donation by standard techniques. Median follow-up time was 14 months. The relationship between postoperative renal function and allograft biopsy results was assessed. Recursive partitioning was applied to identify optimal cut-off points for each parameter.

Results. Median (interquartile range) serum TC, TG, LDL, and HDL levels were 183 (161–205) mg/dL, 86 (63–131) mg/dL, 108 (92–128) mg/dL, and 53 (44–62) mg/dL, respectively. The glomerular filtration rate at last follow-up was associated with TC ($r = -0.187$; $P = .002$) and LDL ($r = -0.172$; $P = .005$) levels, but showed no correlation with TG and HDL. Root nodes of TC and LDL determinations in recursive partitioning were 170.5 mg/dL and 80.5 mg/dL, respectively, serving as thresholds for further evaluation. On logistic regression analysis, the likelihood of CKD (glomerular filtration rate < 60 mL/min/1.73 m^2) at last follow-up was greater in donors with elevated TC and LDL levels (odds ratio = 1.96 and 3.33; $P = .021$ and .029, respectively).

Conclusion. Kidney donors with serum TC and LDL elevations require close observation, given their demonstrable predisposition to CKD after donation.

KIDNEY transplantation is the gold standard for treating patients with end-stage renal disease [1]. Because of limited numbers of cadaveric organs, more living kidney donors are urgently needed. However, the safety of donors after nephrectomy must be ensured to encourage this trend. In fact, many publications are adamant that living kidney donors and nondonors remain comparable in terms of health, minimizing chances of later developing end-stage renal disease [2]. Nevertheless, there is still a possibility that the residual renal function of donors may decline as a consequence of medical conditions, such as hypertension or diabetes [3,4]. Recent attempts to expand the criteria for kidney donation ultimately may place more emphasis on selecting donors less vulnerable to renal insufficiency in the aftermath [5].

Earlier studies have identified some factors predictive of later renal problems in live kidney donors. Individuals with underlying disease (eg, hypertension or diabetes), high body mass index, diminished baseline renal function, metabolic syndrome, and micro-albuminuria more likely

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will suffer declines in renal function after kidney donation [6–12].

Hyperlipidemia is a risk factor for cardiovascular disease and for chronic kidney disease (CKD) owing to related microvascular abnormalities [13], it is a common health problem in Western countries, and it has a racial predisposition [14,15]. In kidney transplant recipients, hyperlipidemia has a negative effect on graft survival and is a risk factor for impaired allograft function [16,17]. Even if donors alone are hyperlipidemic, graft outcomes may be adversely affected [18].

To our knowledge, no research to date has targeted the clinical ramifications of hyperlipidemia in living kidney donors that monitors their renal function after donation. Our aim was to explore the relationship between serum lipids and residual renal function after living-donor nephrectomy.

METHODS

This study was approved by our Institutional Review Board. Charts of 366 living kidney donors undergoing nephrectomy between January 2010 and March 2013 were reviewed retrospectively. Of these, 282 donors (77%) followed up for at least 6 months were recruited. As previously reported, two surgeons performed all donor nephrectomies via video-assisted mini-incision surgery [19]. Recorded donor characteristics, including age, gender, height, weight, body mass index, and body surface area, were extracted, as were results of routine diagnostics performed in each instance, including diethylene triamine penta-acetic acid (DTPA) renal scans and computerized tomographic angiography. In accordance with in-house donor criteria, candidates with estimated glomerular filtration rate (eGFR) values <80 mL/minute/1.73 m^2 at baseline and those with diabetes or hypertension inadequately controlled by single medication were rejected as donors. Baseline levels of total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL), and high-density lipoprotein (HDL) in standard testing were also collected. Renal function was estimated, using the Modification of Diet in Renal Disease (MDRD) formula to calculate eGFR pre- and postoperatively [20], and donors were grouped by eGFR at last follow-up examination, creating healthy (>60 mL/min/1.73 m^2) and CKD (<60 mL/min/1.73 m^2) subsets. Median follow-up time was 14 months.

Using an 18-G needle, allografts were biopsied by transplantation surgeons just before reperfusion. Only 156 of the 282 donors allowed biopsy through informed consent. Histologic abnormalities were interpreted in accord with the Banff classification (2007) [21].

Preoperative serum lipid profiles and postoperative renal function of donors were analyzed in conjunction with allograft biopsy findings. Data are shown as median and interquartile range (IQR) for continuous variables and numbers, and as percentiles for categorical variables. Mann-Whitney U-test and Pearson's χ^2 test were applied appropriately to compare variables between groups. Donor lipid profiles and eGFR at last follow-up were compared via Spearman correlation analysis, creating scatter plots of data. Most donors had lipid profiles within normal range, so recursive partitioning was used to establish optimal cut-off points for each lipid parameter. Receiver operating characteristics (ROC) curves were generated, reflecting the relationship between preoperative lipid status and existing CKD at last follow-up. Statistical analysis was two-sided, relying on open-source software (R version 3.1.1, R Foundation for Statistical Computing, Vienna, Austria; http://www.r-project.org) and setting significance at $P < .05$.

RESULTS

Of the 282 donors (median age, 41.5 years; IQR, 31–49 years), 115 (40.8%) were male, and 37 (13.1%) of nephrectomies performed were right-sided. Other donor variables, expressed as median values, were as follows: 1) body mass index, 23.2 (IQR 21.2–24.9) kg/m^2; 2) body surface area, 1.68 (IQR 1.56–1.83) m^2; 3) preoperative serum creatinine, 0.79 (IQR 0.67–0.91) mg/dL; 4) MDRD eGFR, 94.9 (IQR 83.6–107.8) mL/min/1.73 m^2; 5) DTPA eGFR, 106.4 (IQR 94.8–117) mL/min/1.73 m^2; and 6) MDRD eGFR at last follow-up, 65.2 (IQR 58.7–73.1) mL/min/1.73 m^2.

Preoperative median TC, TG, LDL, and HDL levels were 183 (range, 161–205) mg/dL, 86 (range, 63–131) mg/dL, 108 (range, 92–128) mg/dL, and 53 (range, 44–62) mg/dL, respectively. MDRD eGFR at last follow-up correlated with TC ($r = -0.187$; $P = .002$) and LDL ($r = -0.172$; $P = .005$; Fig 1) levels, with no apparent link to levels of TG ($r = -0.065$; $P = .282$) and HDL ($r = 0.071$; $P = .249$).

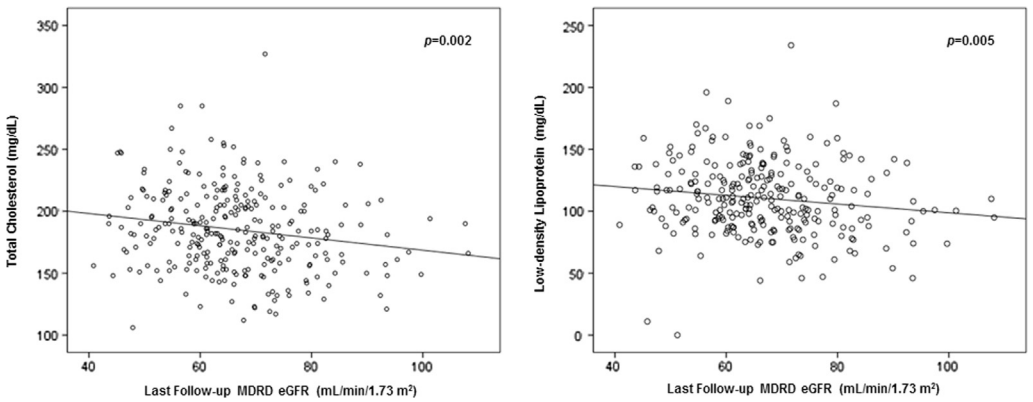

Fig 1. Scatter plots of preoperative total cholesterol and low-density lipoprotein levels relative to calculated Modification of Diet in Renal Disease estimated glomerular filtration rates at last follow-up examination.