Live donor profile in paediatric liver transplantation: a three-year experience

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Abstract

Introduction: Liver transplantation for paediatric patients was started in Sri Lanka in 2020, focusing on living donors. This retrospective study examines the donors evaluated at the Colombo North Centre for Liver Disease for the first twelve paediatric liver transplants.

Methods: Related donors and undirected donors were encouraged. Donor assessment was done in stages: initial screening, haematological investigations, imaging, and ethical approval. Twelve donors were selected for ethical approval and donor surgery.

Results: A total of 36 donors underwent workup. 24 were rejected, and 12 were accepted. The reasons to reject were abnormal LFTs and fatty liver disease 16 (67%), the presence of comorbidities 5 (21%), and unfavourable anatomy 2 (8%). In one donor (4%), surgery was abandoned due to rising intraoperative lactate levels. Of the rejected group, 17 were males and 7 were females, and the median age was 33 (Range 43-20) years.

12 donors (7 related and 5 non-related) had a median age of 33 (range 25-41) and a median BMI of 19.25 (16.3-22.5) and a male-to-female ratio of 7:5. Left lateral sector donation was done in 6 while left lobe donation in 4 and right lobe donation in 2 were done respectively.

Conclusion: Fatty liver disease was the predominant cause of donor disqualification. Living donor paediatric liver transplantation is feasible in the Sri Lankan setting. It would be a safer option due to the detailed donor workup given the high prevalence of fatty liver disease in the population.

Introduction

Liver transplantation is the only curative treatment for end-stage liver disease. Due to the complexity of the procedure and lack of supporting infrastructure, the progress of liver transplantation has been slow in Sri Lanka. Cadaveric donor livers are the primary source of organs in the West, while live donor liver transplant (LDLT) has taken the lead in the East and Middle East [1]. Paediatric liver transplantation is even more challenging considering the expertise needed in medical management, technical challenges in inflow and outflow reconstruction and management of graft size [2].

In this background, LDLT for paediatric patients was started in Sri Lanka in 2020, focusing on living donors [3]. This retrospective study looks at the donors who were evaluated in the Colombo North Centre for Liver Disease for the first twelve paediatric liver transplants.

Methods

The donor assessment process was started once the child was listed for liver transplantation. Related donors and undirected, unrelated donors were encouraged. In the first consultation, a detailed meeting was held with the donor and his/her family to explain the surgery using a standard information leaflet. There were 36 donors evaluated for the 12 LDLTs performed. Donor assessment was done in three stages.

1. Basic clinical evaluation and haematology

At the first contact, donors were explained in detail about the donation process and the risks. Background social status and medical history were evaluated. Donors between 21 to 45 years were evaluated. Donors with medical comorbidities, clear history of blood bone infections, malignancies and doubts in consent were not evaluated further. Previous donation of a kidney was considered a relative contraindication at this point of the transplant program.

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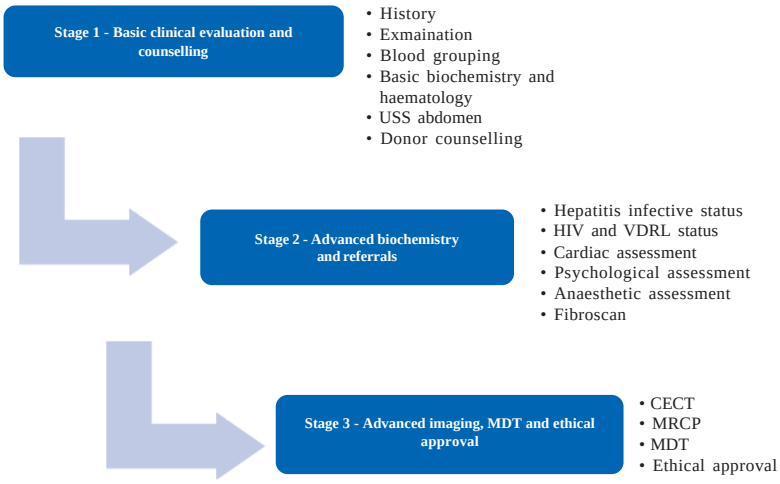

Figure 1. **The stages of donor workup.**

Potential donors' liver profile, renal profile, lipid profile, blood count and diabetic status were assessed. All patients underwent ultrasound scans by a single assessor to assess the presence of fatty liver and liver anteroposterior and lateral lengths. The surgical team evaluated the results, and suitable candidates were evaluated further.

2. Advanced biochemistry and referrals

The donor underwent a detailed assessment of infective status and metabolic status. Donors' cardiac status, dental assessment, psychological fitness for surgery, and anaesthetic assessment were done at this stage. All donors underwent a fibro scan.

3. Imaging

Finally, donors underwent triphasic CT abdomen with portal vein, coeliac axis angiogram, and magnetic resonance cholangiogram (MRC). After evaluating the CT scan, the donors' final anatomical suitability was assessed. Donors with complex anatomical variations were excluded. The transaction plane was indicated to the radiologist before the volumetric assessment, which was done using OsiriX MD software. Recipient graft recipient weight ratio (GRWR) between 1.5 and 4 was considered optimal.

Once the medical assessment was completed, donor and recipient details were submitted to the Ethical Review Committee at North Colombo Teaching Hospital, Ragama for approval. Eventually, 12 donors completed the donation.

A fast-track donor workup was done in the case of acute liver failure. Emergency approval was obtained from the Director General of Health Services. This expedited workup was done within 12 hours in our setup with the support of the clinical and para-clinical teams.

Results

Thirty-six donors underwent workup. 24 were rejected, and 12 were accepted. The reasons to reject were abnormal LFTs and fatty liver disease 16 (67%), the presence of comorbidities 5 (21%), and unfavourable anatomy 2 (8%). In one donor (4%), surgery was abandoned due to rising intraoperative lactate levels.

Only 33% of the potential donors completed donation. Fatty liver disease and abnormal liver biochemistry were the commonest reasons for turning down. Twelve successful donors (7 related and 5 non-related) had a median age of 33 (range 25-41) and a median BMI of 19.25 (16.3-22.5) (Table 1). Seven were males, and five were females. Left lateral sector donation was done in 6, left lobe donation in 4 and right lobe donation in 2 were done respectively. None of the donors had postoperative complications.

Table 1. Perioperative data of the successful donors

Donor Number	*Recipient indication for transplant*	*Donor age*	*Relationship*	*Donor segment*	*Graft weight (g)*	*Residual volume*		*Blood loss (days)*	*ICU stay (days)*	*Hospital stay (days)*
						ml	*%*			
1	PFIC type 3	38	Mother	LLS	309	868	83.6	150	3	4
2	Seronegative autoimmune liver disease	37	Mother	LLS	285	663	77.2	330	3	5
3	Wilson' disease	25	Monk	RL	459	330	40.3	550	3	4
4	Auto immune hepatitis	25	Monk	RL	450	346	41.2	600	2	5
5	Sero-negative autoimmune hepatitis	36	Father	LLS	245	902	81.2	350	3	12
6	Biliary Atresia	33	Monk	LLS	296	832	76	350	2	11
7	Wilson's Disease	43	Father	LLS	236	767	87.1	100	2	7
8	Sero negative autoimmune hepatitis	28	Monk	LL	318	493	51	450	2	6
9	Biliary atresia (Kasai not done)	33	Mother	LL	153	1006	76.8	300	2	4
10	Wilson's Disease	29	Mother	LL	436	746	66.1	550	2	7
11	Sero negative autoimmune hepatitis	27	Mother	LLS	200	-	-	400	3	10
12	Wilson's disease	37	Monk	LL	349	866	70.6	500	3	5

PFIC – progressive familial intrahepatic cholestasis, LL – left lobe, RL–- Right lobe, LLS – Left lateral sector.

Table 2. Indications for rejection of the donor

Reason for rejection	*Percentage*
1. Fatty liver disease	67% (16)
2. Other comorbidities	21% (05)
3. Unfavourable anatomy	8% (02)
4. Other – high lactate	4% (01)

Discussion

Out of 836 potential liver donors evaluated, 12 donated to paediatric recipients. The commonest reason for rejection was related to NAFLD. The 12 donors had an uncomplicated recovery. Paediatric liver transplantation differs from adult LT due to the need for a smaller graft. LDLT and in situ or back table split of a deceased donor graft are viable options for obtaining smaller grafts in paediatric liver transplantation [4].

Data comparing split and living donor liver transplants have shown no overall difference in the outcome [5]. However, when the left lateral segment living donor and disease donor grafts were evaluated, a better outcome was seen with live donors [6]. Much lower rates of graft dysfunction and arterial complications were reported with living donor grafts. This is an interesting observation relevant in the Sri Lankan setting, where a large proportion of our population has an ultrasonically detectable fatty liver [7]. The absence of significant fatty liver is a selection criterion for a liver split [8]. Further accurate, objective assessment of the presence of fatty liver is a practical challenge in our cadaveric donor assessment. Short ICU stay and minimum inotropic requirement are some of the other criteria considered before accepting a liver for splitting. In Sri Lanka, most donor offers have an ICU stay of more than five days with high inotrope requirement by the time brain stem testing and consenting are done. Considering all LD split may be a pragmatic option for our patients.

Our previous data demonstrated that almost half of our donors were turned down due to the presence of fatty liver [9]. However, conversion rates were higher in donors for paediatric patients. In the paediatric donor pool, parents and other potential donors were much younger and good candidates for LD. In comparison, donors of the adult recipients were much older, leading to poor-quality livers in them. Their siblings were in an older age group and had poor-quality livers [10].

Some LDLT programs in Asia have reported good outcomes using steatotic donor livers [11]. A strict caloric restriction regimen and exercise helped reduce steatosis and improve the outcomes. Since most of the rejected donors had grade two fatty liver, Sri Lanka may have to resort to donor optimisation in the MDT setting.

Another interesting aspect was non-directed altruistic donors. Twelve donors visited the liver clinic with the intention of non-directed donation. Out of them, nine were meditating Buddhist monks. All the monks had low BMI and non-fatty livers. Even though the data are not published, in Sri Lanka, non-related altruistic donation has become the main mode of supplying organs in kidney transplantation. Altruistic non-related donation is gaining momentum in liver transplantation in the West [12]. Organ trafficking and commercial donation is a concern in unrelated donation. Streamlining the approval process for donation and making the clinician accountable for the approval process can strengthen the unrelated altruistic donation.

30 % of the monks had already donated a kidney by the time they volunteered for liver donation, and they were turned down. However, previous data on multiple organ donations indicated its safety [13]. This included liver first, kidney first and lung first. However, we were reserved in selecting these donors considering the stage we were in our living donor liver transplant program.

In conclusion, living donor paediatric liver transplantation is feasible in the Sri Lankan setting. It would be a safer option due to the time available for accurate donor workup and optimisation in a country with a high prevalence of fatty liver disease in the population.

Authors' contributions

All authors contributed to the clinical management of the patient and manuscript writing. All authors read and approved the final manuscript.

Competing interests

None declared.

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Ethical aspects

No ethics concerns identified.

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