
Donor Age-Based Analysis of Liver Transplantation Outcomes: Short- and Long-Term Outcomes Are Similar Regardless of Donor Age



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BACKGROUND: The shortage of donor organs has led to increasing use of extended criteria donors, including older donors. The upper limit of donor age that produces acceptable outcomes continues to be explored. In liver transplantation, with appropriate selection, graft survival and patient outcomes would be comparable regardless of age.

STUDY DESIGN: We performed a retrospective analysis of 1,036 adult orthotopic liver transplantations (OLT) from a prospectively maintained database performed between January 1, 2000 and December 31, 2013. The study focus group was liver transplantations performed using grafts from older (older than 60 years) deceased donors. Deceased donor liver transplantations done during the same time period using grafts from younger donors (younger than 60 years) were analyzed for comparison. Both groups were further divided based on recipient age (less than 60 years and 60 years or older). Donor age was the primary variable. Recipient variables included were demographics, indication for transplantation, Model for End-Stage Liver Disease (MELD), graft survival, and patient survival. Operative details and postoperative complications were analyzed.

RESULTS: Patient demographics and perioperative details were similar between groups. Patient and graft survival rates were similar in the 4 groups. Rates of rejection ($p = 0.07$), bile leak ($p = 0.17$), and hepatic artery thrombosis were comparable across all groups ($p = 0.84$). Hepatitis C virus recurrence was similar across all groups ($p = 0.10$). Thirty-one young recipients (less than 60 years) received grafts from donors aged 70 or older. Their survival and other complication rates were comparable to those in the young donor to young recipient group.

CONCLUSIONS: Comparable outcomes in graft and patient survivals were achieved using older donors (60 years or more), regardless of recipient age, without increased rate of complications. (J Am Coll Surg 2015;221:59–69. © 2015 by the American College of Surgeons)

There is a growing disparity between the number of patients awaiting liver transplantation and the number of available organs for donation, leading to increasing wait-list mortality.¹⁻³ The median pretransplantation

waiting time among active wait-listed adult patients increased from 12.9 months in 2009, to 17.6 months in 2010, to 18.5 months in 2011.² In an effort to expand available organs for liver transplantation, many transplant centers are looking beyond the traditional “ideal” donor, to include the use of marginal or extended criteria donor organs, including the use of grafts from older donors.⁴⁻¹⁰

The ideal donor is one who lacks characteristics that would place the graft at risk for primary nonfunction or early failure. This has typically been described as a brain dead donor, less than 40 years old, hemodynamically stable, with acceptable liver function and electrolytes.¹¹ Other considerations have been given to donor cause of death, medical comorbidities, presence of steatosis, or length of ICU stay.⁴

The upper limit of donor age that produces acceptable outcomes continues to be explored. How age affects

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Abbreviations and Acronyms

CIT	= cold ischemia time
HAT	= hepatic artery thrombosis
HCC	= hepatocellular carcinoma
HCV	= hepatitis C virus
HR	= hazard ratio
MELD	= Model for End-Stage Liver Disease
O	= older
OLT	= orthotopic liver transplantation
Y	= younger

clinically relevant liver function is not completely understood. It has been suggested that the older liver graft is limited by 2 factors: the ability of the aged hepatic parenchyma to tolerate the ischemia reperfusion injury (with fewer hepatocytes and decreased regenerative capacity) and the burden of the medical comorbidities of the donor on the quality of the graft, for example obesity, diabetes, and hypertension, resulting in increased steatosis and atherosclerosis.⁶ Concern over the use of older-donor grafts is supported by reports of increased risks of primary nonfunction, hepatic artery thrombosis (HAT), and biliary complications, but these worse outcomes are not consistently reported. Although reports from the European Liver Transplant Registry and the Scientific Registry of Transplant Recipients (SRTR) have suggested that donor age greater than 40 years was associated with decreased 3-month graft survival, and that age 60 years or more was a definite risk factor for worsened outcomes, there are many case series that report excellent outcomes into the octogenarian age range.^{6,9,12,13}

Whether or not there are additional clinical criteria that need to be met when using the older donor is not completely understood. Various factors have been considered additive; when in combination with older donor grafts, they produce worse outcomes. In particular, previous studies suggest that the use of livers from donors older than 50 years were associated with increased rates of recurrent hepatitis C virus (HCV) when used in HCV-positive recipients.^{14,15} Additionally, it has been suggested that the older-donor graft is more susceptible to preservation injury than its younger counterparts, making cold ischemia time (CIT) and degree of steatosis particularly important considerations.^{16,17}

We have had a policy of careful consideration of the older donor with an ever-expanding age cut-off. We previously reported our early experience with older donor use for liver transplantation¹⁸ and noted improved results for older donor use after the introduction of the Model for End-Stage Liver Disease (MELD) in 2002 and with efforts to maintain short CITs. In this report, we provide

an updated review of our experience with older-donor organ use to assess longer-term results and to assess older donor use in younger recipients, including those with underlying HCV as a cause of their chronic liver disease. We hypothesized that in liver transplantation, with appropriate selection, the graft survival and patient outcomes using donors aged 60 years or older would be comparable to outcomes for donors less than 60 years old.

METHODS

Under approval from our institutional review board (IRB), our prospectively maintained transplant database was retrospectively reviewed for adult orthotopic liver transplantations (OLT) performed between January 1, 2000 and December 31, 2013. Organs from donation after cardiac death (DCD), living donors, pediatric, multi-visceral, and retransplant recipients were excluded from analysis.

The study focus group was liver transplantations performed using grafts from older (60 years or more) deceased donors. Deceased donor liver transplantations done during the same time period using grafts from younger donors (less than 60 years old) were analyzed for comparison purposes. Both groups were further divided based on recipient age (less than 60 years and 60 years or older). Grafts and recipients younger than 60 were classified as “younger (Y)” grafts and recipients age 60 or older were classified as “older (O).” We refer to these groups as O-to-O (grafts from older donors given to older recipients); O-to-Y (grafts from older donors given to younger recipients); Y-to-O (grafts from younger donors given to older recipients); and Y-to-Y (grafts from younger donors given to younger recipients). Donor age was the primary variable. Recipient variables including demographics, indication for transplant, MELD, graft survival, and patient survival were collected and used for analysis. Operative details and postoperative complications were collected and analyzed.

Liver graft procurement

Since the establishment of our organ recovery center in April 2001, an increasingly greater number of organ procurements have been performed there—currently more than 90% for deceased donors within the donor service area.¹⁹ Procurement liver biopsy is performed selectively based on gross appearance of the liver and medical history of the donor.

Transplantation technique and management

The majority (>95%) of liver transplantations at our center are performed in a piggyback technique with caval

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