Nutritional Status of Children with Congenital Heart Disease: before and after cardiac surgery and Therapeutic Catheterization.

Thesis

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Abstract

Background: Congenital heart disease (CHD) accounts for more infant deaths than all other congenital defects put together. It is a popular view that children with congenital heart disease are often small and undernourished. Infants with CHD are prone to malnutrition for several reasons including decreased energy intake, increased energy requirements, or both. The severity of malnutrition can range from mild under-nutrition to failure to thrive. This can have a notable effect on the outcome of surgery, increasing morbidity and mortality. Different types of cardiac malformations can affect nutrition and growth to varying degrees. The maintenance of nutritional homeostasis is fundamental to normal health.

Objective: Assessment of nutritional status and growth centiles of pediatric patients with CHD at Cairo University Hospital before and after cardiac surgery or interventional cardiac catheterization.

Patients and methods: 40 children fulfilling the inclusion criteria will be subjected to: Full history, general examination, thorough cardiac examination, anthropometric measurements, for assessment of growth pattern, biochemical data and related tests, echocardiography. The anthropometry, biochemical data and related tests will be obtained one day before and three months after intervention either surgical or transcatheter.

Inclusion criteria: Pediatric age group from 1 month till 12 years old with all the following:
(1) Confirmed medical diagnosis of CHD documented by echocardiography.
(2) Candidate for palliative or corrective heart surgery or interventional catheterization.

Results: In the current study, 40 patients with CHD (27 acyanotic and 13 cyanotic) with their age ranged from 1 month to 12 years, 21 female and 19 male, underwent corrective procedure (therapeutic catheterization and surgery). Our patients showed marked decrease of weight (mean 9.08 ± 6.84), height (mean 76.45 ± 21.15) and BMI (mean 13.41 ± 2.52) before correction of malformations. Significant (p value < 0.001) early somatic catch up growth in the following anthropometric measurements; weight, height and BMI was documented. There was severe somatic growth deceleration below 10^{th} percentile it was more pronounced in the cyanotic group of patients, 50% and 86% of them were below the 10^{th} percentile for Wt. and Ht. respectively.

Conclusion: We concluded that Infants with CHD are prone to malnutrition, thorough nutritional assessment by anthropometric measures is important for appropriate nutrition care of the pediatric CHD patient.

Key words: Anthropometric measures, congenital heart disease, cardiac therapeutic procedures.

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بسم الله الرحمن الرحيم

" قَالُوْا سُبْحَانَكَ لا عِلْمَ لَنَا إِلا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ العَلِيمُ الحَكِيمُ"

صدق الله العظيم

(البقرة الآية 32)

List of abbreviations

ALS: Acid labile subunit
AS: Aortic stenosis
ASD: Atrial septal defect
BMI: Body mass index
BP: Blood pressure
CAVC: Common atrioventricular canal
CGD: Constitutional growth delay
CHD: Congenital heart disease
CHF: Congestive heart failure
COA: Coarcetation of the aorta
DORV: Double outlet right ventricle
ECG: Electocardiography
ERK: Extracellular signal regulated kinase
GFR: Glomerular filtration rate
GH: Growth hormone
GHRH: Growth hormone releasing hormone
ET-1: Plasma endothelin-1
HC: Head circumference
HR: Heart rate
Ht: height
IGF-1: Insulin growth factor 1
IGFBP: Insulin growth factor binding protein
IL-1: Interleukin-1
IVS: Interventricular septum
JAK-STAT: Janus kinase - signal transducers and activators of transcription
LA: Left atrium
LBM: Lean body mass
LCT: Long chain triglyceride
MAPK: Mitogen activated protein kinase

MCT: Medium chain triglyceride
Mo: Month
MPH: Mid parental height
NICU: Neonatal intensive care unit
PA: Pulmonary atresia
PAPVR: Partial anomaly pulmonary venous return
PDA: Patent ductusarteriosus
PS: Pulmonary stenosis
RA: Right atrium
RDA: Recommended dietary allowance
REE: Resting energy expenditure
RR: Respiratory rate
Sao2: Oxygen saturation
SDS: Standard deviation score
SNS: Sympathetic nervous system
SRIF: Somatostatin release inhibiting factor
T3: Triiodothyronine
T4: thyroxine
TAPVR: Total anomaly pulmonary venous return
TGA: Transposition of great arteries
TNF: Tumor necrozing factor
TOF: Teratology of fallot
TRH: Thyroid releasing hormone
TSH: Thyroid stimulating hormone
VSD: Ventricular septal defect
Wt: weight
Yr: year

Introduction

Congenital heart diseases (CHD) consist of defects of the cardiac architecture which interfere with the venous drainage, septation of the cardiac segments and their sequences and regular function of the valve apparatuses. In normal heart, segments are disposed in such a way to allow deoxygenated venous blood to go to the lungs through the pulmonary artery and the oxygenated venous blood to go to the systemic organs through the aorta without mixing. Small and great circulations are in sequence, with no communication to each other ***(Thiene and Frescura, 2010)***.

Children with congenital heart diseases are exposed to the potential risks of hypoxia, acidosis and hypotension ***(Gaynor et al., 2007).***

Children with congenital heart disease (CHD) are at increased risk for poor growth, several factors may play a role including feeding difficulties, increased caloric requirements, and the effects of cardiac lesions on growth regulation ***(Knirsch et al., 2013).***

Growth retardation is a hallmark of chronic illnesses ***(Gaynor et al., 2007).***

Growth impairment is frequently observed in infants with congenital heart diseases (CHDs). The growth chart should reflect height and weight in terms of absolute values and also in percentiles. Accurate plotting and following of the

growth curve are essential parts of the initial and follow-up evaluations of a child with significant heart problems ***(Gaynor et al., 2007).***

Different patterns of growth impairment are seen in different types of CHD. Cyanotic patients have disturbances in both height and weight. Acyanotic patients, particularly those with a large left-to-right shunt, tend to have more problems with weight gain than with linear growth ***(Park, 2008).***

Poor growth in a child with a mild cardiac anomaly or failure of catch-up weight gain after repair of the defect may indicate failure to recognize certain syndromes or may be due to the underlying genetic predisposition ***(Park, 2008).***

Aim of the work

Assessment of nutritional status and growth of pediatric patients with congenital heart disease before and after cardiac surgery or interventional cardiac catheterization.