



# Outcomes of Left-Lobe Donor Hepatectomy for Living-Donor Liver Transplantation: A Single-Center Experience

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## ABSTRACT

Living-donor liver transplantation (LDLT) is an excellent option for patients with end-stage liver disease in situations of donor shortage. The aims of this study were to evaluate our experience with left-lobe donor hepatectomy for LDLT and to grade postoperative complications using the 5-tier Clavien classification system. Data from medical records of 60 adult living liver donors (30 men, 30 women) who underwent left-lobe hepatectomy between November 2006 and April 2012 were reviewed. The median donor age was  $31.7 \pm 8.9$  (range, 19–63) years. Sixteen complications were observed in 12/60 (20%) donors. Complications developed in 6/15 (40%) donors who underwent left hepatectomy and in 6/45 (13.3%) donors who underwent left lateral segmentectomy. Seven of 16 (43.7%) complications were Grade I and 2 (12.5%) were Grade II. Major complications consisted of 4 (25%) Grade IIIa and 3 (18.7%) Grade IIIb complications; no Grade IVb or V complications occurred. The most common complication was biliary, occurring in 7 (11.6%) donors and comprising 43.7% of all 16 complications. The mean duration of follow-up was  $30 \pm 7.1$  (range, 2–58) months. No donor mortality occurred. Left-lobe donor hepatectomy for LDLT, which does not benefit the completely healthy donor, was performed safely and with low complication rates, but carries the risk of morbidity. Low morbidity rates following living-donor hepatectomy can be expected when surgical and clinical monitoring and follow-up are adequate and the surgeon has gained increased experience.

**L**IVER transplantation (LT) is the only definitive treatment modality with well-demonstrated efficacy in patients with end-stage liver disease. Living-donor liver transplantation (LDLT) is an excellent option for patients with end-stage liver disease in situations of donor shortage. LDLT is an alternative method that enlarges donor pools in countries with limited cadaveric donor pools.<sup>1,2</sup> First performed in 1989, LDLT is currently applied as an alternative therapy for patients with liver failure.<sup>3</sup>

Transplantation of a liver graft from an adult donor to an infant or young-adult recipient through left-lobe or left-lateral segmentectomy is accepted worldwide. LDLT differs from other surgical procedures because the donor hepatectomy must be performed safely and the benefit to the recipient must be optimized. Donor safety is the primary concern.<sup>4</sup> Nineteen donor deaths have been reported recently, 2 of which occurred after left-lateral segmentectomy.<sup>5</sup> Although a high volume of living-donor hepatectomies for LDLT is performed safely at centers with experienced surgeons, this procedure, which does not ben-

efit the completely healthy donor, carries low risks of donor morbidity (8.7%) and mortality (0.1%).<sup>6–8</sup>

Among other countries, Turkey suffers greatly from a shortage of donor organs; the organ donation rate was 3.2/1 million population in 2008.<sup>9</sup> A LT program was initiated in 2006 at Turgut Ozal Medical Center, and LDLTs (78.9% of LTs), 9.8% of which have been left-lobe LDLTs, have been performed with no donor mortality to-date. In this study, we evaluated the results of left-lobe donor hepatectomies for LDLT performed in our clinic and graded postoperative complications using the 5-tier Clavien classification system.

## MATERIALS AND METHODS

The outcomes of left-lobe donor hepatectomies for LDLT performed at Turgut Ozal Medical Center between November 2006

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and April 2012 were reviewed retrospectively. The study protocol (no. 2012/64) was approved by the ethics committee and institutional review board of Inonu University's School of Medicine.

### Donor Selection and Evaluation

All donors were informed preoperatively about the risks associated with the procedure and signed surgical consent forms. Donor candidates were evaluated, and inappropriate donors were excluded, in 3 phases: (1) clinical assessment and serological testing, (2) abdominal Doppler ultrasonography (USG) to detect preoperative steatosis and radiological assessment using magnetic resonance cholangiopancreatography (MRCP) and multislice computed tomography (CT), and (3) percutaneous liver biopsy and CT to detect stenosis in obese (body mass index [BMI]  $\geq 28$ ) donors. All donor candidates underwent routine assessment to determine blood group and to obtain hemograms, biochemistry values, viral serological panels, and blood and urinary cultures. After physical and psychiatric evaluations, abdominal USG was performed to detect liver steatosis and multislice CT was used to calculate liver volume and assess the vascular structures of the liver. Donor candidates with BMI  $\geq 28$  and  $>20\%$  steatosis, as determined by CT, underwent liver biopsies. Candidates with mismatched blood groups, positive findings on viral serological tests, and/or  $>20\%$  hepatosteatois were not selected as donors.

### Surgical Technique for Left Lobe Hepatectomy

In all patients, the abdomen was entered through a "J" incision after the induction of general anesthesia. The falciform ligaments were separated and retractors/carteurs were then placed. The left triangular and coronary ligaments were dissected and the left lobe of the liver was mobilized. The hepatic artery configuration was assessed. Hilar dissection of the gastrohepatic ligament was performed. The left hepatic artery and left portal vein branches were dissected and exhibited. Segments 2-3 and 4 were used as grafts from donors who underwent left hepatectomy, and segments 2-3 were used as grafts from those who underwent left lateral segmentectomy. Although a small portion of the caudate lobe remained, it was harvested from some donors, increasing the graft weight by 2%. The left hepatic vein was preserved at the left lobe and parenchymal dissection was performed with a Cavitron ultrasonic surgical aspirator (Valleylab, Boulder, Col, United States). Electrocautery was performed with no vascular inflow interruption on either side of the liver. The bile duct was cut after dissection was completed, and cholangiography was performed. The short hepatic veins and left hepatic veins were reconstructed when required.

### Postoperative Care, Follow-Up, and Data Collection

The patients stayed in the intensive care unit for at least 1 postoperative day to monitor the development of any early bleeding complication. Epidural anesthesia was applied to patients routinely. Postoperative regimens were initiated on the first postoperative day. Low-molecular-weight heparin was not used routinely. Abdominal drains were removed if no abnormality was detected during postoperative follow-up or by physical examination, and if the amount of drainage was  $<50$  mL. Prothrombin time and levels of alanine aminotransferase, aspartate aminotransferase, and bilirubin were determined daily. Postoperative complications were classified according to the modified 5-tier Clavien system.<sup>10</sup> After hospital discharge, the patients returned for polyclinical follow-up examinations in months 1, 3, 6, and 12.

### Statistical Analyses

Data are expressed as means  $\pm$  standard deviations for continuous variables and as percentages for categorical variables. Fischer exact test was used to evaluate differences among postoperative complications.

## RESULTS

During the study period, 782 LTs were performed at the clinic; 617 (78.9%) procedures were LDLTs, of which 60 (9.8%) were left-lobe donor hepatectomies included in this study. The mean age of these 60 donors (30 men, 30 women) was  $31.7 \pm 8.8$  years. Fifty-five (91.6%) donors were at least 4th-degree relatives of the recipient and 5 (8.3%) donors had no biological relationship to the recipient. Before these 5 unrelated donors underwent hepatectomy, the ethics committee obtained consent for donation. Fifteen (25%) donors underwent left hepatectomy (segments 2-4) and 45 (75%) underwent left-lateral segment resection (segments 2-3). The mean follow-up period was  $30 \pm 7.1$  (range, 2-58) months. Donors' demographic and surgical data are summarized in Table 1.

Sixteen postoperative complications occurred in 12/60 donors who underwent left lobe hepatectomy and were evaluated using a modified 5-tier Clavien classification system (Table 2). Briefly, the morbidity rate was 20%: 9 (56.2%) postoperative complications were minor (Grade I,  $n = 7$  [46.6%]; Grade II,  $n = 2$  [13.4%]) and 7 (43.7%) complications were major (Grade IIIa,  $n = 4$  [26.6%];

**Table 1. Demographical and Surgical Data of the Donors are Summarized**

Characteristics	No. (%) / Mean $\pm$ SD
No. of donors	60
Age	$31.7 \pm 8.8$
Gender	
Men	30 (50%)
Women	30 (50%)
Type of donor	
Related	55 (91.6%)
Unrelated	5 (8.3%)
Blood type	
O Rh (+/-)	32 (53.3%)
A Rh (+/-)	15 (25%)
B Rh (+/-)	12 (20%)
AB (+)	1 (1.6%)
BMI	$24.9 \pm 3.5$
Type of Surgical Procedure	
Left hepatectomy	15 (25%)
Left letaral hepatectomy	45 (75%)
Operation time	$340.51 \pm 68.2$
Graft Weight	$328.11 \pm 123.0$
Blood transfusion	0
Reoperation	1 (1.66%)
Intensive care unit stay (d)	$1.2 \pm 0.4$ (1-3)
Duration of hospitalization (d)	$8.21 \pm 7.4$ (2-31)
Follow-up time (mo)	$30 \pm 7.1$

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