



Recipient body size does not matter in pediatric liver transplantation



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ABSTRACT

Background and purpose: It is controversial whether small size recipient is associated with adverse outcome in liver transplantation. This study aims to evaluate the outcomes of pediatric liver transplantation according to body weight of recipients.

Methods: Liver transplant recipients (age <18 years, from 1993 to 2011) were studied retrospectively. They were categorized according to the body size at the time of transplantation (A: <6 kg; B: between 6 kg to 10 kg; C: >10 kg). **Results:** A total of 113 patients (83 LDLTs and 30 DDLTs) were studied. Thirteen (11.5%) belonged to group A, 56 (49.6%) belonged to group B, and 44 (38.9%) belonged to group C. The best graft and patient survivals were found in group A (Figs. 1 and 2), and none of the patients required re-laparotomy for general surgical complications, while 32 patients (32%) in groups B and C did. Regarding transplant-related complications, although group A patients had the highest incidence of biliary tract complications (38.5%, $n = 5$), the incidence of vascular complications (hepatic artery: 7%, portal vein: 0%, hepatic vein: 0%) in this group was the lowest among the three groups. **Conclusion:** Outcomes of small-sized recipients are not inferior. Less technical-related vascular complications, which may lead to early graft loss, were observed. This could be patient-related (less advanced cirrhosis) or surgeon-related (additional attention paid).

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Despite the advancement in the treatment of liver diseases in children, liver transplant is still indicated in some diseases that progress to acute or chronic liver failure. Transplantation surgery in children is always challenging and technically demanding. Meticulous hemostasis and accurate anastomosis are required for successful outcomes. Some studies have reported a worse outcome in liver transplant for young children when compared to adults [1–3]. In our opinion, a lower body weight is probably more reflective of the underlying nutritional status and body reserve. In this study, we evaluate the outcomes of pediatric liver transplantation with reference to their body weights at the time of surgery.

1. Patients and methods

The first pediatric liver transplantation in our center was performed in 1993. Since then, a total of 120 cases (primary transplantation and retransplantation) have been completed. Techniques for living donor liver transplant (LDLT) and deceased donor liver transplant (DDLT) are standardized and have been described previously [4,5]. In both procedures, after total hepatectomy, vascular and biliary anastomoses were performed using fine absorbable sutures. In the early postoperative

period, patients would stay in the intensive care unit with management under our standard protocol. Bedside Doppler ultrasound to assess vascular flow was performed at least once daily within the first two weeks after operation. Upon discharge, all patients have lifelong follow-up in our outpatient clinic at regular intervals.

In this study, the medical records of liver transplant recipients (age at operation <18 years, from 1993 to 2011) were reviewed retrospectively. Cases of retransplantation were excluded. This study has been approved by the institutional review board of our hospital. To evaluate the outcomes of these patients with respect to their body size, they were categorized according to the body weight (BW) at the time of operation (A = less than or equal to 6 kg; B = between 6 kg to 10 kg; C = above 10 kg). As previous reports have shown a higher complication rate and more surgical difficulties in vascular reconstruction at 6 kg and 10 kg recipients [6,7], these two body weight values were chosen as the landmarks for comparison in this study. Demographic data including body weight, gender, indications for operation, pretransplant Paediatric End-stage Liver Disease (PELD) score and general status before transplantation would be presented. The main outcomes to be evaluated include general surgical complications, vascular complications, biliary complications as well as graft and patient survival. Statistical analysis was done using IBM Statistical Package for Social Science, version 20.0. Continuous variables were expressed as median (range) and compared using the Kruskal–Wallis test. Categorical variables were compared using the chi-square test. A p -value of less than 0.05 was considered to be statistically significant. Graft and patient survival after liver transplantation were estimated by the Kaplan–Meier survival method.

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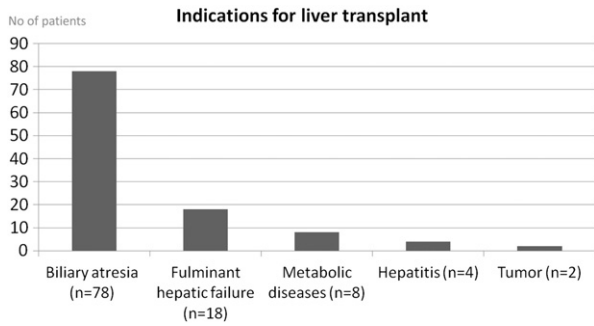


Fig. 1. Indications for liver transplantation in pediatric patients.

2. Results

During the study period, there were 120 liver transplantations performed. However, 7 cases were excluded from the present study because they were retransplantations. Among the 113 cases, 83 were living donor liver transplants (LDLTs) and 30 cases were deceased donor liver transplant (DDLTs). There were slightly more female than male patients (female/male = 58:55). The youngest patient at the time of transplantation was a full term baby girl at the age of 46 days with body weight 4.4 kg. The median follow-up period was 8.5 years (range, 3 months to 17 years). The indications for liver transplant included biliary atresia ($n = 78$), fulminant hepatic failure ($n = 18$), metabolic diseases ($n = 8$), hepatitis ($n = 4$), tumor ($n = 2$) and others ($n = 3$) (Fig. 1).

Background information of the studied patients is summarized in Table 1. Of the 113 patients, 13 (11.5%) belonged to group A ($BW \leq 6$ kg); 56 (49.6%) belonged to group B ($BW 6$ kg to 10 kg) and 44 (38.9%) belonged to group C ($BW > 10$ kg). For the pretransplant status, the median PELD scores were 10 (range: 8 to 20), 12 (– 10 to 23) and 14 (8 to 32) in group A, B and C respectively ($p = 0.67$). The highest median bilirubin level ($\mu\text{mol/L}$) before transplantation was found in group C (154, range: 34 to 334), followed by group B (92, range: 10 to 224) and group A (86, range: 56 to 154) ($p = 0.26$). As expected, group A has the lowest median graft weight (gram) (225, range: 185–364). However, there is no statistical significance difference in the estimated standard liver volume among the three groups. Twenty-six (23.0%) patients needed intensive care unit admission before transplantation.

While the overall one-year graft survival was 84.1.7% (95/113), the results in different groups (A/B/C) were 100%, 80.4% and 84.1% respectively ($p = 0.07$) (Fig. 2). The overall patient survival at 1 year was 88.5% (100/113). The results in different groups were 100% in group A, 85.7% in group B and 88.6% in group C ($p = 0.08$) respectively (Fig. 3).

Table 1 Demographic and characteristics of patients in groups A, B and C.

	Group A	Group B	Group C	<i>p</i> Value
Body weight	≤ 6 kg	6 kg to 10 kg	≥ 10 kg	
No. of patients	13	56	44	
Body weight (kg) ^a	5.4 (4.4–5.9)	8.6 (6.1–9.9)	14.8 (10.1–68.9)	0.02
Indications				
Biliary atresia	8	40	30	
Nonbiliary atresia	5	16	14	
Pretransplant bilirubin level ($\mu\text{mol/L}$) ^a	86 (56–154)	92 (10–224)	154 (56–334)	0.26
PELD score before transplantation ^a	10 (8–20)	12 (– 10–23)	14 (8–34)	0.67
Graft weight (g) ^a	225 (185–364)	295 (165–450)	385 (200–1385)	0.03
Estimated standard liver volume (%)	120 (106–165)	103 (60–205)	85 (39–150)	0.07

^a Median (range).

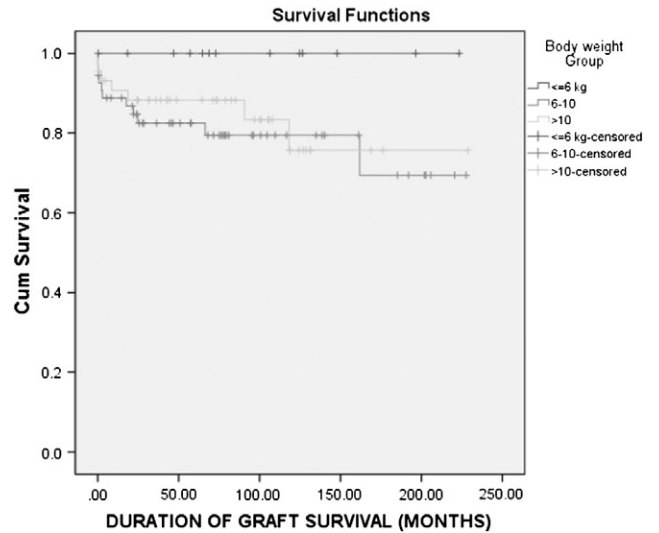


Fig. 2. Graft survival curve in groups A, B and C.

Incidence of surgical complications was summarized in Table 2. Regarding the incidence of general surgical complications, none of the patient in group A required relaparotomy for surgical complications while 32 patients in groups B and C did. For complications specific to liver transplantation, the overall incidence was 37.2% (42/113). There were 5 patients who suffered from hepatic artery thrombosis in the early postoperative period. Three came from group C and the other two patients were from group A and B respectively. They all required reoperation and this resulted in one graft loss in group C. Portal vein complications (stenosis/thrombosis) ($n = 13$) were most common in group B ($n = 9$). The remaining 4 patients belonged to group C. On the other hand, there were no patients from group A suffering from portal vein complications. There were only two patients in group C who suffered from hepatic vein/vena caval complications. Incidence of biliary complications (stricture and leakage) was 19.4% (22/113). Seventeen cases were stricture and five cases were leakage. The highest incidence of biliary tract complication was found in group A (38.5%, $n = 5$), followed by group B (21.4%, $n = 12$) and group C (11.4%, $n = 5$), ($p = 0.25$).

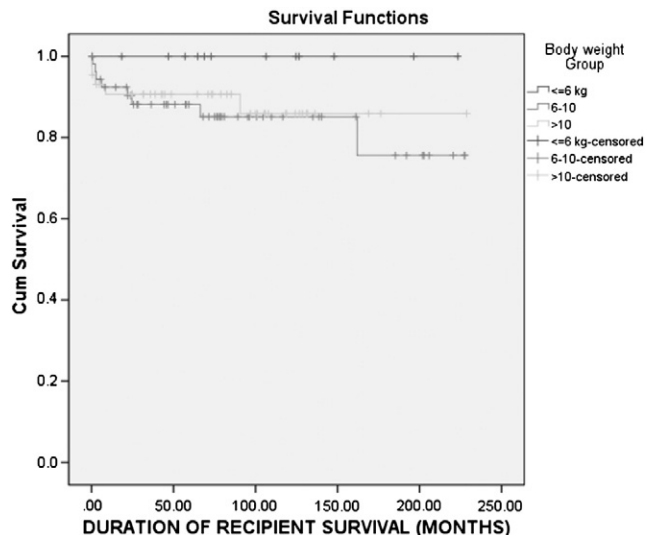


Fig. 3. Recipient survival curve in groups A, B and C.

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