

**ARTICLE OF THE MONTH**

Humar A, Ganesh S, Jorgensen D, et al. Adult Living Donor Versus Deceased Donor Liver Transplant (LDLT Versus DDLT) at a Single Center: Time to Change Our Paradigm for Liver Transplant. *Ann Surg*. 2019;270(3):444-451.

**Abstract:**

Objective: The aim of this study was to compare outcomes between living donor liver transplant (LDLT) and deceased donor liver transplant (DDLT) at a single center to demonstrate the advantages of LDLT and provide justification for the increased utilization and application of this procedure.

Summary of Background Data: LDLT comprises a very small percentage of all liver transplants performed in the United States, this despite its advantages and a shortage of the availability of deceased donor organs.

Methods: A retrospective review of all adult LDLT (n 1⁄4 245) and DDLT (n 1⁄4592) performed at a single center over 10 years (2009–2019), comparing survival outcomes by Kaplan-Meier analysis and comparing other measures of outcome such as recovery times, complications, costs, and resource utilization.

Results: Patient survival outcomes were superior in LDLT recipients (3-year 86% vs 80%, P 1⁄4 0.03). Other outcomes demonstrated shorter length of hospital stay (11 vs 13 days, P 1⁄4 0.03), less likelihood of intraoperative blood transfusion (52% vs 78%, P < 0.01), and less likelihood of need for posttransplant dialysis (1.6% vs 7.4%, P < 0.01). Early reoperation and biliary/vascular complication rates were similar. Hospital costs related to the transplant were 29.5% lower for LDLT. Complications in living donors were acceptable with no early or late deaths, 3-month reoperation rate of 3.1%, and overall complication rate of 19.5%. Given its advantages, we have expanded LDLT—in 2018, LDLT comprised 53.6% of our transplants (national average 4.8%), and our transplant rate increased from 44.8 (rate per 100-person years) in 2015 to 87.5 in 2018.

Conclusions: LDLT offers advantages over DDLT including superior out- comes and less resource utilization. The time has come to change the paradigm of how LDLT is utilized in this country.

COMMENTS MADE BY SCHLICHTING, NICOLETTE MD

**Summary:**

This retrospective single center study published in the September 2019 issue of Annals of Surgery compares the outcomes of living donor liver transplants (LDLT) and deceased donor liver transplants (DDLT) over a 10-year period. The results demonstrate significant advantages associated with LDLT. As we continue to face an organ shortage, these results suggest that we may need to reevaluate and perhaps increase the utilization of LDLT in the United States.

This study was performed at the University of Pittsburgh Medical Center (UPMC) and compared the outcomes of 245 LDLT to 592 DDLT between 2009 and 2019. LDLT recipients had better survival outcomes, decreased length of stay, decreased rates of intraoperative blood transfusion and posttransplant renal replacement therapy, and the overall hospital costs were ~30% lower compared to DDLT. The center subsequently expanded their LDLT program, and in 2018, LDLT made up more than half of their transplants compared to a national average of 4.8%.

There is an ongoing shortage of liver allografts available for transplantation with long periods of time spent on the waitlist and high waitlist mortality. Furthermore, many patients on the waitlist experience progression of their end stage liver disease (ESLD) before obtaining a high enough status on the list to receive a DDLT. While LDLT has the potential to improve waitlist mortality rates and allow patients to be transplanted prior to clinical decompensation, less than 5% of liver transplants in the United States are from living donors due to concerns of donor complications and mortality. UPMC has shown a LDLT program can be successfully expanded in a center with high volume and expertise while maintaining acceptable outcomes.

It is important to note that recipients in the DDLT group had significantly higher Model for End-stage Liver Disease (MELD) scores compared to the LDLT group (22 vs 16, p < 0.01) and a significantly larger percentage of DDLT recipients had hepatocellular carcinoma (HCC) compared to the LDLT recipients (36% vs 22%, p <0.01). LDLT were also younger with lower BMIs, suggesting they were in better health at the time of transplant. While this may mean that the groups are too dissimilar to compare outcomes, there is clearly a survival benefit as the LDLT group can be transplanted prior to progression of their ESLD. Additionally, as the UPMC team developed more experience and expertise, they broadened their indications for LDLT to include patients with higher MELD scores, acute liver failure, or tumors that did not meet criteria for DD, re-transplants, and elderly patients. While the number of patients remains low, the 1-year survival rates have been similar for the LDLT vs DDLT groups. The one exception is elderly patients, where their 1-year survival was significantly improved in the LDLT group (93% vs 79%, p = 0.03).

The donors have been closely followed for at least two years, and there have been no deaths or cases of liver failure. The complication rate for donors was 19.5% with 8.8% being major complications, e.g. a complication requiring reoperation or an invasive intervention. LDLT was not associated with a higher rate of surgical complications, and there was no difference in the rates of hepatic artery thrombosis and portal vein thrombosis in the recipient LDLT vs DDLT groups. The overall incidence of biliary complications was comparable in the two groups, however biliary leaks were more likely to occur in the LDLT group and biliary strictures were more likely to occur in the DDLT group.

This study is important for liver transplant anesthesiologists as we are integral members of the perioperative team that cares for these patients. Ideally, expansion of LDLT programs will occur at high volume LT centers in parallel with efforts to increase the DD pool through utilization of extended criteria donors and improvements in machine perfusion techniques. It behooves us to pursue all possible options to increase the donor pool so that more of our patients can undergo liver transplantation in a timely fashion thereby decreasing waitlist mortality. The authors recognize that the LDLT recipients were healthier than the DDLT recipients, however as the study progressed and they became more comfortable with the operation, less traditional recipients were undergoing LDLT with noninferior outcomes. It is possible that LDLT will become a more popular option in the United States, and liver transplant anesthesiologists should be well versed in the specific considerations necessary for caring for both the donor and recipient during this important operation.

**References:**

1. Humar A, Ganesh S, Jorgensen D, et al. Adult Living Donor Versus Deceased Donor Liver Transplant (LDLT Versus DDLT) at a Single Center: Time to Change Our Paradigm for Liver Transplant. *Ann Surg*. 2019;270(3):444-451.

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