



Long-term Results of Living Donors in Simultaneous Kidney and Liver Transplantations

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ABSTRACT

Introduction. Because of the shortage of organs available for transplantation, living related sequential transplantation with the use of liver and a kidney from the same donor has emerged as a reasonable therapeutic alternative. However, there is insufficient literature about the complications that living donors experience after simultaneous kidney and liver transplantations.

Methods. From December 2001 to October 2009, 5 living donors provided simultaneous donation of livers and kidneys and 1 living donor donated first her kidney and then her liver. Demographic data of the donors and information concerning the surgery and postoperative observation were collected prospectively.

Results. All of the donors were female. The median age was 27.5 (range, 19–36) years. Indications requiring the simultaneous transplantation of livers and kidneys were primary hyperoxaluria type 1 (PH1) in 5 potential recipients and cirrhosis due to chronic hepatitis B infection and idiopathic chronic renal insufficiency in 1 potential recipient. Four recipients underwent right hepatectomy (segments 5–8) and right nephrectomy; 1 recipient underwent left hepatectomy (segments 2–4) and right nephrectomy; and 1 recipient underwent left lobectomy (segments 2–3) and right nephrectomy. There were no complications except in 1 donor (postoperative ileus). No donor developed hypertension or microalbuminuria.

Conclusions. With the right indications, appropriate preoperative evaluation, meticulous surgical technique, proper postoperative care, and long-term close monitoring to minimize morbidity and mortality risks, liver and kidney donation from the same donor can be considered for simultaneous kidney and liver transplantation.

RECENTLY liver and kidney transplantations have become highly effective in treatment of liver and kidney diseases [1–3]. Transplantation of liver and kidneys from living donors is a method that provides partial solution in countries, such as Turkey, where there is a shortage of cadaveric organs or brain death is not accepted culturally [4].

Risks concerning the living donor in liver and kidney transplantation can be justified only when the recipient enjoys reasonable and visible positive results. Although transplantation from living donors is a potentially life-saving method for recipients, it might induce serious complications in healthy donors [5,6]. Because of the shortage of organs available for transplantation, living related sequential

transplantation with the use of liver and a kidney from the same donor has emerged as a reasonable therapeutic alternative [7–11]. Moreover, simultaneous kidney-liver transplantation from the same donor has been described for children and adults [12–14]. However, there is insufficient literature about the complications that living donors

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experience after simultaneous kidney and liver transplantation.

In their research from 2013, Cheah et al found that in 11,553 cases of hepatectomy, mortality of donors was 23 (0.2%) and morbidity was $23.9 \pm 13.9\%$ [4]. In a report by the Organ Procurement and Transplantation Network (OPTN) that covered 51,113 living kidney donors in the years 1998–2008, the mortality rate of donors was 0.027%. According to the Clavien surgical morbidity and mortality scale, major morbidity rate was 3%-6% and minor morbidity was 22% [15]. However, those studies do not refer to complications after donation of liver and kidney from the same donor.

In the present series, we discuss the results of donors that underwent simultaneous liver and kidney transplantation in our center.

METHODS

From February 1997 to October 2016, 565 liver transplantations were performed at the Hepatopancreatobiliary Surgery and Liver Transplantation Unit of Dokuz Eylul University Hospital, Izmir, Turkey; 321 (56.8%) of them were living-donor transplantations. In the present series, from December 2001 to October 2009, 5 living donors provided simultaneous donation of liver and kidney, and 1 living donor donated first her kidney and then her liver. Demographic data of the donors and information concerning the surgery and postoperative observation were collected prospectively.

Preoperative Preparation of the Donors

All the living donors who volunteered for the donor hepatectomy underwent a full evaluation, including blood group verification and calculation of body mass index. Preoperative laboratory testing for donors included liver (alanine aminotransferase [AST], aspartate aminotransferase [ALT], alkaline phosphatase [ALP], gamma glutamyl transferase [GGT], total bilirubin, direct bilirubin), renal biochemistry (creatinine, urea), electrolytes (sodium, potassium, chloride), glomerular filtration rate (GFR), complete blood count, coagulation profile (activated partial thromboplastin time [APTT], prothrombin time [PT], international standardized ratio [INR]), albumin, oxalate (for primary hyperoxaluria type 1 [PH1]), and creatinine levels in urine, virologic assays for hepatitis B and C viruses, and serologic screening for human immunodeficiency virus, cytomegalovirus, and Epstein-Barr virus. Electrocardiography, chest radiography, and pulmonary function tests were also performed routinely.

A spiral or helical computerized tomographic angiogram with portal phase and 3D-reconstruction liver volumetric evaluation was used in our center to determine the donor's vascular anatomy and accurate measurement of graft and total liver volume.

Surgical Technique

During the donor's hepatectomy, intraoperative cholangiography via gallbladder was performed routinely to delineate the biliary anatomy first. Then, cholecystectomy was performed. In the right hepatectomy, the middle hepatic vein was preserved to avoid outflow obstruction to the remaining donor segment 4. All of the inferior hepatic veins >5 mm diameter were preserved for subsequent anastomosis to the recipient's inferior vena cava. Hepatic parenchymal dissection was performed with the use of an ultrasonic

dissector, conventional coagulation, and electrocautery. The hepatectomy was performed without interrupting the vascular blood flow. After the liver graft implantation was completed in the recipient, the right donor nephrectomy was performed in the same bilateral subcostal incision.

Postoperative Follow-up of the Donors

All donors were routinely managed in the surgical service. None of the donors was followed in the intensive care unit after surgery. After discharge from the hospital, the follow-up for each donor included weekly visits in the 1st month, biweekly visits in the 2nd month, monthly visits in the subsequent 6 months, and then yearly visits. Laboratory examinations for donors' follow-up included liver (AST, ALT, ALP, GGT, total bilirubin, direct bilirubin), renal biochemistry (creatinine, urea), electrolytes (sodium, potassium, chloride), GFR, complete blood count, coagulation profile (APTT, PT, INR), and albumin and creatinine levels in urine.

RESULTS

All of the donors were female. The median age was 27.5 (range, 19–36) years, average weight was 58.83 ± 8.75 kg, average height was 160.17 ± 4.88 cm, and average body mass index was 23.13 ± 3.07 kg/m².

Of the 5 donors whose liver and kidney were transplanted simultaneously, 2 were mothers, 2 were sisters, and 1 was the daughter of the recipients. The donor who first donated her kidney and 11 days later her liver was the wife of the recipient.

Indications requiring the simultaneous transplantation of livers and kidneys were PH1 in 5 of the potential recipients and cirrhosis due to chronic hepatitis B infection and idiopathic chronic renal insufficiency in one potential recipient.

The donors and the recipients had the same blood type.

Four recipients underwent right hepatectomy (segments 5–8) and right nephrectomy; 1 recipient underwent left hepatectomy (segments 2–4) and right nephrectomy; and 1 recipient underwent left lobectomy (segments 2–3) and right nephrectomy.

The hepatectomy rate was 32% for the left lobectomy donor and 44.76% for the left hepatectomy donor. The mean hepatectomy rate for right hepatic donors was $53.92 \pm 5.43\%$ (range, 48.62%-58.90%).

The ratio of the remaining liver to body weight was 1.18 for the left lobectomy, 0.97 for the left hepatectomy, and 1.39, 0.92, 1.06, and 0.84 for the right hepatectomies.

Mean operative time was 591 ± 266.92 (range, 340–1,065) minutes.

Three donors were not given any blood products other than a total of 5 units (2, 1, and 2 units) of erythrocyte suspension. The 1st donor who received erythrocyte suspension had undergone left hepatectomy and right nephrectomy, and this was the 10th case in the living-donor transplantation program. None of the donors needed intensive-care follow-up.

The mean duration of hospital stay in the donors who underwent simultaneous hepatectomy and nephrectomy was 11.40 ± 5.13 (range, 7–19) days. The reason for the

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