Neuro-cognitive and growth delay in infants and children with end-stage liver disease prior to liver transplantation is associated with myopenia after liver transplantation (LTx)

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Background

Myopenia in adults with end-stage liver disease has been associated with increased morbidity and mortality risk before and after liver transplantation (LTx) (1). We recently showed that myopenia or reduced skeletal muscle mass (SMM) occurs in 30-40% of children with end-stage liver disease (ESLD) before and after LTx (1, 2). Myopenia after LTx has been associated with reduced growth, increased hospitalization and length of stay in the peri-operative period and over the longer term rehospitalization (2). While poor growth and neurocognitive delay may be indicative of myopenia risk, no data is currently available. The objective of this study is to investigate the association between neurodevelopment and pre LTx myopenia in children with ESLD.

Hypothesis

We hypothesized that growth and neurocognitive delay before LTx would be associated with myopenia after LTx in children with ESLD.

Methods

We retrospectively studied growth and neurocognitive development in 71 children (0.41-0.91 years) with ESLD (34M/35F) at liver transplant assessment.

Primary Outcomes: 1) Neurodevelopmental Assessment at time of liver transplant assessment 2) Post-LTx body composition.

Neurodevelopmental Assessments

Individual (communication, daily living skill, socialization, motor skill) and composite domain (adaptive behaviour composite) from Vineland Adaptive Behavioral Scales-II performed at LTx assessment were recorded by standard score (SD) and percentile.

Skeletal Muscle Mass

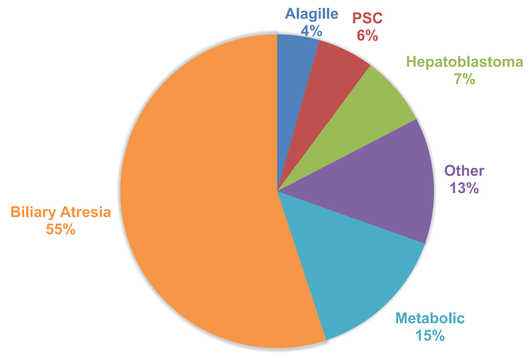
Body composition was measured using Dual Energy X-ray absorptiometry 3-5 years post-LTx. Data was compared to age-matched healthy control data (3). Myopenia was defined as a SMM z-score <-2.

Additional variables included age, sex, liver disease diagnosis, PELD, serum liver biochemistries (AST, ALT, GGT, albumin, total/conjugated bilirubin, PTT, INR), weight-z, height-z, BMI-z, weight-SDS and height-SDS.

Study was approved by the Human Research Ethics Board, University of Alberta (Pro00078499).

Results

Figure 1. Diagnoses at Liver Transplant Assessment (n=69)



Other: Progressive Familial Intrahepatic Cholestasis, Fulminant Hepatic Failure, Alpha-1 Antitrypsin, Choledochal cyst, Caroli's Disease, Neonatal hepatitis

Table 1. Demographic and Anthropometric Data in Children at Liver Transplant Assessment

Variable	Mean	Median	N (%)
Age (years)	0.83 (±0.71)	0.61 (0.41 – 0.86)	
Gender			
M			34 (49)
F			35 (51)
ePELD	30.18 (±8.56)	28.00 (24.00 – 35.00)	
UNOS PELD	13.5 (±14.84)	12.00 (4.25 – 22.25)	
Weight (kg)	7.79 (±2.62)	7.06 (5.98 – 8.70)	
Weight-z	-0.47 (±1.50)	-0.61 (-1.37 – 0.42)	
Height (cm)	67.52 (±9.25)	65.50 (61.20 – 71.00)	
Height-z	-0.93 (±1.36)	-0.92 (-1.73 – -0.06)	
BMI	16.69 (±2.04)	16.37 (15.50 – 17.78)	
BMI-z	0.30 (±3.19)	-0.01 (-0.94 – 0.97)	
Weight velocity Standard Deviatio Score (LTx to time of DEXA)	0.46 (±0.68)	0.62 (-0.11 – 0.75)	
Height velocity Standard Deviation Score (LTx to time of DEXA)	1.48(±1.79)	1.50 (0.62- 2.70)	

BMI: Body Mass Index; PELD: Pediatric End-stage Liver Disease Score; ePELD: exception PELD

Table 2. Vineland Adaptive Behaviour Scales II at Liver Transplant Assessment

Domain	Mean (SD)	>1 SD below mean (%)	>2 SD below mean (%)
Communication	97.81 (±16.13)	17 (24.6)	4 (5.8)
Daily Living Skills	89.03 (±14.51)	26 (37.7)	6 (8.7)
Socialization	92.70 (±14.10)	15 (21.7)	4 (5.8)
Motor Skills	84.17 (±14.03)	41 (59.4)	12 (17.4)
Adaptive Behavior Composite	89.52 (±12.10)	26 (37.7)	6 (8.7)

Vineland Adaptive Behavior Scales-II was performed at liver transplant assessment was collected for 69 patients. The Vineland is a standardized scoring system, with a mean of 100 and standard deviation of 15. >1SD are scores 85 and below, >2SD are scores 70 and below.

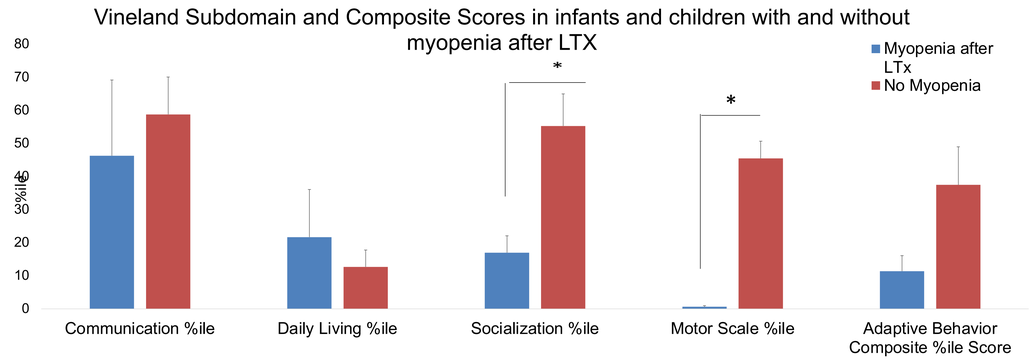


Figure 2: Motor function and socialization scores (standard and percentile) at time of liver transplant assessment is associated with expression of myopenia for up to 5 years after liver transplant (LTx) in infants and children with end-stage liver disease. Body composition was measured using Dual Energy X-ray absorptiometry and myopenia was defined as a skeletal muscle mass-z scores <-2. In this cohort, 30% of children had myopenia. *signifies statistical significance at P <0.05.

Conclusions

- Neurodevelopmental Delay was highly prevalent; affecting up to 60% of children with ESLD at time of liver transplant assessment. Delays in Motor skills are especially prevalent.
- There was a statistically significant difference between children with myopenia in regards to their pre-LTx socialization and motor scale scores.
- Children with neuro-cognitive development may be at higher risk for persistent deficits in SMM after liver transplantation.
- Rehabilitation strategies aimed at identifying and treating myopenia are important in children post liver transplantation.

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References

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