Electrocardiographic Alterations and Heart Rate Variability in Cirrhotic and Cholestatic Children

Thesis

Submitted in Partial Fulfillment

Of

M.Sc. Degree in Paediatrics

Presented By

Mohy El Din Ahmed Kotb

M.B., B. Ch.

Supervisors

Prof. Dr. Nabil Abd El Aziz Mohsen

Professor of Paediatrics

Faculty of Medicine

Cairo University

Dr. Zahra Mohamed Ezz El Din

Assistant Professor of Paediatrics

Faculty of Medicine

Cairo University

Dr. Faten Abd El Aziz

Assistant Professor of Paediatrics

Faculty of Medicine

Cairo University

Faculty of Medicine

Cairo University

2001

بسم الله

الرحمن الرحيم

و

به نستعين

Acknowledgment

My unlimited gratitude, respect and thanks are due to Professor Dr. Nabil Abd El Aziz Mohsen Professor of Paediatrics, Faculty of Medicine, Cairo University for his generosity in time and guidance.

I am greatly indebted to Assistant Professor Zahra Mohamed Ezz El Din Assistant Professor of Paediatrics, Faculty of Medicine, Cairo University for her efforts at making this work. I would like to thank her for her continuous guidance and invaluable supervision.

I owe Assistant Professor Faten Abd El Aziz Assistant Professor of Paediatrics, Faculty of Medicine, Cairo University the most for her encouragement, unyielding support and contribution in time and effort in this work.

Last but not least I would like to thank my parents. I would like to thank all the children who contributed in this study and wish them a speedy complete recovery.

Abstract

Patients with cirrhosis were reported to have an impaired autonomic regulation of the heart, as evaluated by 24-hour heart rate variability. This impaired autonomic regulation involves both sympathetic and parasympathetic branches of the autonomic nervous system (Lazzeria et al., 1997 and Oliver et al., 1997). It was reported to relate to the severity of liver cirrhosis (Dilon et al., 1994).

The 24-heart rate variability assessment is a powerful non-invasive tool to assess the sympathovagal balance of the heart (Lazzeri et a;., 1997).

Patients with cirrhosis were also reported to have QT interval alterations (Garcia et al., 1999). The presence of a cirrhotic myocardiopaty was proposed, it is still a speculation (Acosta et al., 1999).

Deoxycholate and cholate, the main bile acids in jaundiced serum were suggested to be the toxic substance responsible for heart function alterations in children with cholestasis (Bogin et al., 1983).

The aim of this work was to study ECG alterations and heart rate variability in Egyptian cirrhotic and cholestatic children.

Key Word

Electrocardiograph
Heart Rate Variability
Liver cirrhosis
Cholestasis
Autonomic dysfunction

Contents

List of Tables

List of Figures

List of Abbreviations

AMA	Antimitochondrial antibodies
ANA	Antinuclear antibodies
ALT	Alanine aminotranseferases
ASD	Atrial septal defect
AST	Aspartate aminotranseferases
AV	Atrio-ventricular
Bil D	Direct bilirubin
Bil T	Total bilirubin
CHF	Congestive heart failure
dRR average	Average of RR intervals differences
dRR MD	Mean deviation of RR intervals differences
dRR SD	Standard deviation of RR intervals differences
ECD	Endocardial cushion defect
ECG	Electrocadiograph
EHBA	Extrahepatic biliary atresia
TGA	Transposition of great arteries
Hb%	Haemoglobin percent
HF	Power in high frequency range
HRV	Heart rate variability
LAH	Left atrial hypertrophy
LBBB	Left bundle branch block
LF	Power in low frequency range
LF/HF	Low frequency/ High frequency ratio
LKM	Liver kidney microsomal antibodies
LPLs	Left pericordial leads
LV	Left ventricle
LVH	Left ventricular hypertrophy

NN50 count	Number pairs of adjacent N-N intervals differing by>50ms in the entire recording
No	Number
PFIC	Progressive familial intrahepatic cholestasis
PIBR	Paucity of intrahepatic biliary radicals
PNN50	N-N50count divided by the total number of all N-N intervals
PSA	Power spectral analysis
PVC	Premature ventricular contraction
QTc	QT interval corrected to heart rate
RAH	Right atrial hypertrophy
RBBB	Right bundle branch block
RBCs	Red blood corpusles
RMSSD	The square root of the mean of the sum of the squares of differences between adjacent N-N intervals
RPLs	Right pericordial leads
RR average	Average RR intervals
RR MD	Mean deviation of RR intervals
RR SD	Standard deviation of RR intervals
RV	Right ventricle
RVH	Right ventricular hypertrophy
SD	Standard deviation
SDANN	Standard deviation of the averages of NN intervals in all 5 min segments of the entire recording
SDNN	Standard deviation of all NN intervals
SD index	Mean of the standard deviations of all NN intervals for all 5 min segments of the entire recording
SDSD	Standard deviation of differences between adjacent N-N intervals
SMA	Smooth muscle antibodies

SVT	Supraventricular tachycardia
ULF	Ultra low frequency
VLF	Power in VLF range
VSD	Ventricular septal defect
VT	Ventricular tachycardia
WBC	White blood cells
WPW	Wolf-Parkinson-White syndrome

Introduction and Aim of the Work

Introduction And Aim of Work

Patients with cirrhosis were reported to have an impaired autonomic regulation of the heart, as evaluated by 24-hour heart rate variability. This impaired autonomic regulation involves both sympathetic and parasympathetic branches of the autonomic nervous system (Lazzeria et al., 1997and Oliver et al., 1997). It was reported to relate to the severity of liver cirrhosis (Dilon et al., 1994).

The 24-heart rate variability assessment is a powerful non-invasive tool to assess the sympathovagal balance of the heart (Lazzeri et al., 1997).

Patients with cirrhosis were also reported to have QT interval alterations (Garcia et al., 1999). The presence of a cirrhotic myocardiopaty was proposed, it is still a speculation (Acosta et al., 1999).

Deoxycholate and cholate , the main bile acids in jaundiced serum were suggested to be the toxic substance responsible for heart function alterations in children with cholestasis (Bogin et al.,1983).

The aim of this work was to study ECG alterations and heart rate variability in Egyptian cirrhotic and cholesteric children.

Review of literature

Chapter I

CHOLESTASIS

Definition

Cholestasis (from the Greek chole; bile; and stasis; stop) is defined by decrease or absence of bile flow into the duodenum (Erlinger, 1999). The clinical definition of cholestasis is any condition in which substances normally excreted into bile are retained. The histopathological definition of cholestasis is the appearance of bile within the elements of liver (Whitington, 1996).

Incidence

Idiopathic neonatal hepatitis in1/5,000 - 10,000 and Biliary atresia has been detected in1/10,000 - 15,000 live births. The estimated incidence of Alagille`s syndrome is approximately 1 in 40,000 live births (Whitington, 1996). Intra-hepatic bile duct paucity appears much less commonly, in about1/50,000-75,000 live births (Balistreri, 2000). Incidence of choledochal cyst is 1 in 13.000 to 15,000 population in Western countries. but rates as high as 1 per 1000 live births have been described in Japan (Mc Evoy and Suchy, 1996).

Classification of Cholestasis

A. Congenital Infection

i. Toxoplasmosis
ii. Rubella
iii. Varicella
iv. Cytomegalovirus
v. Herpes simplex
vi. Syphilis