Platelet count reduction and outcomes in living liver donors

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BACKGROUND: **Platelet count reduction in living donors after graft harvesting is very common. The mechanisms and the subsequent adverse consequences are not clear. The present study was to explore the mechanisms and the consequences of platelet count reduction in living donors.**

METHODS: **We collected data from 231 living liver donor patients who donated at our transplant center between July 2002 and August 2009. Baseline and post-operative platelet counts were collected and analyzed. Multivariate logistic regression analysis was used to compare the risk factors for the persistent decrease in platelet counts. Complications and other post-operative recovery were compared between the donors.**

RESULTS: **Platelet count decreased differently at each of the follow-up intervals, and the average reduction from baseline evaluation to year 3 was 18.2%. A concomitant decrease in white blood cells was observed with platelet count reduction. All of the splenic volumes at the post-operative follow-up time points were significantly higher than those at baseline ($P<0.01$). Multivariate logistic regression analysis indicated that the graft-to-donor weight ratio was a risk factor for low post-operative platelet counts in living donors at the three follow-up time points: one week ($P=0.047$), one month ($P=0.034$), and three months ($P=0.047$). At the one week follow-up time, 77 donor platelet counts were higher (group 1) and 151 donor platelet counts were lower (group 2) than baseline levels. Two hemorrhage events (1.3%) were observed in group 2, while three hemorrhage events (3.9%) were observed in group 1 ($P=0.211$). The overall complication rate was comparable between the two groups ($P=0.972$).**

CONCLUSION: **An increase in harvesting graft may decrease platelet counts, but this reduction does not produce short- or long-term damage in living liver donors.**

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KEY WORDS: **living donor liver transplantation; platelet count reduction; outcomes**

Introduction

Transplantation is the exclusive treatment for patients with end-stage liver disease. However, the increasing death rate of patients on the transplant waiting list has led to the increased use of the riskier approach of living donor liver transplantation (LDLT). The use of LDLT has increased in China because this country harbors a large number of hepatitis B virus (HBV)-infected patients,[1, 2] and social customs prohibit public acceptance of the brain death law. LDLT is criticized for its risks, which include high morbidity[3-6] and donor death.[7-9] Therefore, donor safety is the primary concern in LDLT, and studies have focused on the complications and the quality of life in living donors after donation.[10, 11] Short- and long-term alterations in laboratory test results have been investigated.[12] Trotter et al[12] found that approximately 10% of donors exhibited a platelet count $<150\times10^9$/L in 2 to 3 years post-donation. Donors with a platelet count $\leq150\times10^9$/L at 1 year post-donation exhibited significantly lower mean platelet counts ($189\pm32\times10^9$/L) compared with the remainder of the cohort ($267\pm32\times10^9$/L, $P<0.0001$). Although Trotter and colleagues revealed this phenomenon, they did not delineate the causes and consequences of platelet count reduction in these donors. However, several hypotheses were introduced in his report, such as elevated portal pressure in donors, reduced thrombopoietin in the remaining liver, and portal vein thrombosis. Although these hypotheses are rational, no evidence has been provided. Therefore, the etiology of reduced platelets is not clear. Another shortage of Trotter's study is that no long-term consequences of platelet count reduction in liver transplant donors were recorded. We also observed this phenomenon and described it in a previous report.[13]

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The present study was to investigate the possible mechanisms and consequences of persistent platelet count reductions in living liver donors.

Methods

Protocol and data collection

A total of 237 donors underwent partial liver graft harvesting in our transplantation center from July 2002 to August 2009. We retrospectively collected data from these donors from a database: The Chinese Liver Transplant Registry (http://www.cltr.org). The database included pre-operative demographic characteristics, intra-operative data, short- and long-term outcomes, and follow-up data in the outpatient setting. The pre-operative data were collected one week prior to donation. A professional secretary performed all donor follow-ups. Only 6 cases were lost to follow-up in the three years after donation, and these six cases were excluded from our analysis. Our routine follow-up time points in the outpatient setting were 1- and 3-month, 1-, 2- and 3-year after discharge.

Protection of human subjects

All procedures were performed with approval from the Ethics Committee of Sichuan University, and local permission was obtained. All donations were voluntary and altruistic. All donors must have exhibited at least a one-third degree of consanguinity with the recipients as verified by the Health Administrative Departments and the Public Security Organs or a DNA test. We informed the donors and their families of the possible risks of donor hepatectomy. Written consent was provided by the donors for the storage of their information in the hospital database and its use in research. The inclusion and exclusion criteria and surgical techniques that were used in this study have been described previously.[14, 15]

CT for splenic volume

Multi-row-detector CT scans for volumetric measurements were performed to evaluate graft size, hepatic vascular anatomy (including hepatic artery, portal vein, and hepatic vein), and the remaining donor liver size, and magnetic resonance imaging (MRI) was used to evaluate the biliary tract. After the donation, the donor participated in routine follow-up examinations, which included CT scans. We retrieved all of the imaging examination data, which were transferred to a SYNAPSE computer workstation (Fujifilm Co., Tokyo, Japan). Splenic volumes were measured using new software developed by the Fujifilm Company.

Statistical analysis

Descriptive data were expressed as means. Continuous variables were compared with independent samples using the non-parametric Wilcoxon's rank-sum test because some of the measurements did not follow a normal distribution. Categorical data were compared using the Chi-square test or Fisher's exact test when necessary. Inclusion of variables in the final model was based on biological and statistical considerations. Multivariate logistic regression analysis was used to identify factors decreased. Statistical analyses were performed using the SAS statistical software package (version 9.1.3; SAS Institute, Inc., Cary, NC, USA), and a two-sided P value <0.05 was considered to be statistically significant.

Results

Baseline demographic characteristics and intra-operative data

The mean donor age of the 231 living donors was 35.2 years (range 19 to 61). Twenty-one donor serum tests were positive for anti-hepatitis B virus core antibody (HBcAb), but HBV DNA tests were negative. Enhanced CT or MRI revealed no cirrhosis in these 21 donors. The demographic characteristics of the 231 living liver donors at the time of evaluation are detailed in Table 1. The operative details of all 231 donors were collected retrospectively. The majority of the grafts (190 cases, 82.3%) were taken from the right lobe for adult recipients. All left lateral lobe recipients were children, with the exception of two patients. The mean graft-to-donor weight ratio was 0.88% in the 231 donors.

Alterations in platelet and white blood cell counts (WBCs)

Platelet counts at baseline were 247.6×10^9/L. Different degrees of platelet count reductions were observed at each of the follow-up intervals. The average reduction in platelet count from baseline to week one was 5.3%. A slight rebound was observed at one month compared with one week after donation, but persistent platelet count reductions were observed thereafter. The average reduction from baseline to year 3 was 18.2% (Fig. 1). Reductions in platelet counts diminished over time. Scatter plots of patient platelet counts at post-donation time points versus baseline values are illustrated in Fig. 2. The points below the equivalence line indicate that patients whose post-donation time points were lower than baseline levels, and the points above the line indicate the levels that were higher