

بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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Evaluation of brain iron content in Egyptian Patients with Sickle cell disease and its impact on Neurocognitive functions

A Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

سَبَّحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

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ABSTRACT

Background: Sickle cell disease (SCD) is considered the most prevalent monogenic diseases worldwide. Iron overload is one of its major complications especially those who required frequent transfusion. MRI is a reliable and non-invasive method for quantifying iron concentration in many organs as the liver and heart. Children with SCD are at a high risk for neurocognitive impairment; they often scored lower on general IQ measures than healthy children which may be due to iron overload in brain tissue.

Primary objective: To assessed brain iron content (using R2* values) in the caudate and thalamic regions through quantitative brain MRI study in SCD patients in comparison to age and sex-matched healthy controls. **Secondary objective:** To evaluate the impact of brain iron content on neurocognitive functions assessed by neurocognitive examinations.

Methods: 32 children and young adults (19 males, 13 females) with SCD and 11 control persons (5 males, 6 females) were recruited. Brain MRI study using multi-echo fast gradient echo sequence was performed for only 15 SCD patients and 11 controls. Brain R2* values of both caudate and thalamic regions (right and left sides) were calculated. All SCD patients were examined for the neurocognitive functions; Wechsler IV Intelligence Scale (verbal, perceptual, memory, processing and total IQ) and Benton Visual Retention Test.

Results: No statistically significant differences were found between SCD and control group in all regions of interests in brain MRI. No statistically significant differences were found between the two subgroups ($p>0.05$) in right thalamus, left and right caudate regions. 62.5% SCD patients had anxiety; 4.2%, 8.3% and 50% had severe, moderate and mild anxiety respectively.

Conclusion: Although children and young adults with SCD had high prevalence of neurocognitive dysfunction, this could not be explained by brain iron overload alone which might be slowly accumulating iron.

Keywords: Brain iron overload, Sickle cell disease, T2* values.

List of Contents

Title	Page No.
List of Tables	i
List of Figures	iii
List of Abbreviations.....	iv
Introduction.....	1
Aim of the Work	4
Review of Literature	
Sickle Cell Disease.....	5
Neurocognitive Deficits in Children with Sickle Cell Disease	24
Patients and Methods	36
Results	44
Illustrative Case.....	61
Discussion.....	64
Limitation of the Study.....	71
Conclusion	72
Recommendations	73
Summary	74
References	76
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table (1):	Clinical characteristicsamong the studied SCD patients	44
Table (2):	Treatment modalitiesamong the studied SCD patients.....	45
Table (3):	Disease related complications among the studied SCD patients	46
Table (4):	Laboratory data among the studied SCD patients.....	47
Table (5):	Laboratory data among the studied SCD patients.....	48
Table (6):	Wechsler IV Intelligence Scale among the studied SCD patients	50
Table (7):	Wechsler IV Intelligence Scale among the studied SCD patients	51
Table (8):	Comparison between SCD patients and controls as regards age and sex.....	53
Table (9):	Comparison between the SCD patients and control as regards MRI in different brain areas	54
Table (10):	Correlations between different brain areas and age and clinical data among sickle cell disease cases.....	55
Table (11):	Correlations between different brain areas treatment modalities among sickle cell disease cases	56

List of Tables (cont...)

Table No.	Title	Page No.
Table (12):	Correlations between different brain areas and laboratory investigation among sickle cell disease cases.....	57
Table (13):	Correlations between different brain areas and neurocognitive function among sickle cell disease cases	59
Table (14):	Correlation coefficients between R2* values of different regions of brain with patients' other radiological parameters	60

List of Figures

Fig. No.	Title	Page No.
Figure (1):	Normal RBCs and abnormal sickled red blood cells	7
Figure (2):	Molecular pathophysiology of sickle cell disease.....	9
Figure (3):	Percentage of SCD patients with serum ferritin more than 2500ng/ml	49
Figure (4):	Depression category among the studied SCD patients.....	52
Figure (5):	Correlations between left caudate R2* and age among sickle cell disease cases	55
Figure (6):	Correlation between right thalamus R2* and transfusion index among SCD patients	56
Figure (7):	Correlation between left caudate R2* and HbS%.....	58
Figure (8):	Correlation between left caudate R2* and HbA%	58
Figure (9):	Correlation between left caudate R2* and difference of correct	59
Figure (10):	Multi-echo fast gradient echo brain MRI T2* sequence	62
Figure (11):	Data analysis using Microsoft Excel Spread Sheet V 2.01: the signal intensity (TE) is plotted against multiple TE values	63

List of Abbreviations

Abb.	Full term
ACS	Acute chest syndrome
ALT	Alanine amino transferase
AST	Aspartate amino transferase
BBB.....	Blood brain barrier
BCECs	Brain capillary endothelial cells
BPRS.....	Brief Psychiatric Rating Scale
CBC.....	Complete blood count
CNS.....	Central nervous system
CSSCD	Cooperative Study of Sickle Cell Disease
CVAs	Cerebrovascular accidents
DFO	Deferoxamine
DFP	Deferiprone
DFX	Deferasirox
DNA	Deoxyribonucleic acid
GI	Gastrointestinal
GSH	Glutathione
Hb	Hemoglobin
HbA.....	Hemoglobin A
HbA2.....	Hemoglobin A2
HbF	Hemoglobin F
HbS	Hemoglobin S
HCV	Hepatitis C virus
HPLC	High-Performance Liquid Chromatography
IQ	Intelligence Quotient
Kg.....	Kilogram
LDH	Lactate dehydrogenase
LIC.....	Liver Iron Concentration

List of Abbreviations (Cont...)

Abb.	Full term
MRA.....	Magnetic resonance angiogram
MRI.....	Magnetic Resonant Imaging
MTD	Maximum tolerated dose
NADPH.....	Nicotinamide adenine dinucleotide phosphate
NTBI	Non transferrin bound iron
RBCs.....	Red Blood Cells
ROC	Receiver Operating Characteristic
ROI.....	Region of Interest
ROS.....	Reactive oxygen species
SCA.....	Sickle cell anemia
SCD.....	Sickle cell disease
SCI	Silent cerebral infarction
SDS	Standard deviation score
SWI	Weighted Images Sequence
TF	Transferrin
TfR1	Transferrin receptors
TIQ	Total Intelligence Quotient
TLC	Total Leucocytic Count
UT	Under threshold (UT)
VOC's.....	Vaso-occlusive crises
WAIS-IV	Wechsler Adult Intelligence Scale-Fourth Edition
WBC	White blood cell
α	Alpha
β	Beta
γ	Gamma