Neuron–Specific Enolase Level In Serum Of Children After Cardiopulmonary bypass In Left to Right Cardiac Lesions

Thesis Submitted for Partial Fulfillment of the Requirements of Master Degree In ***Pediatrics***

By

Moataz Mohamed Reda

(M.B., B.Ch., Alexandria University, 2002)

Supervised by

Prof. Mahmoud Tarek Abdel Monem

Professor of pediatrics

Faculty of Medicine – Ain Shams University

Prof. Ola Abd Elaziz Elmasry

Assistant professor of pediatrics

Faculty of Medicine – Ain Shams University

Dr. Iman Ali Abd El Hamid

Lecturer of pediatrics

Faculty of Medicine – Ain Shams University

Faculty of Medicine

Ain Shams University

2010

مستوى نيورون سبيسيفيك إينوليز
عند الأطفال المصابين بعيوب بالقلب
بعد عمليات القلب المفتوح

رسالة

توطئة للحصول على درجة الماجستير فى طب الأطفال

مقدمة من

الطبيب / معتز محمد رضا

بكالوريوس الطب والجراحة- جامعة الأسكندرية (٢٠٠٢)

تحت اشراف

الأستاذ الدكتور/ محمود طارق عبد المنعم

أستاذ طب الأطفال

كلية الطب- جامعة عين شمس

الدكتورة /علا عبد العزيز المصرى

أستاذ مساعد طب الأطفال

كلية الطب- جامعة عين شمس

الدكتورة / ايمان على عبد الحميد

مدرس طب الأطفال

كلية الطب- جامعة عين شمس

كلية الطب

جامعة عين شمس

٢٠١٠

Aim of the Work

The aim of this study was to measure the level of neuron-specific enolase in children before and after cardiopulmonary bypass and assess it as a marker of neurologic insult in Egyptian children undergoing cardiac surgery and to correlate its level with different perioperative variables.

List of Abbreviations

AK	: Adenylate kinase
APUD	: Amine precursor uptake and decarboxylation
ASD	: Atrial septal defect
ATP	: Adenosine triphosphate
AVCD	: Atrioventricular canal defect
°C	: degrees Celsius
C3a	: Activated complement three
CABG	: Coronary artery bypass graft
CBC	: Complete blood count
CHD	: Congenital heart disease
CJD	: Creutzfeldt-Jakob disease
CNS	: Central nervous system
CO2	: Carbon dioxide
COPD	: Chronic obstructive pulmonary disease
CPB	: Cardiopulmonary bypass
CPK-BB	: Creatine phosphkinase brain isoform
CSF	: Cerebrospinal fluid
CT	: Computed tomography
CuZn-SOD	: Cu-Zn superoxide dismutase
DHCA	: Deep hypothermic circulatory arrest
DNS	: Dispersed neuroendocrine system
EEG	: Electroencephalography

List of Abbreviations (cont.)

EF	: Ejection fraction
ELISA	: Enzyme-linked immunosorbent assay
GFAP	: Glial fibrillary acidic protein
Hb	: Haemoglobin
HF	: Heart failure
HIT	: Heparin-induced thrombocytopenia
HS	: Highly significant
ICU	: Intensive care unit
IL-1	: Interleukin-1
IL-6	: Interleukin-6
kDa	: kilo Dalton
LA	: Left atrium
LDH	: Lactate dehydrogenase
LV	: Left ventricle
MAP	: Mean arterial pressure
MBP	: Myelin basic protein
MRI	: Magnetic resonance imaging
MRS	: Magnetic resonance spectroscopy
n	: Number
NCAM	: Neural cell adhesion molecule
NCD	: Neurocognitive decline
NIRS	: Near infrared spectroscopy

List of Abbreviations (cont.)

NO	: Nitric oxide
NS	: Not significant
NSE	: Neuron specific enolase
O2	: Oxygen
PDA	: Patent ductus arteriosus
PET	: Position emission tomography
PGE	: Prostaglandin
POCD	: Postoperative cognitive dysfunction
PT	: Prothrombin time
PTT	: Partial thromboplastin time
PVC	: Polyvinyl chloride
RA	: Right atrium
rCBF	: Regional cerebral blood flow
RV	: Right ventricle
S	: Significant
TIA	: Transient ischemic attack
TNF-a	: Tumor necrosis factor- alpha
VSD	: Ventricular septal defect
WBCs	: White blood cells

INTRODUCTION

Congenital heart disease (CHD) refers to a heterogenous group of diseases characterized by a structural heart defect at birth. The incidence of moderate to sever CHD is estimated to be 6/1000 live births ***(Hoffmann and Kaplan, 2002).***

Children with CHD are at risk of suboptimal developmental outcomes for a number of reasons. Firstly, they are at higher risk from the physiological consequences resulting from the cardiac abnormality itself and including: cyanosis / hypoxia, cardiac failure, and / or collapse, and cerebral insults. Secondly, there is a body of evidence suggesting that cardiac surgery may influence psychological neurodevelopmental functioning ***(Mahle, 2001).***

Much attention has focused on their developmental and cognitive functioning following surgery and the contributions from the nature of cardiopulmonary bypass (CPB) and the variable methods of cardioplegia ***(Bellinger et al., 2001).***

Due to considerable progress in pediatric cardiac surgery, life expectancy of patients with CHD has improved significantly over the last 50 years ***(Ohye and Bove, 2001).***

Neurone – specific enolase (NSE) has been identified as a neurotrophic factor supporting survival of cultured neocortical rat neurons in a dose dependant manner. Therefore, it was desinated as a "neuronal survival factor" in the central nervous system, stressing the particular importance of this protein to the neuronal metabolism ***(Horn et al., 1995).***

Immunohistochemical studies have shown early release of neuron-specific enolase by damaged neurons, thereby indicating functional disturbances or structural defects of the plasma membrane due to cerebral ischemia in rats, gerbils, and humans ***(Reynolds et al., 2003).***


بسم الله الرحمن الرحيم
قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا
عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ
صدق الله العظيم
سورة البقرة آية (32)

Acknowledgment

First and Foremost thanks to "ALLAH", The All-Merciful, The Ever-Merciful.

I would like to express my deepest gratitude to Prof. Dr. Mahmoud Tarek Abdel Monem, Professor of Pediatrics, Faculty of Medicine, Ain Shams University for his masterful teaching, continous support, enthusiastic encouragement and correction.

I am also deeply indebted to Dr. Ola Abd Elaziz Elmasry , Lecturer of Pediatrics, Faculty of Medicine, Ain Shams University for her valuable comments, remarkable suggestions and continuous encouragement.

My obligation is deep to Dr. Iman Ali Abd El Hamid, Lecturer of Pediatrics, Faculty of Medicine, Ain Shams University for her decent encouragement gernerously offered with unremitting zeal.

I would like to thank Prof. Dr. Hasan Mohamed Moftah, Professor of cardiovascular and thoracic surgery, Faculty of Medicine, Ain Shams University for his masterful teaching.

Also, I would like to thank Prof. Dr. Ez Elden Abdel Rahman Mostafa, Professor of cardiovascular and thoracic surgery, Faculty of Medicine, Ain Shams University for his great help.

I am deeply greatful to Dr. Hala Abd El Al , assistant professor of clinical pathology, Faculty of Medicine, Ain Shams University for her great help.

I would like to express my heartily thanks and deepest gratitude to my family for their support and encouragement.

Thanks to the children who are the candidates of this work and without them this thesis cannot be done.

Moataz Mohamed Reda

List of Contents

List of Tables