Special Article

Donor Outcomes after Living Donor Liver Transplantation (LDLT)

Pongphob Intaraprasong MD*,
Abhasnee Sobhonslidsuk MD*, Sasinee Tongprasert MD*

** Division of Gastroenterology, Department of Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand*

Liver transplantation is an accepted management for end stage liver disease, early-stage hepatocellular carcinoma, and acute liver failure. The number of patients with end stage liver disease is growing rapidly. Living Donor Liver Transplantation (LDLT) has become an important alternative to cadaveric organ transplant for patients with end stage liver disease. On average, about one in three potential donors eventually donate part of their liver. The overall reported donor mortality was 0.2% and median morbidity of 16%. Understanding donor outcomes is important as it enables the transplant team to fully inform the potential donor. In addition, this information will help the transplant team improve their post operative management and plan for long-term follow-up after liver donation.

Keywords: *Liver transplantation, Living donor, Outcomes*

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Results of liver transplantation with deceased donor transplantation and living donation have shown similar outcomes for the recipients. However, there are concerns about donor morbidity and even mortality in living donation because donors are generally healthy without any prior significant medical problem. Consequently, symptoms or post-donation complications that effect donor lives are especially important to understand as they may negate the benefits of performing liver transplantation.

Classification of outcomes

Important outcomes in liver transplantation can be classified in many ways such as medical or psychological, postoperative, or long-term outcomes; and these can be subdivided according to the type of donation. Most reports are retrospective in nature. The Clavien system for classification of negative outcome in general surgery and solid organ transplantation is used frequently for assessing and reporting outcomes for complications by many papers including the Adult Living Donor Liver Transplantation Cohort (A2ALL) study which collected data from 9 liver transplants centers in the U.S. from 1998 to 2003[1]. The Clavien system classified negative outcomes into four grades. Grade 1 includes all minor complications. Grade 2 includes all life threatening complications. Grade 3 includes complications with residual disability or cancer. Grade 4 includes complications that lead to retransplantation or death. Donor characteristics, such as age, also affect their outcome. Older donors have shown a decreased and delayed capacity for liver regeneration[2]. This has also been shown in recipients in early graft regeneration[3] although the outcomes of donors and recipients were not affected.

The overall reported donor mortality was 0.2% in a systematic review from 1990-2004 (with the estimation of 12 to 13 deaths in 6,000 LDLT worldwide). The total numbers included donation of left lateral segment, left or right lobes, adult-to-child, and adult-to-adult donation[4]. Mortality from donation of the right lobe (0.23-0.5%) is potentially higher than that of left lobe donation (0.05-0.21%) and this is likely due to the extent of resection. Right lobe donation also has a greater incidence of complications and there are reports of three donors who subsequently underwent liver transplantation because of complications related to donation[5]. However, mortality from right lobe

Correspondence to:
Intaraprasong P, Department of Medicine, Ramathibodi Hospital, 270 Praram 6 Rd, Rajathevee, Bangkok 10400, Thailand.
Phone: 0-2201-1304, Fax: 0-2201-1387
E-mail: pongphob@yahoo.com

donation often resulted from multiple organ failure and sepsis. In general, the potential risk for adult-to-adult LDLT is greater than adult-to-children LDLT due to the extensive surgery and the smaller donor remnant.

Donor morbidity has been reported from 0% to 100% in different reports with the median rate of 16.1%[4]. The lack of uniformity in the definition of complication, under reporting and the fact that most reports were derived from single center reports are the main reasons for the wide range of complication rates. Lower annual center volume and higher ratio of living donor to all donors are associated with lower risk of any complication[6]. A study from Hong Kong reported a reduction of an overall major donor complication from 14% to 6% in their second 50 right lobe donors[7], indicating an improvement in outcomes with more experience. The expertise of transplant surgeons who perform hepatic resections for liver cancer on a daily basis, who are skilled in both anatomical and non-anatomical resection might also be a contributing factor in reducing donor morbidity.

Medical outcomes

Biliary complications and infections were the most common reported causes of morbidity. Biliary complications included bile leaks, biliary stricture, and biloma. In 2000, the American Transplant Congress reported 4% biliary complication rate in donors, requiring surgical intervention, endoscopic retrograde chlangiography or percutaneous catheter drainage of a postoperative biloma[8]. The A2ALL study found that higher pre-donation alkaline phosphatase (> 86 IU/L) and intraoperative blood transfusion was strongly associated with post-donation biliary complication[9]. The rates of infection ranged between 0 and 28.6% and the most common sites of infection were wound, urinary tract, and pneumonia. Bacterial infection was the leading cause, followed by viral and fungal infections. Other postoperative complications included incisional hernia (5.6%), pleural effusion (5.3%), and neuropraxia. There was one donor who required thrombectomy for portal vein thrombosis. However, there has been no report of liver decompensation or hepatic artery thrombosis[9]. Post-donation dyspepsia or altered gastric motility was frequently mentioned and may be associated with vagal trunk or branch injury during surgery and it was observed in 11% of previously healthy donors[10]. As a result, many centers have placed all their donors on proton pump inhibitors immediately after surgery and continued it for two more months after surgery[11]. There have been reports of two cases of gastric stasis that were possibly caused by adhesions between the stomach and the hepatic cut surface. In both cases, surgical revision relieved their symptoms[12].

In the A2ALL study, the average length of hospital stay for donation surgery was seven days (range 2-28 days). After discharge, 51 donors (13%) were rehospitalized at least once, with two-thirds of the hospitalization occurring within 90 days of donation. After analysis, the authors revealed that the probabilities of rehospitalization were 10% and 23% at three months and two years post-donation.

It has been noted that the liver can regenerate to about double the size of the remnant lobe within several months and that recipient livers regenerate much faster than donor livers[13]. The authors suggested the rate of regeneration is regulated by other factors besides hepatocytes themselves. Postoperative cholestasis and hepatic dysfunction are relatively common but usually transient, with the normalization of aminotransaminase levels and synthetic function within 72 hours of donation.

Psychological outcomes

In addition to the medical outcomes, another important endpoint is the psychosocial consequence of organ donation that includes employment and financial issues, family relationship, daily activities, and body image. Donors usually return to work or resume near normal activity at 3- to 6-month[4]. Some donors, especially those in adult-to-child liver transplantation, experience the feeling of slow to heal since they focus more on the recipient recovery and outcome. The donor is by definition a healthy person without significant medical or psychiatric problems. Therefore, assessment of the psychosocial outcome using questionnaires or scoring systems comparing donor to the general population can be difficult to interpret as donors who go through the selection process usually have higher baseline scores than the general population. Nevertheless, the majority of donors believe in the benefit they gain from donation regardless of the outcomes of the transplantation[14] and most of them agree with the role of living donation in increasing the number of liver transplantation.

Long-term follow-up of donors reveal many interesting perspectives. More than half of the donors experience more pain than they anticipated[11]. They also found that the medical team and other family members perceive them as non-patients. Even some

donors perceived the recipients being more of patients than they are after the surgery. Donors worried about the lack of follow-up care and being ignored by the transplant team once the organ had been obtained. There are reports of increasing psychiatric disorders post-donation with the prevalence in the same range as that of post kidney donation. The occurrence of post donation depression rates ranging between 0.2 and 15%[4]. However, psychiatric outcomes are not uniformly described due to limited donor psychosocial follow-up post-donation. The survey from transplant centers in France recommended life-time annual visits for all living donors[15]. Meeting with other donors who had previously undergone the procedure also helped the potential donors as well.

There were no reported changes in sexual function or menstruation post-donation and two donors (1 man and 1 woman) successfully procreated[10]. Donor relationships with the recipients tended to be the same or better. Many donors also expressed concern associated with their medical insurance coverage and financial support during the recovery period.

Donors who are generally healthy and may not have experienced any previous medical intervention thus, may find preparing for major surgical procedure such as liver donation very stressful. Information on outcomes of donors from all perspectives, not only focusing on medical complications will help the transplant team to be able to discuss the procedure with potential donors and enable them to fully understand the process of donation and its consequences so that donors can decide without guilt or pressure from the family of the recipients.

In summary, overall LDLT has a good safety profile for donors with the median morbidity of 16% and the mortality of 0.2%. With the advantages over deceased donation such as shorter cold ischemia time, prescheduled procedure, and healthier liver grafts, LDLT may produce better recipient outcomes. An expanding LDLT program should definitely shorten waiting time to transplantation for end stage liver disease patients and patients with early stage hepatocellular carcinoma or acute liver failure. This should decrease the number of patients dying while waiting for a liver. However, in Thailand, LDLT is still infrequently performed and has not been introduced to many programs. Data collection for donor outcomes is still limited. Therefore, the authors encourage more research in this area.

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ภาวะแทรกซ้อนของผู้บริจาคตับหลังการปลูกถ่ายตับจากผู้บริจาคมีชีวิต

พงษ์ภพ อินทรประสงค์, อาภัสณี โสภณสฤษฏ์สุข, ศศิณี ทองประเสริฐ

การปลูกถ่ายตับเป็นวิธีรักษาที่ได้รับการยอมรับในโรคตับในระยะสุดท้าย มะเร็งตับระยะต้น และโรคตับวายเฉียบพลัน ในปัจจุบันผู้ป่วยโรคตับระยะสุดท้ายมีจำนวนเพิ่มขึ้นอย่างรวดเร็ว นอกจากการปลูกถ่ายตับจากผู้บริจาคสมองตาย การปลูกถ่ายตับโดยได้รับตับบริจาคจากผู้บริจาคมีชีวิตเป็นทางเลือกอีกทางสำหรับผู้ป่วยโรคตับระยะสุดท้าย โดยเฉลี่ยแล้วหนึ่งในสามของผู้บริจาคมีชีวิตที่ประสงค์บริจาคตับสามารถบริจาคตับส่วนหนึ่งได้ โดยทั่วไป อัตราการเสียชีวิตที่มีรายงานเท่ากับร้อยละ 0.2 และมีภาวะแทรกซ้อนที่อาจเกิดขึ้นได้ร้อยละ 16 การเข้าใจถึงภาวะแทรกซ้อนที่อาจเกิดขึ้นกับผู้บริจาคตับมีความสำคัญ เพราะทำให้ทีมปลูกถ่ายอวัยวะสามารถแนะนำผู้ที่มีความประสงค์บริจาคตับได้เข้าใจถึงความเสี่ยงจากการปลูกถ่ายตับได้อย่างเต็มที่ นอกจากนี้ช่วยให้ทีมปลูกถ่ายอวัยวะให้การดูแลหลังการผ่าตัดได้ดีขึ้น และวางแผนการติดตามผู้บริจาคตับระยะยาว