Journal of Advanced Research 8 (2017) 663-668



Contents lists available at ScienceDirect

## Journal of Advanced Research

journal homepage: www.elsevier.com/locate/jare

**Original Article** 

# Pulmonary hypertension and cardiac hypertrophy in children recipients of orthotopic living related liver transplantation $\overset{\text{\tiny}}{\overset{\text{\tiny}}\overset{\text{\scriptsize}}\overset{\text{\tiny}}\overset{\text{\quad}}\overset{\text{\tiny}}\overset{\text{\tiny}}\overset{\text{\quad}}\overset{\end{array}}}\overset{\text{\quad}}\overset{\text{\quad}}\overset{\text{\quad}}\overset{\text{\quad}}\overset{\text{\quad}}\overset{\end{array}}\overset{\text{\quad}}\overset{\end{array}}\overset{\text{\quad$





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### G R A P H I C A L A B S T R A C T



Echocardiographic findings in 25 Recipients of Orthotopic Living Related Liver Transplantation Mean duration ± SD of follow up= 7.02 ± 3.02 years

http://dx.doi.org/10.1016/j.jare.2017.07.004

Abbreviations: OLRLT, orthotopic living related liver transplantation; ECG, electrocardiogram.

 $<sup>^{\</sup>star}$  It is an observational study that does not require registration.

<sup>\*\*</sup> Part of this work was accepted as an oral presentation in Saudi heart Association Conference, 2015 and poster presentation in Royal Collage for Pediatrics and Child Health, UK 2016 annual conference.

Peer review under responsibility of Cairo University.

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#### ARTICLE INFO

Article history: Received 30 April 2017 Revised 25 July 2017 Accepted 26 July 2017 Available online 27 July 2017

Keywords: Children pediatric Orthotopic living related liver transplantation Cardiovascular complications adverse events Left ventricular hypertrophy cardiomyopathy pulmonary hypertension Immunosuppressive medications Tacrolimus

#### ABSTRACT

Surgical stress, liberation of cytokines associated with re-perfusion injury, and long standing use of immune suppressive medications in children recipients of orthotopic living related liver transplantation (OLRLT) pose cardiovascular risk. Reported cardiovascular adverse effects vary from left ventricular wall thickening, hypertrophic cardiomyopathy to resting ECG abnormalities, asymptomatic ST depression following increased heart rate and ventricular arrhythmias. Twenty-five consecutive children recipients of OLRLT were assessed by conventional 2-D, M-mode echocardiography and Doppler. The mean age ± SD at transplantation and at enrollment in study was  $6.3 \pm 4.5$  and  $13.5 \pm 5.6$  years respectively. All children were on immunosuppressive medications, with tacrolimus being constant among all. Long-term posttransplant echocardiography revealed statistically significant interventricular septal hypertrophy among all (mean thickness  $0.89 \pm 0.16$  cm), (P = 0.0001) in comparison to reference range for age, 24 had pulmonary hypertension (mean mPAP 36.43 ± 5.60 mm Hg, P = 0.0001), and early diastolic dysfunction with a mean Tei index of 0.40 ± 0.10. However cardiac function was generally preserved. Children recipients of OLRLT have cardiac structural and functional abnormalities that can be asymptomatic. Pulmonary hypertension, increased cardiac mass, de novo aortic stenosis and diastolic heart failure were among abnormalities encountered in the studied population. Echocardiography is indispensible in follow-up of children recipients of OLRLT.

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#### Introduction

Pediatric liver transplantation for end-stage liver disease is one of the most successful solid organ transplantations [1]. Long-term survival after pediatric liver transplantation is now the rule rather than the exception [2]. While postmortem studies had proved uniform cardiomegaly in children recipients of orthotopic living related liver transplantation (OLRLT) on tacrolimus [3,4], not all children manifest clinically significant hypertrophic cardiomyopathy. Others suggested that this effect was transient [5]. Cardiovascular complications following orthotopic liver transplantation are not uncommon in adults (25–70%) and result in 7% of mortality [6]. They are related to coronary artery disease, acute coronary syndrome, stable angina, congestive heart failure, stroke, arrhythmia, and peripheral artery disease [7]. The goal of this study was to evaluate cardiac function and structure in children recipients of OLRLT by conventional echocardiography.

#### Subject and methods

#### Subjects

This study was a single center cross sectional pilot study that included 25 consecutive children recipients of OLRLT. The echocardiography and cardiac assessment was conducted in Echocardiography Clinic, Pediatric Cardiology Unit, Children's Hospital, Faculty of Medicine, Cairo University. All children underwent OLRLT in Wadi El Nil Hospital, Cairo, Egypt. The study spanned February 2012 to June 2013.

All patients underwent OLRLT in Wadi Al Nil Hospital and were placed on protocol immunosuppressive medications. First line comprised tacrolimus, mycophenolate mofitel and steroids, while second line comprised tacrolimus, azathioprine and steroids. *The study was approved by Pediatric Department Committee for Post-Graduate Studies and Research, and by Post-Graduate Studies and Research Administration, Faculty of Medicine, Cairo University, Egypt.* Strobe statement is presented as supplementary material.

#### Methods

All data of children were analyzed. Analyzed data included etiology of disease prior to transplantation, complications and/or associations of liver disease, age of the patient at the time of the study, age at the time of operation, weight and height percentiles at the time of operation, type of immunosuppressive medications, dose and compliance to the medications and preoperative cardiac and echocardiographic assessment.

All children underwent cardiac examination. Anthropometric measures were plotted against Egyptian Percentiles for weight and height (Diabetic Endocrine and Metabolic Pediatric Unit, 2002) [8] and recorded as percentiles for age.

ECG and echocardiographic examination were performed to examine cardiac structure, dimensions and systolic ventricular function using 2-D, M- mode and Doppler study.

The transthoracic two dimensional (2D) guided (M mode) and Doppler echocardiography was performed using SIEMENS Ocuson CV 70 ultrasonic machine phased array sector scanner with the 4 or 8 MHZ probes according to age. Cardiac dimensions were measured according to the recommendations of the American Society of Echocardiography (ASE) by M-mode. Linear measurements of left ventricle (LV) cavity was obtained: Left ventricle end diastolic diameter (LVEDD), left ventricle end systolic diameter (LVESD), walls (interventricular septum [IVS] and posterior wall [PW]) and calculation of fractional shortening (FS%) as an indicator of LV systolic function was done according to the recommendations of the American Society of Echocardiography (ASE). FS value < 28% was considered lower than normal with impaired LV systolic function [9,10].

LV Mass was calculated automatically using the validated formula (the ASE cube corrected by Devereux et al.). [11] LVM =  $0.80 \times [(\text{sepal thickness} + \text{LV internal diameter} + \text{Posterior} wall thickness})3 - (\text{LV internal diameter})3] + 0.6 g [12].$ 

LV Mass Index was also calculated by dividing LV Mass by body surface area (BSA) [13]. Diastolic LV function was evaluated by Doppler (E passive phase of LV inflow/atrial contraction phase of LV inflow (E/A) [14].

Myocardial performance index (MPI) was defined as the ratio of the sum of iso- volumetric contraction and relaxation times over the ejection time [15].

The myocardial performance index (MPI) was calculated for the left ventricles by obtaining the "a" value, i.e., the time from closure to opening of the corresponding. AV valves and the "b" value which is the ejection time of ventricle as obtained by placing the pulsed Doppler just below the aortic valve. An average of three recorded Download English Version:

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