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Outcomes of emergent pediatric ABO-incompatible living donor liver transplantation in Korea.

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Background & Methods

- Emergency pediatric living donor liver transplantation (LDLT) is vital for acute liver failure patients facing life-threatening scenarios.

- However, we do not know the outcomes of emergency pediatric ABO-incompatible (ABOi)-LDLT, which is an alternative treatment for patients without ABO-compatible (ABOc) living liver donors (LLDs).

- The purpose of our study is to compare the outcomes between emergency pediatric ABOi-LDLT and emergency pediatric ABOc-LDLT using data from the Korean Network for Organ Sharing (KONOS).

- We analyzed retrospective KONOS data for consecutive pediatric emergency LDLT patients between 2017 and 2021 in Korea.

Results

Table 1. Comparison of pediatric recipients of emergency ABOc or ABOi LDLT

Total (n=53)	ABOc LDLT (n=44)	ABOi LDLT (n=9)	P-value
Sex (male)	16 (36.4%)	6 (66.7%)	0.140
Liver disease progression			0.722
Acute liver failure	32 (72.7%)	7 (77.8%)	
Acute on chronic liver failure	9 (20.5%)	2 (22.2%)	
Critical cirrhosis	3 (6.8%)	0 (0%)	
Age (years)	1.0 (0.3-18)	1 (0.2-12)	0.765
BMI	17.6 (14.2-26.0)	17.9 (14.6-19.8)	0.950
Re-transplantation	6 (13.6%)	0 (0%)	0.574
Hepatic encephalopathy			0.535
None	24 (54.5%)	6 (66.7%)	
Grade I or II	13 (29.5%)	2 (22.2%)	
Grade III or IV	7 (13.2%)	1 (11.1%)	
Hepatorenal syndrome	4 (9.1%)	0 (0%)	0.347
Pre-transplant ICU care	32 (72.7%)	6 (66.7%)	0.701
Pre-transplant ICU stay (days)	3 (1-14)	3 (1-5)	0.656
Pre-transplant ventilator support	18 (40.9%)	4 (44.4%)	0.845
Pre-transplant CRRT	12 (27.3%)	3 (33.3%)	0.713
Ascites	21 (48.8%)	1 (11.1%)	0.037
PELD score	25 (10-40)	33 (22-40)	0.463
PELD score >30	19 (44.2%)	4 (44.4%)	0.989
Wait time (days)	1 (0-7)	1 (0-7)	0.732
GRWR	2.09 (0.86-4.99)	1.75 (0.87-3.18)	0.462

BMI, body mass index; ICU, intensive care unit; CRRT, continuous renal replacement therapy; PELD, pediatric end-stage liver disease; GRWR, graft-to-recipient weight ratio.

Table 2. Comparison of living liver donors for emergency pediatric ABOc and ABOi LDLT

Total (n=53)	ABOc LDLT (n=44)	ABOi LDLT (n=9)	P-value
Sex (male)	15 (34.1%)	1 (11.1%)	0.248
Age	37 (28-50)	35 (25-46)	0.765
BMI	22.1 (17.5-29.4)	22.8 (21.3-32.4%)	0.427
HTN	1 (2.3%)	0 (0%)	0.648
Donor and recipient relationship			
Parents	40 (90.9%)	9 (100%)	0.572
Relatives	4(9.1%)	0 (0%)	
Donor operation			0.018
Open	21 (48.8%)	1 (11.1%)	
Laparoscopic	10 (23.3%)	1 (11.1%)	
Robotic	12 (27.9%)	7 (77.8%)	
Postoperative complications	4 (9.3%)	1 (12.5%)	0.780
Hospitalization	8 (4-17)	8 (4-13)	0.958
Follow-up duration (days)	365 (13-1,265)	368 (43-382)	0.999

BMI, body mass index; HTN, hypertension

Ninety-nine LLDs (92.5%) were the parents of the children in need of transplantation.

There was no difference in any LLD characteristic between the two groups

The incidence of ABOc-LDLT and ABOi-LDLT was 83% (n=44) and 17% (n=9), respectively.

ICU care was required for over 70% of patients as they awaited LDLT.

There was no discernible difference in any of the recipient characteristics between the two groups

Results

Table 3. Recipient outcomes from emergency pediatric ABOc and ABOi LDLT

Total (n=53)	ABOc LDLT (n=44)	ABOi LDLT (n=9)	P-value
Post-transplant ICU stay (days)	8 (3-119)	6 (2-18)	0.159
Post-operative complications	34 (77.3%)	8 (88.9%)	0.665
Post-transplant infectious complications	23 (52.3%)	6 (66.7%)	0.487
Viral infection	12 (27.3%)	5 (55.6%)	0.126
Bacterial infection	15 (34.1%)	4 (44.4%)	0.706
Fungal infection	7 (15.9%)	0 (0%)	0.334
Hospitalization (days)	25 (1-78)	24 (2-42)	0.950
In hospital mortality	2 (4.5%)	0 (0%)	0.514
Rejection			0.438
None	37 (84.1%)	9 (100%)	
ACR	6 (13.6%)	0 (0%)	
AMR	1 (2.3%)	0 (0%)	
Graft failure	6 (13.6%)	1 (11.1%)	0.838
Death	7 (15.9%)	1 (11.1%)	0.714
Cause of death			0.330
Postoperative complications	1 (14.3%)	0	
Graft failure	1 (14.3%)	0	
Infection	4 (57.1%)	0	
Others	1 (14.3%)	1	
Follow up duration	26.9 (0-67.1)	22.3 (0.9-66.9)	0.700

ICU, intensive care unit; ACR, acute cellular rejection; AMR, antibody-mediated rejection

In the ABOc-LDLT group, the incidence of infectious complications was 52.3%, while in the ABOi-LDLT group, it was 66.7%.

The ABOi-LDLT group had the viral infection at a higher rate than the ABOc-LDLT group.

The two groups' median hospitalization periods were identical.

In the ABOc-LDLT group, diagnoses of acute cellular rejection (ACR) (n = 6) and AMR (n = 1) were made.

There was no discernible difference in recipient outcomes between the two groups.

Results

Table 4. Risk factors of pediatric patients receiving emergency LDLT.

Univariate	Patient mortality (n=53, events=8)		Graft failure (n=53, events=7)	
	HR (95% CI)	p-value	HR (95% CI)	p-value
Male sex	1.38 (0.35–5.52)	0.649	1.96 (0.44–8.77)	0.378
Age	1.03 (0.92–1.16)	0.598	1.06 (0.94–1.19)	0.355
BMI	1.03 (0.80–1.31)	0.841	1.06 (0.83–1.37)	0.623
Ascites	0.07 (0.00–1.44)	0.085	0.20 (0.02–1.68)	0.138
Reason for emergent LDLT				
Acute liver failure	Ref	1	Ref	1
Acute-on-chronic liver failure	0.75 (0.11-5.04)	0.764	0.24 (0.01-5.61)	0.373
Pre-transplant ICU care	2.52 (0.31–20.45)	0.389	2.05 (0.25–17.0)	0.508
Pre-transplant ventilator care	2.76 (0.66–11.55)	0.166	1.24 (0.28–5.55)	0.779
Pre-transplant CRRT	4.90 (1.17–20.52)	0.030	2.27 (0.51–10.16)	0.283
Hepatorenal syndrome	6.61 (1.32–33.03)	0.021	1.33 (0.06–28.5)	0.857
Hepatic encephalopathy				
Grade I or II	2.13 (0.43–10.56)	0.355	2.14 (0.43–10.60)	0.352
Grade III or IV	3.03 (0.51–18.18)	0.226	1.46 (0.15–14.05)	0.744
MELD score	1.01(0.94–1.09)	0.763	1.07 (0.98–1.17)	0.117
ABO-incompatibility	1.09 (0.11–1.044)	0.943	1.55 (0.14–17.1)	0.719
Re-transplantation	1.18 (0.14–9.57)	0.879	0.53 (0.03–11.4)	0.687
Post-transplant ICU stay	1.02 (1.00-1.04)	0.067	1.03 (1.00-1.05)	0.041
GRWR	0.38 (0.12–1.16)	0.089	0.44 (0.16–1.23)	0.118

LDLT, living donor liver transplantation; BMI, body mass index; ICU, intensive care unit; CRRT, continuous renal replacement therapy; MELD, Model for End-Stage Liver Disease; GRWR, graft-versus-weight ratio.

The univariate analysis revealed a strong correlation between pre-transplant CRRT and hepatorenal syndrome and death.

In the univariate analysis, extended stays in the ICU following transplantation were linked to graft failure.

In the multivariate analysis, no factors were found to be significant.
Neither graft failure nor death was associated with ABOi-LDLT.

Discussion & Conclusion

- All ABOi-LDLT patients in this study (n=9) survived for five years without acute rejection (AMR or ACR)
- ABOi-LDLT is feasible and safe in emergencies, though planning is challenging due to time constraints and the need for rapid desensitization
- The study's retrospective design and small sample size (9 ABOi cases) may introduce selection bias.
- Emergency ABOi-LDLT is a viable and safe option for pediatric ALF patients when ABO-compatible donors are not available, although further research is needed to strengthen these findings.