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Original Article

Donor outcome in live-related liver transplantation

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ABSTRACT

Background: Live donor liver transplant has become an accepted, effective and lifesaving alternative to deceased donor transplant. The effect on donor and his safety remains a cause of concern. The donors are all in productive age and in our setting may have to go back to active service. This study is aimed at knowing the results of donor hepatectomies at our centre.

Methods: Data of all donor hepatectomies done at our centre from Apr 2007 to Jun 2013 reviewed. This included the preoperative workup, operative details and postoperative follow-up.

Results: 35 Donors of age between 20 and 50 years were taken up for procedure of which one was abandoned due to haemodynamic instability after intubation. In the 34 procedures done the percentage of the residual liver was at least 30%. No donor required blood transfusion. The overall complication rate was 26.5% which was stratified according to the modified Clavien classification of postoperative complications. There was transient rise of bilirubin and liver enzymes in all which returned back to normal with time. Infections were the most common cause of complication. All the donors had gone back to their work after a mean of 42 days after surgery. All donors were willing to donate again if needed.

Conclusion: Living donor liver transplant a widely practiced modality for end-stage liver disease. It is a safe procedure with good recovery and results. Our study shows that meticulous selection criteria and strict adherence to protocols leads to good outcome.

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Introduction

With the organ shortage due to various reasons, live donor liver transplantation (LDLT) is the only lifesaving alternative to deceased donor liver transplantation (DDLT) for patients with end-stage liver disease.¹ We at our centre perform both

DDLT and LDLT with similar and satisfactory recipient outcome. The primary concern of LDLT programs remains donor hepatectomy outcome being an ultra-major surgery in a healthy individual. Donors are in their productive age and some of them are serving personnel who have to go back to active service. Several studies have reported outstanding

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outcomes of LDLT donors. This article reviews the profile, preoperative workup, postoperative results and follow-up of donor hepatectomies done by us. Intention of study was to compare our results with others and based on this define the employability restrictions till they return to fully active life.

Materials and methods

Between Apr 2007 and Jun 2013, 34 LDLT procedures were performed at our institution. All donor and recipient data maintained at the centre were reviewed and studied.

The donor selection was strictly followed as per the protocol of our centre. We accepted donors between ages of 20–50 years who were medically, psychological fit. All were evaluated preoperatively for qualitative, anatomical and quantitative status of liver. For this all were subjected to triple phase computed tomography scan of abdomen and magnetic resonance cholangiopancreatography (MRCP). Those with focal or diffuse liver disease and anatomical variation thought to be detrimental to donor safety were rejected. Steatosis was assessed by calculating liver attenuation index (LAI). LAI between 5 and 15 was accepted and those with LAI of –5 to 5 were subjected to liver biopsy. Steatosis of less than 20% was accepted. A minimum remnant liver volume of 30% on volumetry is mandatory.

During the operative procedure care was taken to adhere to standard steps. The procedure is started with cholecystectomy and intraoperative cholangiography. Parenchymal transection was done without any hepatic vascular occlusion (Fig. 1). After resection minor and major bile leak was detected with saline test and repaired. Before closure an intra op cholangiogram was repeated to see the anatomy of the remaining biliary tree. Postoperatively all patients were empirically given antibiotics for 5 days.

The follow-up included fortnightly visits for first two months, then monthly visits for the subsequent 4 months, and then yearly recheck. Additional visits outside the routine follow-up were done as and when required. During each visit routine haemogram, liver function test were done. Sonography was performed on all donors at 6 weeks postoperatively to

Fig. 1 – Donor parenchymal resection without vascular occlusion.

Table 1 – Preoperative donor details.

Data	Numbers/ Mean	Percentage/ Range
No. of persons underwent surgery	35	80%
Procedure abandoned	1	3%
Age	44.4	23–51
Sex		
Male	8	23.5%
Serving personnel	5	17.5%
Female	26	76.5%
Donor relationship to the recipient		
Biologically related	22	64.7%
Parent	18	52.9%
Child	2	5.8%
Sibling	2	5.8%
Non biologically related	12	35.3%
Wife	12	35.3%
Husband	Nil	–
Investigations		
Bilirubin	0.8	0.2–1.3
Alkaline phosphatase	68	36–96
Liver attenuation index	6.6	–3 to 12.3
Total liver volume (ml)	1036	946–1234
Residual liver volume (%)		
Rt. Without MHV	31.6%	30–36.4%
Rt. With MHV	30.3%	30.3%
Lt. lobe	46.7%	42.1–49.5%
Lt. lateral	70.4%	68.6–75.0%

see the status of the residual liver. Early complications were taken as those occurring within 30 days post surgery. We classified postoperative complications among liver donors according to the widely accepted Clavien system.^{1–3} At the end of 6 months donor was asked whether they were willing to donate again if required. This was done with assumption that it will act as a surrogate marker of their experience.

Results

A total of 35 donors were taken up for hepatectomy at our centre. In one the procedure has to be abandoned after intubation because intraoperative haemodynamic instability. We had no donor mortality and all donors are well at the endpoint of follow-up. The mean follow-up of 34 donors is 9 months (range 3–36 months). The preoperative profile of the donors is as per Table 1. The total volume of liver resected from donor ranged from 946 to 1234 mL and range of remnant liver was

Table 2 – Intraoperative data of donor surgery.

Data	Numbers/ Mean	Percentage/ Range
Surgery		
Left lateral segmentectomy	9	26.5%
Left hepatectomy	6	17.6%
Right hepatectomy with MHV	1	2.9%
Right hepatectomy without MHV	18	52.9%
Operative time (mins)	410	366–512
Blood loss (ml)	215	0–600

Table 3 – Postoperative complications.

Complications	Total (%)	Left lateral segmentectomy	Left hepatectomy	Right hepatectomy with MHV	Right hepatectomy without MHV
Deaths	0	—	—	—	—
Early complications	8 (24)	—	1	1	6
Surgical site infection	6 (18)	—	1	1	4
Pneumonia	1 (3)	—	—	—	1
UTI	1 (3)	—	—	—	1
Late complications	1 (3)	—	—	—	1
Raised liver enzymes	1 (3)	—	—	—	1
Mean hospital stay	14.3	8.9	12.7	13	13.5

349–715 mL. The percentage of the residual liver was 30–36.4% following right/left hepatectomy. Operative details of donor hepatectomy are as given in Table 2. The mean intensive care unit stay was 48 h. No donor received any transfusion during or after surgery. All donors exhibited transient liver enzyme elevations, hyperbilirubinemia, hypoalbuminemia, and abnormal prothrombin time (Table 3). There has been no significant difference in the level of AST, ALT and INR elevation in different types of donor hepatectomy. The biochemical profiles normalised in 33 patients within 7 postoperative days. One patient continued to have raised enzymes beyond first week and was taken as a late complication. Other postoperative complications are summarised in Table 4. Postoperative surgical complications were stratified according to the modified Clavien classification of postoperative complications (Table 5). The overall complication rate was 26.5% and no donor suffered a life-threatening complication (Clavien grade IV). The majority of postoperative complications (78%) were stratified as Clavien grade I complications in the form of prolonged hyperbilirubinemia and surgical site infection. Eight donors (23.5%) developed a complication in the early postoperative period and 1 donor (3%) suffered a complication after the initial discharge from the hospital. Early complications included surgical site infection in six donors (17.7%), bacterial pneumonia and urinary tract infection in one each. None of them required any surgical intervention. After the initial discharge from the hospital, one donor (3%) had raised liver enzymes, which resolved after 6 weeks without any intervention. None of the donors had other late complication in the form of incisional hernia, keloid, hypertrophic scar, chronic pain, nor had to be readmitted to the hospital or required some other form of reoperation relating to the previous liver donation (Fig. 2). All the donors had gone back to their work after a mean of 42 days after surgery. All donors were willing to donate again if needed.

Discussion

With the shortage of cadaveric donors living donor liver transplantation today is an established modality of treatment for end-stage liver disease.^{3–5} The safety of the donor is of paramount importance for the success of LDLT in any centre. Results from numerous centres have shown that careful donor selection and not deviating from standard laid down steps and procedures are the two most important factors for successful outcome of donor hepatectomies.^{6,7} We rigidly applied this to our programme and it worked to our advantage. The intraoperative time and blood loss we had has compared well with those of other authors.⁸ We had to abandon the procedure in one due to haemodynamic instability immediately after intubation the cause for which could not be found inspite of extensive investigations.

With the absence of a worldwide registry for living liver donation, the accurate estimation of donor mortality and morbidity is almost impossible. Sporadic donor deaths have been reported from centres across the world and the overall mortality rate is estimated to be 0.08–0.5%.^{9–11} In our series no donor mortality and no donor suffered a life-threatening complication. We had morbidity rate of 26.5% in 34 donor hepatectomies performed during the study period. The intraoperative and post-operative complications of donors in the reported series vary from 9% to 67% with centres and surveys across the United States and Asian countries generally reporting lower figure as compared to European centers.^{1,12} There was no marked difference observed in donor morbidity between right lobe with or without MHV, left lobe or left lateral lobe hepatectomy, however, right lobe/left lobe donors underwent an operating procedure of longer duration. Statistical significance could not be drawn because of small numbers in each group. As per literature right lobe donation

Table 4 – Grades of postoperative complications.

Clavien's grade	Total (%)	Left lateral segmentectomy	Left hepatectomy	Right hepatectomy with MHV	Right hepatectomy without MHV
I	7 (20.6)	0	1	1	5
II	2 (6.0)	0	0	0	2
III	0	0	0	0	0
IV	0	0	0	0	0
V	0	0	0	0	0

Table 5 – Postoperative levels of liver function tests.

		POD 1	POD3	POD 7
Bilirubin (mg/dl)	Left lateral segmentectomy	1.8–2.9	1.5–2.0	0.6–1.6
	Left hepatectomy	1.9–2.4	1.9–2.0	0.8–1.8
	Right hepatectomy with MHV	5.6	4.8	2.0
	Right hepatectomy without MHV	1.9–4.9	1.9–4.6	0.7–3.5
AST (IU/L)	Left lateral segmentectomy	176–248	118–202	34–70
	Left hepatectomy	186–445	124–404	38–60
	Right hepatectomy with MHV	356	234	56
	Right hepatectomy without MHV	213–345	158–444	66–405
ALT (IU/L)	Left lateral segmentectomy	114–202	78–184	24–62
	Left hepatectomy	240–450	98–284	36–66
	Right hepatectomy with MHV	376	222	59
	Right hepatectomy without MHV	188–446	78–390	45–330
INR	Left lateral segmentectomy	1.3–1.6	1.2–1.6	1.0–1.2
	Left hepatectomy	1.4–1.8	1.2–1.8	1.0–1.2
	Right hepatectomy with MHV	2.1	1.9	1.3
	Right hepatectomy without MHV	1.4–1.9	1.2–1.8	1.1–1.4

was associated with prolonged hospital stay, increased blood transfusions and prolonged operating time when compared with left and left lateral lobe donation, whereas donor mortality and morbidity did not differ between these groups.¹³ As regards to the morbidity of our donors, surgical site infections (17.7%) were the most common postoperative complications. In living donors, the reported rate of infections complication is 9–19%.^{1,5,14} The other complications that can occur specific to liver resection are hepatobiliary complications in form of bile leak, formation of bilioma, biliary strictures, ascites, and liver failure. The long-term complications that have been reported are chronic pain, keloid formation, incisional hernias and intestinal obstruction. The low incidence of postoperative

complications and especially the low incidence of biliary complications after donor hepatectomy could be attributed to the experience and the stringent donor protocol being followed in our transplant centre.

In our series donors presented postoperatively with increase in serum bilirubin, enzymes and deranged INR more in right hepatectomy donors as compared to those after left lateral segmentectomy. However because of the small numbers a proper subgroups analysis could not be carried out. The biochemical derangement has been studied by other authors and liver function tests return back to normal with time though regeneration to the pre-resection volume is less than complete even after 2.5 years of follow-up.¹⁴

According to one study ninety percent of them returned to the same jobs but about 10% of donors would not donate again if there was such a need.^{1,9,14} We had 5 serving personnel as donors and as for any major laparotomy procedure we advised them sheltered appointment for one year after which all have returned to active service without any problem. All our donors stated their willingness to donate again if need arose. The reason could not only be because the experience was satisfactory but also that because they had donated to save life of their loved ones.

Conclusion

Living donor liver transplant is an accepted and widely practiced modality for treatment of end-stage liver disease. Donor safety has always been of paramount importance. Our centre had very good outcome following donor hepatectomies and all of them returned to their pre-donation work within reasonable period. Their willingness to donate again also further reinforced our results. Meticulous workup and strict adherence to protocols was the major reason we attribute for this.

Conflicts of interest

All authors have none to declare.

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Fig. 2 – Scar 3 months after surgery.

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