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Original Article

Pretransplant mortality predictors in living and deceased donor liver transplantation

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Abstract

Background: Although there were some reports predicting postoperative morbidity and mortality in patients undergoing liver transplantation, most of them studied deceased-donor liver transplantation (DDLT). In this context, we performed this study to predict early mortality after liver transplantation from preoperative variables in both living-donor liver transplantation (LDLT) and DDLT.
Methods: We retrospectively reviewed the medical charts of 159 patients undergoing liver transplantation (LDLT, $n = 103$; DDLT, $n = 56$). Then, we identified the factors that independently predicted 30-day mortality using multivariable logistic regression models.
Results: The 30-day mortality and 1-year mortality for DDLT versus LDLT were 30% versus 6% and 39% versus 11%, respectively. In multivariate logistic regression analysis, pretransplant hepatic encephalopathy (odds ratio, 5.594; 95% confidence interval, 1.110–28.194; $p = 0.037$) in patients with DDLT and serum creatinine (odds ratio, 4.883; 95% confidence interval, 1.296–18.399; $p = 0.019$) in patients with LDLT were the independent risk factors for a composite of 30-day mortality.
Conclusion: In conclusion, hepatic encephalopathy in DDLT and serum creatinine level in LDLT were the significant pretransplant variables that were related with early death after LT.

Keywords: creatinine; hepatic encephalopathy; liver transplantation; mortality

1. Introduction

Liver transplantation (LT) for patients with hepatocellular carcinoma, cirrhosis, and fulminant hepatic failure is fairly common. However, this operation is not without risk—it carries a 5–10% incidence of 30-day mortality.[1] Identification of pretransplant risk factors that predict early mortality is important for postoperative management. It has been known that accuracy rates for pretransplant MELD (Model for End-stage Liver Disease) score and Child–Pugh classification are low as predictors of 3-month postoperative mortality.[2,3] The Child–Pugh score has been used to assess the prognosis of patients with liver cirrhosis. Although it was originally used to predict mortality during surgery, it is now used to determine the prognosis, as well as the required strength of treatment and the necessity of liver transplantation. However, a limitation of the classification is that each variable is given the same weight. Multivariate analysis showed that the impacts of the different predictive factors on mortality were different.[4] Giving the same weight to different variables resulted in overestimating or underestimating their actual impact. In previously reported studies, the predictive values of survival explained by Child–Pugh scores were less than 50%.[5] The

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MELD score, originally created with the aim of predicting survival after transjugular intrahepatic portosystemic shunt,[4] has been also used for predicting pretransplant survival, but its usefulness as a model to predict survival following LT is still controversial.[6,7] Although there had been some reports predicting postoperative morbidity and mortality in patients undergoing liver transplantation including Child–Pugh classification, pre-LT renal insufficiency, malnutrition, technically complex surgery indexes,[8] and the MELD,[9] most of them have been studied in deceased-donor liver transplantation (DDLT).

The purpose of this study was to assess the predictive variables for posttransplant mortality and investigate the predictors of mortality for patients with living- and deceased-donor LT.

2. Methods

2.1. Participants

We retrospectively reviewed the medical charts of 159 consecutive LTs (living donor, $n = 103$; deceased donor, $n = 56$) that had been performed in our institute from March 2007 to October 2010. Patients were excluded if they had any history of advanced heart or lung conditions or aged <20 years.

2.2. Anesthesia and operative procedures

On arrival at the operating room, standard monitoring such as lead II and V5 of electrocardiography, arterial blood pressure, pulse oximetry, bispectral index, and cerebral oximetry were applied. A pulmonary artery catheter (Swan-Ganz CCOmbo CCO/SvO_2; Edwards Lifesciences LLC, Irvine, CA, USA) was inserted via the right internal jugular vein, and we monitored continuous cardiac output and mixed venous oxygen saturation and pulmonary arterial pressure. Anesthesia was induced with intravenous propofol, remifentanil, and atracurium, and then maintained with desflurane, remifentanil, and atracurium. Intravascular volume replacement was managed with crystalloid and colloid solutions to maintain the pulmonary capillary wedge pressure between 8 mmHg and 14 mmHg. The central blood temperature, which was measured using a pulmonary artery catheter, was maintained at about 36 °C with a warm mattress, a forced warm air blanket, and fluid warmer as necessary. During the surgical procedure, the mean arterial pressure was maintained above 70 mmHg with dopamine, norepinephrine, vasopressin, or epinephrine infusion. Allogenic-packed red blood cells were transfused when the hematocrit level was under 25% throughout the study period. Surgical procedures proceeded in the standard order used at our clinics. After mobilization of the recipient liver, the native liver was removed. Whole-size DDLT and right-lobe living-donor LT (LDLT) was performed in each group. For DDLT, donor age under 60 years and donation prior to cardiac death with Asian race without hepatic problems were selected.[10] After reperfusion, several anastomoses, hemostases, and closures were performed. All patients were transferred to the intensive care unit (ICU) after surgery. They received standardized ICU care at the discretion of the ICU staff according to the standard ICU protocols. Criteria for weaning from ventilatory support included an appropriate sensorium, hemodynamic stability (cardiac index, >2.2 L/min/m^2; pulmonary capillary wedge pressure, >60 mmHg; pulmonary capillary wedge pressure, <20 mmHg; and no significant arrhythmias), PaO_2/FiO_2 >200, minimal operation site drainage, no signs of hepatic failure or graft dysfunction, and temperature >35.5°C. Discharge criteria from the ICU were as follows: stabilized patient's clinical status without the need for ICU monitoring and care (including no further requirement for either inotropic or vasoactive agents), and no plan for further active intervention.

2.3. Statistical analysis

We identified factors that were independently associated with 30-day mortality with multivariate logistic regression models. The factors considered were age, sex, and components of Child–Pugh classification [hepatic encephalopathy (HE), ascites, total bilirubin, international normalized ratio (INR), serum albumin] and MELD score (serum creatinine, INR, total bilirubin),[11] as well as donor factors (age, sex, cold ischemic time, graft size in the LDLT, bile duct variation, macrovesicular steatosis, lymphocyte crossmatching).

Data were analyzed with SPSS version 18 (SPSS, Inc., Chicago, IL, USA) and expressed as mean ± SD or number of patients (%). Continuous variables were analyzed by independent t tests. Categorical data were analyzed with the Chi-square test. To determine the preoperative mortality predictor, an initial univariate analysis was used with logistic regression. Variables that showed p <0.1 by univariate analysis were included in the multivariable logistic regression model. A p value of <0.05 was considered statistically significant.

2.4. Ethics statement

This study was approved by the institutional review board of our hospital (Ref: 4-2010-0671).

3. Results

3.1. Characteristics of patients and mortality

Patients' characteristics and perioperative data are shown in Table 1. The overall 30-day mortality and 1-year mortality were 14% and 21%, respectively. The periodic difference of mortality from March 2007 to October 2010 was not found retrospectively. More patients with fulminant hepatic failure were in the DDLT group than in the LDLT group (18% vs. 4%, $p = 0.006$). The 30-day mortality (30% vs. 6%, p <0.001) and 1-year mortality (39% vs. 11%, p <0.001) were higher in DDLT than in LDLT. Patients with fulminant hepatic failure had higher 30-day mortality (43% vs. 12%, $p = 0.007$) and 1-year mortality (57% vs. 17%, $p = 0.002$) than patients without