

Brief Report

Establishing a Liver Transplantation Program at Tehran University of Medical Sciences, Iran: A Report of Ten Years of Experience

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Abstract

In 2001, a Liver Transplantation (LT) program was commenced in Imam Khomeini Hospital Complex as the first one in the capital city of Tehran which is the second liver transplantation center in Iran. This study presents the results of our 10-year experience with LT.

Keywords: Learning curve, liver transplantation, progress, survival

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Introduction

Liver transplantation (LT) is the gold standard treatment for patients suffering from end stage liver disease (ESLD).¹ In 2001, a LT program was commenced in Imam Khomeini Hospital Complex, the second LT center in Iran and the first in the capital city of Tehran. In this report we present the results of our 10-year experience with LT and also describe the surgical and non-surgical factors associated with improved outcomes.

Patients and Methods

Recipients

All patients who received transplants from deceased donors between January 2002 and December 2011 were enrolled in the study. The program was divided into three phases:

- Phase 1 (2002 – 2005, n = 9): We tried to start a new program and overcome the basic obstacles.
- Phase 2 (2006 – 2009, n = 41): As a low-volume transplant center, we tried to increase the number of LTs in our center and also improve the quality of transplantation.
- Phase 3 (2010 – 2011, n = 49): We performed more than 20 LTs per year. By one definition, LT program with more than 20 LTs per years is considered as ‘high-volume transplant center’.^{2,3}

After performing a complete preoperative evaluation, a multi-disciplinary committee consisting of transplant surgeons, hepatologists, anesthesiologists, radiologists, pathologist, psychiatrists, infectious disease specialists and liver transplant coordinators prioritized patients on the waiting list. Patients with age over 65 years, serious comorbidities, and positive human immunodeficiency virus test were excluded from the list. Recipients’ data was recorded in a database.

Medical management

Immunosuppression induced by 1000-mg methylprednisolone in anhepatic phase and maintained by using a triple therapy regimen of a corticosteroid, calcineurin inhibitor and mycophenolate mofetil.

Surgical procedures

In phase 1 standard hepatectomy and end-to-end cavo-caval anastomosis was performed. In phase 2 and 3, modified piggy-back technique with side-to-side cavo-caval anastomosis was used. Venovenous bypass was performed in just 2 patients in phase 1. Common bile duct was anastomosed in an end-to-end fashion except for patients with primary sclerosing cholangitis (n = 7) and a re-transplantation case in which the Roux-en-Y choledochojejunostomy was performed.

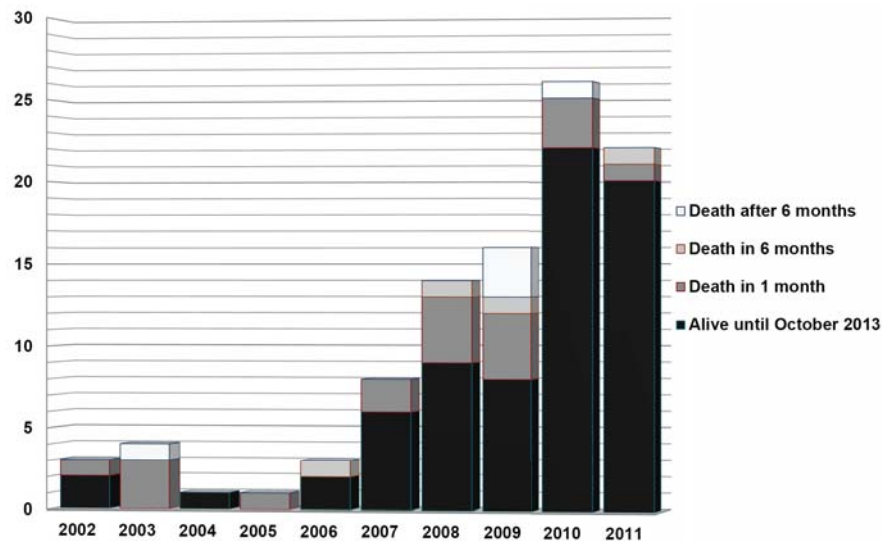
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Table 1. Operative data of patients in 3 phases

Surgical Parameters	Total (n = 98)	Phase 1 (n = 9)	Phase 2 (n = 41)	Phase 3 (n = 48)
Cold ischemia time (minutes)	347 (290–435)	880 (750–1040)	395 (303–461)	305 (280–360)
Operative time (minutes)	450 (390–525)	610 (570–675)	467 (395–525)	425 (380–480)
Arterial reconstruction through jump graft	19 (20 %)	1 (11 %)	12 (29 %)	6 (12 %)
Platelet transfusion (units)	7 (0–15)	7.5 (0–17)	10 (3–15)	5 (0–15)
PRBC transfusion (units)	9 (5–13)	8.5 (7–18)	10 (5–15)	8.5 (4–13)
FFP transfusion (units)	5 (0–13)	12.5 (0–27)	10 (5–15)	0 (0–10)

Values are given as the medians and (interquartile ranges) except for arterial reconstruction; PRBC: Packed Red Blood Cell; FFP: Fresh Frozen Plasma.

**Figure 1.** Trend of primary liver transplants per year and living status outcome of patients until October 2013

Results

Ninety-nine deceased donor orthotopic LTs were performed for 98 patients (49 males) with a mean age of 37.5 ± 13 years (range 8–62). In phase 3, one patient with autoimmune liver disease underwent re-transplantation due to hepatic artery thrombosis after 3 months and was alive until October 2013. Mean body mass index, CTP and MELD scores were 23.6 ± 3.9 (kg/m^2), 19.6 ± 4.5 and 10.1 ± 1.6 , respectively. The main indication for LT was cryptogenic cirrhosis (26 %) followed by autoimmune hepatitis (22%), hepatitis B virus (HBV) (14 %) and hepatitis C virus (HCV) related cirrhosis (12 %). Operative data are summarized in Table 1.

The trend of liver transplants per year and patients' living status are shown in Figure 1. The overall median follow-up time for all patients was 29.5 months (range 11–132 months). One-year Survival rates were 33 % in phase 1, 68 % in phase 2 and 88 % in phase 3.

Discussion

This report shows the progress of a LT program in one of the well-established centers in the Middle East since 2001 which was divided into 3 phases based on technical advances and number of transplants performed per year.

Our data shows an upward trend in LTs from 3 to more than 20 transplantations per year. Parallel to this upward trend in the number of transplants, 1-year patient survival rate increased from 33 % in phase 1 to 88 % in phase 3, despite similar demographics, MELD, and CTP scores among different phases. In addition

to overcoming the procedure-related learning curve, several other important factors might contribute to the outcome.

At the end of phase 1, three important modifications are worth mentioning. First, we rearranged the operations by negotiating with hospital authorities to reduce the cold ischemia time. In phase 1, since the blood bank and laboratories in the hospital could not support such operations at midnight, there was a long delay between two operations. Second, we adapted technique of caval sparing hepatectomy which is recommended in orthotopic LT with few surgical complications.^{4,5} Its Potential advantages include lower risk of bleeding and hemodynamic instability reducing the need for blood components transfusion, shorter operative time, and obviating the need for venovenous bypass.⁶⁻⁸ Third, we used side to side cavo-caval anastomosis (modified piggyback technique). A simpler and faster technique with a lower incidence of intraoperative bleeding reducing the need for blood transfusion which along with partial clamping of the inferior vena cava, has made it a preferred technique in some centers.¹

From the beginning of phase 3, a rotational thromboelastometry device (ROTEM®) was used during the surgery to control coagulation in real time. Since thromboelastometry provides an immediate assessment of coagulation state and implementation of targeted treatment, it may have a role in minimization of blood products transfusion during LT.⁹ We believe taking advantage of thromboelastometry in addition to overcoming the learning curve and performing more than 20 transplants per year were among the major factors that reduced the need for transfusion of fresh frozen plasma and decreased operative time during phase 3.

In summary, our experience with developing a new LT program

highlights the benefits of continuous revision of both technical and administrative aspects of this procedure. Marked improvement in survival among patients is one of the results of this continuous internal audit and making appropriate modifications to the procedure. Continuous evaluation and modifications are necessary to achieve even better outcomes.

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