Major complications of adult right lobe living liver donors

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BACKGROUND: The right lobe of the liver is generally preferred for living donor liver transplantation in adult patients with end-stage liver disease. It is important to know the preoperative factors relating to the major postoperative complications. We therefore evaluated the possible risk factors for predicting postoperative complications in right lobe liver donors.

METHODS: Data from 378 donors who had undergone right lobe hepatectomy at our center were evaluated retrospectively. The factors we evaluated included donor age, gender, body mass index (BMI), remnant liver volume, operation time, history of previous abdominal surgery, inclusion of the middle hepatic vein and variations in the portal and bile systems.

RESULTS: Of the 378 donors, 219 were male and 159 female. None of the donors died, but 124 (32.8%) donors experienced complications including major complications (Clavien scores III and IV) in 27 (7.1%). Univariate analysis showed that complications were significantly associated with male gender and higher BMI ($P<0.05$), but not with donor age, remnant liver volume, operation time, graft with middle hepatic vein, variations in the portal and bile systems and previous abdominal surgery ($P>0.05$). Multivariate logistic regression analysis showed that major complications were significantly associated with male gender ($P=0.010$, $\chi^2=6.614$, df=1) and higher BMI ($P=0.029$). Moreover, the Chi-square test showed that there were significant relationships between major complications and male gender ($P=0.010$, $\chi^2=6.614$, df=1) and BMI >25 kg/m^2 ($P=0.031$, $\chi^2=8.562$, df=1). Of the 96 male donors with BMI >25 kg/m^2, 14 (14.6%) with major complications had significantly smaller mean remnant liver volume than those (82, 85.4%) without major complications (32.50%±4.45% vs 34.63%±3.11%, $P=0.029$).

CONCLUSION: Male donors with BMI >25 kg/m^2 and a remnant liver volume ≤32.50% had a significantly increased risk for major complications.

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KEY WORDS: living donor; right lobe liver donor; major complications; risk factors

Introduction

Living donor liver transplantation (LDLT) has been widely accepted for the treatment of end-stage liver disease and the outcomes have been improving with greater surgical experience and advances in surgical techniques.[1-3] The right lobe is generally preferred for LDLT in adults because it provides sufficient liver volume for adult recipients, but this lobe has more variations in the vascular and bile systems than left lobe liver grafts.[4-6] The most important concern in right lobe LDLT is donor safety. Morbidity rates in donors undergoing right hepatectomy varied because of different standards of morbidity.[7-11]

The modified Clavien classification was to assess morbidity and outcomes in living liver donors.[12, 13] This classification was based on the criteria including risks to the donor and a treatment model for complications, and it has been shown to be applicable in several multicenter studies.[14, 15] We retrospectively evaluated major complications occurring in right lobe living liver donors and identified preoperative factors associated with postoperative complications.

Methods

Between January 2004 and June 2012, a total of 560 liver transplantations were performed at the Liver Transplan-

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tation Center of Istanbul Florence Nightingale Hospital (FNH). These included 378 right lobe LDLTs, 32 left lobe LDLTs, and 150 deceased donor liver transplantations (DDLTs). The 378 donors who had undergone right donor hepatectomy were included in this study; data were retrieved from their charts at our center. The factors we evaluated included donor age, gender, body mass index (BMI), remnant liver volume, operation time, history of previous abdominal surgery, inclusion of the middle hepatic vein (MHV) in the graft and variations in the anatomy of the portal vein and bile system. Liver volume was calculated by computed tomography (CT) (16-detector, Sensation 16-Siemens, Erlangen, Germany). Donor complications were scored based on the modified Clavien classification.[16] Complications scored as Clavien III and IV were defined as major complications. The portal vein and bile system of donors were classified according to Cheng[17] and Huang classifications.[18] We compared the outcomes of donors with no complication versus those with major complications.

Preoperative donor evaluation

Donor candidates were ≥18 years old, in good health with no comorbidities, and up to fourth degree relatives of recipients. All prospective donors underwent extensive preoperative work-up including blood typing, extensive biochemistry analysis, urine analysis, coagulation tests, and tests for hepatitis B and C, human immunodeficiency virus, cytomegalovirus and Epstein-Barr virus. Microbiological analysis of blood and urine, venereal disease research laboratory tests, and tests for the prothrombin gene and factor 5 Leiden mutation were also performed. All donor candidates underwent chest X-rays, electrocardiography, and echocardiography. They were examined by a hepatologist, a transplant surgeon, a psychiatrist, a chest physician, and a cardiologist, female donors also by a gynecologist. Liver volume, parenchyma and vascular structure were assessed by CT, and the bile system was evaluated by magnetic resonance cholangiopancreaticography (MRCP; 1.5 T scanner, Magnetom Sonata, Siemens, Erlangen, Germany). Prior to 2008, remnant liver volume between 26%-30% was accepted in some selected donors such as younger (less than 30 years old) and with no liver steatosis. The donors were chosen only if the remnant liver was >30% and the graft weight to recipient weight ratio was >0.8% since 2008. Donors with hyperlipidemia, >10% liver steatosis as determined by ultrasound, BMI >30 kg/m^2, or positivity for HBcAb underwent percutaneous liver biopsy. Donors with no histological changes were accepted. Donors with >10% liver steatosis were prescribed a diet and an exercise program for weight loss, and they were subsequently reevaluated. If liver steatosis rate was still >10%, donors were rejected.

Surgical procedure for donors

Informed consent was obtained from all donors prior to surgery. A median, J-shaped or reverse T incision was made[19] and intraoperative ultrasound used to evaluate portal and hepatic vascular structures. After cholecystectomy, cholangiography through the cystic duct stump was performed to evaluate the biliary tree. No donor surgery was aborted due to abnormal findings. After completing right lobe mobilization, the hepatocaval ligament and all direct vein branches from the caudate to the inferior vena cava were ligated and divided. Accessory venous branches larger than 5 mm in diameter were temporarily clamped to test their drainage capacities; if congestion was observed, these branches were retained for anastomosis with the recipient vena cava. The right hepatic artery (RHA) and right portal vein (RPV) were temporarily clamped to mark the parenchymal border between the right and left lobes. A cavitron ultrasonic surgical aspirator (CUSA System 200 Macrodissector; Cavitron Surgical Systems, Stamford, CT, USA) was used for parenchymal division. Our approach to the MHV has been described.[20] MHV was left with remnant liver if the remnant liver ≤30%, donors older than 50 years and with remnant liver volume ≤35%.

After completing parenchymal transection, the bile system was assessed by cholangiography. Heparin sodium 1500 units i.v. was administered before clamping the vessels after transection of the parenchyma. The graft was removed after transecting the right bile duct, RPV, RHA and right hepatic vein (RHV). The RHV remnant in the donor was closed using 4/0 prolene, the RPV was closed with 5/0 prolene and the bile duct was closed with 6/0 prolene. The bile system was checked for leakage using methylene blue. Cholangiography was performed if necessary. A silastic drainage tube was inserted into the subhepatic area.

Following extubation, all donors were taken to the intensive care unit and monitored for one day. The nasogastric tube was removed on postoperative day 1 and oral feeding was started. Controlled analgesia was continued for 48 hours after surgery. The central venous catheter was removed on postoperative day 4. The donors received prophylactic antibiotics. Liver function tests were performed every day for a week. An abdominal ultrasound was performed to ensure that there was no collection of intraabdominal fluid or bile leaks. If the drainage was less than 300 mL per day, the silastic drainage tube was removed on postoperative day 5 or 6. All of the donors were followed up by liver function tests after 1, 3 and 6 months. They were contacted every year and