Predictors of Renal Function in Pediatric Liver Transplant Recipients

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Background

- Impaired kidney function is a well-recognized complication following liver transplant (LT).[1]
- In adult LT recipients, the cumulative incidence of renal insufficiency is as high as 10% in 10 years.[2]
- The burden of kidney dysfunction is thought to be higher in pediatric LT recipients due to longer exposure to nephrotoxic agents & longer lifespans.[3,4]

Aims

- The aim of the study is to identify predictors of renal function in pediatric LT recipients at Mattel Children's Hospital.

Methods

- This is a retrospective study of pediatric LT recipients between June 2008 to November 2014.
- Clinical characteristics and estimated glomerular filtration rate (eGFR) were obtained at baseline, 6, 12, 24, and 60 months.
- CKD was defined as an eGFR <90 ml/min/1.73 m^2 for a least 3 months post-transplant.
- A Cox Proportional Hazards model was created to determine predictors of progression to CKD post-LT.

Results

- **Table 1** shows the baseline characteristics of patients who developed CKD post-LT compared to those who did not.
- **Figure 1** represents CKD-free survival over 5 years of patient follow-up. By 500 days (1 year and 4 months) post follow-up, 20% of patients had progressed to CKD.
- Age, African American race, tumor diagnosis, baseline eGFR, pre-transplant HD and pre-transplant AKI were associated with progression to CKD post-transplant in bivariate analysis (**Figure 2**).
- In Multivariable Cox Regression analysis, each additional year of age at the time of transplant was associated with increased risk of progression to CKD (HR 1.010, p=0.0001).
- Additionally, higher baseline eGFR was associated with decreased risk of progression (HR 0.992, p=0.0082).
- Although not a primary outcome, the CKD population had a higher unadjusted frequency of death as compared to the non-CKD population (26.9% vs. 9%, p=0.025.)

Table 1: Baseline Characteristics

Variable		CKD n=26	No CKD n=67	p
Age at LT, months, median (IQR)		86.2 (43.0-154.8)	19.4 (10.4-64.4)	0.001
Follow-up time in months, median (IQR)		58.6(25.9-60.7)	59.9(59-61.3)	0.061
Sex, n (%)				0.152
	Male	20 (76.9%)	41 (61.2%)	
	Female	6 (23.1 %)	26 (38.8%)	
Race, n (%)				0.381
	Hispanic	11 (44%)	36 (53.7%)	
	Caucasian	9 (36%)	24 (35.8%)	
	African American	3 (12%)	2 (3%)	
	Asian	2 (8%)	5 (7.5%)	
Primary Diagnosis, n (%)				0.031
	Cholestatic liver disease	8 (30.8%)	39 (58.2%)	
	Fulminant hepatic failure	4 (15.4%)	11 (16.4%)	
	Metabolic liver disease	4 (15.4%)	8 (11.9%)	
	Tumor	9 (34.6%)	6 (9%)	
	Other	1 (3.9%)	3 (4.5%)	
Patient status at LT, n (%)				0.159
	Home	12 (46.2%)	40 (59.7%)	
	Ward	5 (19.2%)	16 (23.9%)	
	ICU	9 (34.6%)	11 (16.4%)	
Height Z Score, mean ±SD		-1.33 +/- 1.8	-1.34 +/- 1.8	0.780
Weight Z Score, mean ±SD		-0.8 +/-1.9	-0.31 +/-1.3	0.550
eGFR, median (IQR)		137.2 (97.5-151)	162 (126.5-238)	0.015
Albumin, mean ±SD		3.5 (3.2-4.2)	3.4 (3.1-3.9)	0.182
INR, median (IQR)		1.2 (1.1-1.7)	1.3(1.2-2.2)	0.261
Bilirubin, median (IQR)		1.8 (0.3-32.6)	11.3(1.1-24.1)	0.408
Hemodialysis Pre-LT, n (%)	Yes	2 (7.7%)	2 (3%)	0.311
	No	24 (92.3%)	65 (97%)	

*Other diagnosis includes: autoimmune liver disease, PNALD, and neonatal hepatitis

Figure 1: CKD-free survival

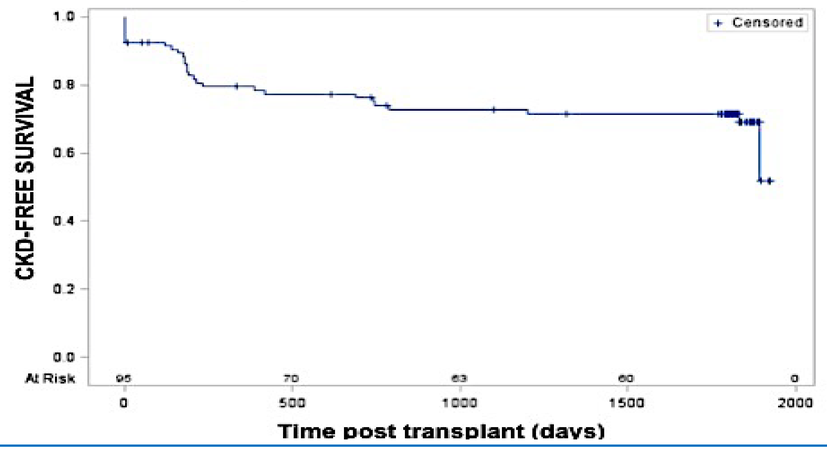
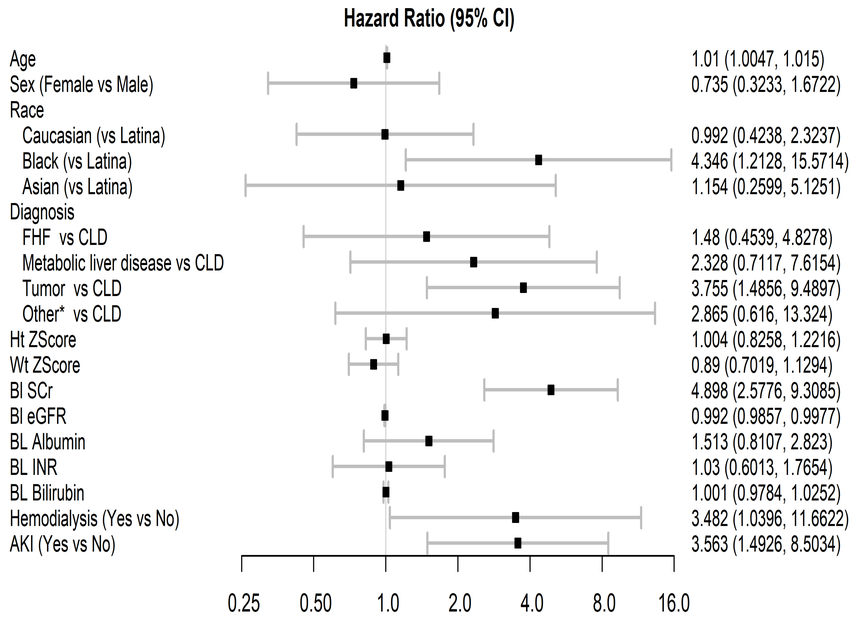


Figure 2: Bivariate Cox Regression Analysis of predictors of progression to CKD



Conclusions

- Younger age and higher baseline eGFR are associated with decreased risk of CKD progression post-liver transplant.
- Further studies are underway to evaluate the role of Tacrolimus exposure in the progression to CKD post-liver transplant.
- Further studies are needed to evaluate whether there is a true increase in mortality in pediatric patients with CKD post-LT

References:

1.K. Campbell *et al.*, "Glomerular filtration rate following pediatric liver transplantation--the SPLIT experience," *Am J Transplant,* vol. 10, no. 12, pp. 2673-82, Dec 2010,
2.B. D. Myers, J. Ross, L. Newton, J. Luetscher, and M. Perlroth, "Cyclosporine-associated chronic nephropathy," *N Engl J Med,* vol. 311, no. 11, pp. 699-705, Sep 13 1984
3.J. C. Bucuvalas, K. M. Campbell, C. R. Cole, and S. L. Guthery, "Outcomes after liver transplantation: keep the end in mind," *J Pediatr Gastroenterol Nutr,* vol. 43 Suppl 1, pp. S41-8, Jul 2006,
4.P. H. Lane, "Puberty and chronic kidney disease," *Adv Chronic Kidney Dis,* vol. 12, no. 4, pp. 372-7, Oct 2005, doi: 10.1053/j.ackd.2005.07.009.

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