Controversy

A successful deceased-donor liver transplant program is not a prerequisite for a living-donor program

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Need for living-donor liver transplant: Indian scenario

The Human Organ Transplant Act (HOTA) permitting transplantation of organs from brain-dead individuals was passed by the Indian parliament in 1994. In the 12 years since, only approximately 100 deceased-donor liver transplants (DDLT) have been performed in 18 centers countrywide. As per the Western liver transplant rates of 15-20 per million population (USA, UK), the number of patients requiring liver transplantation for end-stage liver disease in India would be 20,000 annually. Hence there is a large demand-supply gap.

At present, there are more than 40 surgeons in the country who have obtained fellowships in liver transplantation from centers abroad. Nearly 300 liver transplants have been performed/attempted at 22 centers (personal communication) to date in India. At least 10 other centers are gearing up for it. This implies the existence of the necessary infrastructure in a large number of hospitals in the country. Despite good infrastructure, expertise, and a big demand, the small number of transplants performed per center and overall implies that the problem lies with the availability of organs for transplantation. If donor livers were available in time, thousands of lives could be saved. Nowhere is the need felt more than in acute liver failure.

This scarcity of donor livers can be made up to a large extent by living-donor liver transplantation (LDLT), as has been demonstrated in Japan and South Korea. I foresee many transplant centers attempting to set up LDLT programs all over the country in the near future. Should all these centers be permitted to perform LDLT only after they have established a successful DDLT? Clearly, the answer is no.

Why LDLT seems a logical progression from DDLT but is not

The first LDLT was performed in 1989 when segments 2 and 3 were transplanted from mother to son.¹ This procedure emanated from experience with reduced-sized grafts obtained from deceased adult donors and transplanted into infants and small children. Shortly thereafter, the performance of LDLT in children was adopted with prodigious fervor in Chicago and Japan. This procedure was then applied to adults. While left lobes worked well for small adults, their volumes did not prove enough for larger adults, resulting in the small-for-size syndrome and reduced recipient survival due to poor early graft function. The need for transplanting larger volumes led to the use of left liver with caudate lobe and, in other centers, to the use of right lobe.

The driving force behind the rapid increase in LDLT was the shortage of cadaver livers in the West and non-availability of deceased-donor organs in Asian countries. Since LDLT was initially performed in units with successful cadaver programs, LDLT seemed a logical progression from DDLT. However, successful LDLT programs have also been established in Asian centers without a pre-existing DDLT facility. The success of these programs proves that it is possible to have a stand-alone LDLT program. I believe that although progression from DDLT to LDLT has an evolutionary basis, and previous experience in deceased- (or living-) donor liver transplantation among the medical personnel is essential, a pre-existing DDLT program within the center is neither necessary nor often possible in countries such as India. This becomes evident when one analyzes the differences between DDLT and LDLT.

Differences between LDLT and DDLT

Donor morbidity and mortality

The operation for removal of a part of the liver to be transplanted is associated with definite morbidity and mortality. Overall morbidity is between 15% and 20%;² in half of these it can be regarded as major, resulting in additional hospital stay and, in some, possibly an intervention. Multiple studies have shown that the complication rate is higher with right donor hepatectomy compared to left hepatectomy or left lateral segmentectomy because of the greater magnitude of the procedure and a smaller residual liver volume. Complications have decreased with modifications in technique introduced with increasing ex-
perience. Lack of accurate data surrounds mortality statistics. A total of 18 donor deaths (collected data including personal communication from James Trotter, 2006) have been reported worldwide, and though it is not possible to provide an accurate estimate, donor mortality is likely to be in the range of 0.2%-0.5%.

Experience in deceased-donor transplantation adds nothing to the knowledge and expertise required to prevent donor complications. This can only be gleaned from the experience of other established LDLT centers and from one’s experience with liver resections.

**Infrastructure requirements**

For LDLT, two sets of operating instruments; operating rooms; surgical, anesthetic and allied staff; and ICU facilities are required. These can easily be adapted from a running LDLT center, or rather necessarily emerge as modifications of an existing DDLT facility.

For living donor work up, a spiral MD-CT scanner with 3-D volumetry software and a 1.5 Tesla MR scan to enable 3-D MR cholangiography are required. These are again specific needs of an LDLT center that do not relate to DDLT.

**Surgical skills required**

The technique of DDLT is now well established. Many centers are being established by transplant surgeons with formal training fellowships and experience, without having to go through the learning curve, as in the past.

LDLT is a more complex procedure and a learning curve can be expected. This is particularly true of right lobe LDLT, the technique for which is yet to be standardized. Fan et al have reported their experience with the first 100 LDLT. Outcomes in the second 50 transplants were significantly better than with the first 50 – 90% reduction in graft loss, decreased postoperative complications, and better utilization of hospital resources. These can be attributed to the changes in technique of the surgical team and the learning curve of the team as a whole. To perform an LDLT operation, a surgeon requires expertise in liver resections, biliary surgery, and vascular surgery, and a mastery over the intricate details of intra-hepatic anatomy. None of these skills is particularly helped or acquired by DDLT experience. This means that prior training or experience in DDLT will not negate the learning curve for LDLT because the set of skills required are different. This can be done only by adequate ‘LDL training’.

For postoperative management, the team should have had previous DDLT or LDLT experience, but it still does not require a pre-existing program at the same center.

**Outcome after DDLT and LDLT: our experience**

In our total series of 104 liver transplants, 1 of 4 DDLT and 87 of 100 LDLT patients survived. There were 11 deaths among the first 50 LDLT and 2 among the last 50.

Two of the three DDLT deaths were due to primary non-function and one from oxalate-induced severe necrotizing pancreatitis. The latter was attributable to excessive oxalate load due to inadequate pre-transplant dialysis in a patient with primary hyperoxaluria. All 3 deaths exposed the inadequacies in our pre-transplant donor and patient management protocols for an emergency operation of rare occurrence.

On the other hand, our LDLT results compare with the best anywhere and have continued to improve, suggesting a learning curve that is consistent with the experience of other LDLT centers. Quite clearly, DDLT and LDLT results have little correlation in our program. Despite extensive experience in LDLT, most of our clinicians felt the need to spend a few months in other established LDLT centers before embarking on our own program. Our LDLT experience abroad neither prevented the LDLT deaths nor shortened the learning curve for LDLT.

**Benefits of a successful LDLT program**

In a number of centers where living donors are the primary source of grafts for liver transplant, the success of the program has resulted in increased numbers of deceased-donor transplants. This is true in Turkey, Seoul and Hong Kong. This is because the spread of awareness of the success of liver transplantation (LDLT) may favorably influence societal perceptions regarding the fruitfulness of organ donation by deceased donors. This in turn may help alter their attitudes towards such donation.

**Conclusion**

There is pressing need to develop liver transplantation in India. If a meaningful DDLT program cannot be established, development of an LDLT program must not be delayed since a pre-existing successful DDLT program is neither a prerequisite nor enough to start LDLT. On the contrary, a pre-existing LDLT program may even prove catalytic in the later establishment of DDLT.
Teams wishing to initiate LDLT programs must receive appropriate training at centers performing LDLT. It cannot be stressed strongly enough that a living-donor liver transplant is an operation with the highest of stakes and complexity, and should only be undertaken by surgeons who have received direct training at LDLT centers rather than develop as an extension of their DDLT skills.

References


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