

Evolution of living donor liver transplantation in Egypt

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ABSTRACT

Objectives: To date, cadaveric organ donation is illegal in Egypt. Therefore, Egypt recently introduced living donor liver transplantation (LDLT), aiming to save those who are suffering from end stage liver disease. Herein, we study the evolution of LDLT in Egypt.

Methods: In Egypt, between August 2001 and February 2004, we approached all centers performing LDLT through personal communication and sent a questionnaire to each center asking for limited information regarding their LDLT experience.

Results: We identified and approached 7 LDLT centers, which collectively performed a total of 130 LDLT procedures, however, 3 major centers performed most of the cases (91%). Overseas surgical teams, mainly from Japan, France, Korea, and Germany, either performed or supervised almost all procedures. Out of

those 7 LDLT centers, 5 centers agreed to provide complete data on their patients including a total of 73 LDLT procedures. Out of those 73 recipients, 50 (68.5%) survived after a median follow-up period of 305 days (range 15-826 days). They reported single donor mortality. Hepatitis C virus cirrhosis, whether alone or mixed with schistosomiasis, was the main indication for LDLT.

Conclusion: Egypt recently introduced LDLT with reasonable outcomes; yet, it carries considerable risks to healthy donors, it lacks cadaveric back up, and is not feasible for all patients. We hope that the initial success in LDLT will not deter the efforts to legalize cadaveric organ donation in Egypt.

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Egypt is a heavily populated country, with a strikingly high hepatitis C virus (HCV) infection prevalence of 26%.^{1,2} This high prevalence of chronic liver diseases in Egypt has led to increasing numbers of Egyptian patients suffering from end stage liver disease, necessitating liver transplantation (LT). To date, cadaveric liver transplantation (CLT) is not legalized by the Egyptian government, and

until recently, LT candidates had only one hope for cure, to travel abroad seeking CLT outside Egypt. However, this was not a feasible option to most of the Egyptian patients, and introducing living donor liver transplantation (LDLT) seemed to be the only logical choice to save many patients whom are in desperate need for LT. The first attempt to perform LDLT in Egypt was undertaken in 1991 by the

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surgical team at the National Liver Institute, Menoufiya University, and then only 3 LDLT procedures were performed with the help of an overseas surgical team, and their longest survival was 11 months.³ This break through by the National Liver Institute was followed by enormous efforts to pass a law legalizing cadaveric organ donation; those efforts led to the 1992 decree permitting cadaveric organ harvesting from prisoners who were sentenced to death. Thereafter, the surgical team at the National Cancer Institute in Cairo performed 2 CLT procedures; but unfortunately, both recipients died in the early postoperative period (unpublished data). As a result, the law of cadaveric donation was indefinitely suspended, which was a major setback for LT in Egypt. Throughout the 1990's, Egyptian patients continued to travel abroad seeking CLT, and a considerable number was lucky enough to receive transplants and return to Egypt in good health.⁴ Those successfully transplanted patients, aside from the ever-increasing number of patients who are in desperate need for LT, have put an enormous pressure on the Egyptian government to pass the law allowing cadaveric organ donation. In the late 1990's, all efforts to pass a decree allowing cadaveric organ donation were sadly aborted in the Egyptian Parliament. Ironically, this major setback led to the speedy launch of successful LDLT programs. Herein, we will study the evolution of LDLT programs in Egypt.⁵

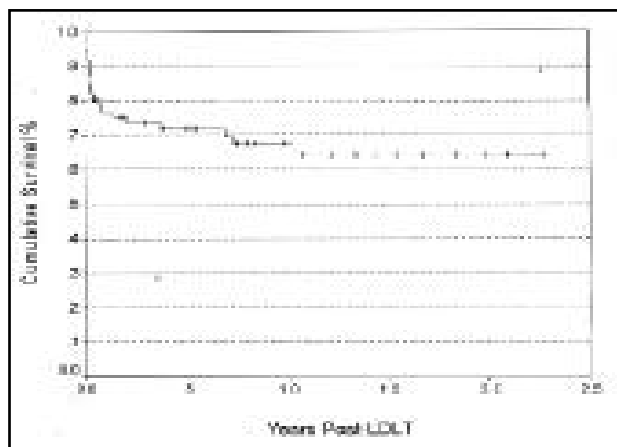
Methods. In Egypt in the period between August 2001 and February 2004, all centers that undertook LDLT were identified through personal communication and through the records of the Egyptian Liver Transplantation Association (ELTA). All those LDLT centers were approached through personal communication, and an enquiry form was sent by e-mail to each LDLT program requesting limited information regarding their LDLT experience. The questionnaire included variable information on both donors and recipients. The requested data on LDLT recipients included demographic characteristics, indications for LT, major complications, and outcome in terms of survival. The requested information on LDLT donors included demographic characteristics, relation to the recipients (related or unrelated), major complications, and outcome in terms of survival. The questionnaire also included information regarding the surgical teams performing the procedure and a rough estimate of the costs of the procedure. Strict confidentiality was promised in handling all the information provided by the LDLT centers. It was also understood by all centers that data will be studied and analyzed collectively and that any result or conclusions that may come out from this study will not reflect the performance of any particular center. Statistical analysis was carried

out by Kaplan-Meier analysis using Statistical Package for Social Sciences software version 8, and was used to obtain a post liver transplant survival curve.

Results. It is worth emphasizing that this is a multi-center review; therefore, the following results do not reflect the performance of any particular center. Seven LDLT centers were identified and approached. Collectively all 7 centers performed 130 LDLT procedures. However, most of the cases (91%) were performed by 3 major centers, namely; Dar Al Fouad Hospital in Cairo, Wady Al-Nile Hospital in Cairo, and the National Liver Institute in Menoufiya. The evolution of LDLT programs in Egypt is demonstrated in **Table 1**. Almost all procedures were either performed or supervised by overseas surgical teams mainly from Japan, France, Korea, and Germany; however, a few cases were performed by surgical teams from the United Kingdom and the USA. Out of the 7 centers performing LDLT in Egypt, 2 programs refused to provide their data while the remaining 5 centers have agreed to provide complete data on their patients. Those 5 centers who agreed to join the study have collectively performed 73 LDLT procedures, which were included in this study. The whole right lobe (liver segments 5 to 8) was used in all adult recipients while the left lateral segment (liver segments 2 and 3) was used in all pediatric recipients. Analysis of the 73 liver recipients showed; male/female ratio of 56:17; adult/pediatric ratio of 49:24; and median age of 42 (range 9 months to 62 years). Hepatitis C virus cirrhosis was the main indication for LT in 49 patients (67.1%); HCV infection was either alone or mixed with other pathologies such as schistosomiasis, hepatitis B virus (HBV) in one patient, and hepatocellular carcinoma in 8 patients. Other indications for LT were; biliary atresia in 6 children (8.2%), congenital hepatic fibrosis in 4 patients (5.5%), Byler's disease 3 patients (4.1%), veno-occlusive disease in 3 patients (4.1%), Budd Chiari syndrome in 2 patients (2.7%), HBV+HCC in one patient (1.4%), acute hepatic failure in one patient, hepatoblastoma in one patient, glycogen storage disease in one patient, hypercholesterolemia in one patient, and primary sclerosing cholangitis in one patient. Out of 73 patients who underwent LDLT, 50 (68.5%) survived after a median follow-up period of 305 days (range 15-826 days); the Kaplan-Meier survival curve of those patients is shown in **Figure 1**. Early deaths were due to uncontrollable bleeding in 4 patients (the procedure was aborted without transplantation in 3 out of 4 bleeders), sepsis in 5 patients, portal vein thrombosis in 4 patients, hepatic artery thrombosis in 2 patients, small for size graft in 2 patients, pulmonary embolism in 2 patients, and malignant portal vein thrombosis in one recipient

Table 1 - Evolution of living donor liver transplantation programs in Egypt.

Data started	Name of Center	N of cases
1991	National Liver Institute, Menoufiya (Suspended in the same year)	3 cases only
August 2001	Dar Al Fouad Hospital, Cairo	> 50 cases
October 2001	Wady Al-Nile Hospital, Cairo	> 50 cases
April 2003	National Liver Institute, Menoufiya (Reactivated)	> 20 cases
March 2003	Mahmoud Charity Hospital, Cairo	< 5 cases
September 2003	Maadi Military Hospital, Cairo	< 5 cases
October 2003	Ahmed Maher Teaching Hospital, Cairo	< 5 cases
Early 2003	National Cancer Institute, Cairo (Suspended in the same year)	2 cases only

**Figure 1** - Kaplan-Meier cumulative survival curve in 73 living donor liver transplantation performed in Egypt.

(the procedure was aborted without transplantation due to advanced malignancy). Late deaths were due to recurrent HCV cirrhosis in one patient, sepsis in one patient, and chronic rejection in one patient. Biliary complications were encountered in 8 patients (11.9%); this included simple bile leak in 4 patients, and biliary obstruction in 4 patients; out of those 8 patients, 5 responded to non-surgical management, and 3 required biliary reconstruction. One patient had hepatic artery thrombosis, and the graft was salvaged by early surgical revascularization. Almost all donors were related to their recipients, however, a few unrelated donations were performed by some centers. Sadly, there was one reported donor death; he donated the right lobe of his liver to his sick brother, the surgery was followed by a bile leak and intra-abdominal collection; this was immediately tackled by the medical team, but unfortunately he rapidly deteriorated into overwhelming sepsis and multi-organ failure leading to his tragic death one month following the procedure. The average cost of the LDLT procedure (both donor and recipient surgeries) was variable depending on the nature of the health institute providing the service, in private based institutes the total cost was approximately \$70,000, while in governmental institutes the price dropped remarkably to around \$15,000 for pediatric LDLT and \$25,000 for adult LDLT.

Discussion. In Egypt, many factors have contributed to the recent speedy launch of several successful LDLT programs. The ever-increasing numbers of patients who are in desperate need of liver transplantation with the failure of the Egyptian government to legalize cadaveric organ donation has created a very difficult situation facing medical health care in Egypt. However, the return of many

Egyptians successfully transplanted abroad has proved to the public the success rates of such procedures, and has further increased the pressure on the government to introduce such services. Finally, the reported high success rates of adult-to-adult LDLT have encouraged some private health care providers in Egypt to consider developing their own private LDLT programs with the help of experienced overseas teams. In late 2001, this collaboration between those private medical centers and overseas surgical teams resulted in the speedy launch of successful LDLT programs in Egypt.

Although LDLT is known to offer excellent quality grafts, which can be transplanted with optimal timing and is associated with extremely high success rates,⁶ however, there are many concerns regarding the rapid unplanned expansion of LDLT programs in different medical centers in Egypt. Donor safety is one major concern; and although donor mortality is very rare, it has been reported in this study and others,^{7,8} and is an unacceptable catastrophe. It has been shown in previous studies that donor morbidity and mortality after LDLT strongly correlate to centers' experience.⁹ Therefore, initial mandatory training and coaching by an experienced surgical team should be implemented for all centers starting LDLT in Egypt; this will help the starting centers to bypass the negative impact of the learning curve process. Moreover, any medical center offering LDLT should be rigorously inspected and accredited by the Ministry of Health to ensure the safety of both donors and recipients. An Egyptian liver transplant registry should be established, and all LDLT centers should report their results to the registry regularly. An independent committee should regularly examine the data from the registry and assess the performance of different LDLT

centers. Any LDLT center that shows a pattern of poor outcome, or malpractices should be immediately investigated and, if necessary, suspended from undertaking such procedures.

Obtaining an informed consent from donors is another very sensitive issue considering that most Egyptians have very strong family relations, and they will usually react to such difficult situations in a very emotional way. Approaching donors in such emotional circumstances requires great skill and should be performed by professionals to ensure that the donor truly gives informed consent without "emotional blackmail." Perhaps, providing an independent donor advocate will ensure their safety and secure their medical and legal interests.

One other major concern that is strongly linked to live donation is the likelihood of organ donation for money; this concern cannot be ignored especially in Egypt where there is a high poverty rate. The Egyptian government in collaboration with the Egyptian Medical Syndicate has already taken firm measures to prevent such illegal practices; however, it is of utmost importance to monitor all LDLT centers and handle any malpractices in a swift and firm manner.

Costs are another legitimate concern in Egypt; it has been argued whether few patients should benefit from LT when there are many others who do not receive medication for common diseases? Who will absorb the high costs of this expensive procedure? Currently, most LDLT procedures have been performed in private medical centers, and the individuals have covered the costs either entirely or partially. At present, and without effective health insurance systems, LDLT is only offered to those who can afford it.

The lack of cadaveric back up for LDLT in Egypt is worrisome; especially in donors that might develop severe hepatic insufficiency necessitating urgent liver transplantation. It is also worrisome that the rapid expansion in LDLT programs might deter the efforts to legalize cadaveric organ donation in Egypt.

Finally, we believe that the recent rapid evolution of LDLT programs in Egypt is a significant step forward; and although almost all cases were carried out with the help and support of overseas experienced teams, we are hopeful that our local

teams will be able to take over in the near future. We also trust that this remarkable success in live organ donation programs will not deter the efforts to legalize cadaveric organ donation in Egypt.

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