



Early Neurological Deterioration in Acute Ischemic Stroke: potential Predictors, causes and relation to infarct growth

Thesis

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By

Ehab AbdElbaset Abdulsamad

M.B.B.Ch., M.Sc. Neuropsychiatry

Supervised by

Prof. Dr. Samia Ashour Mohamed Helal

Professor of Neurology

Faculty of Medicine - Ain Shams University

Prof. Dr. Hany Amin Aref

Professor of neurology

Faculty of medicine- Ain Shams University

Prof. Dr. Ayman Mohammed Nassef

Professor of neurology

Faculty of medicine- Ain Shams University

Prof. Dr. Ramez Reda Moustafa

Assistant Professor of Neurology

Faculty of Medicine-Ain Shams University

Prof. Dr. Mohammed Amir Tork

Assistant professor of Neurology

Faculty of Medicine - Ain Shams University

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بسم الله الرحمن الرحيم

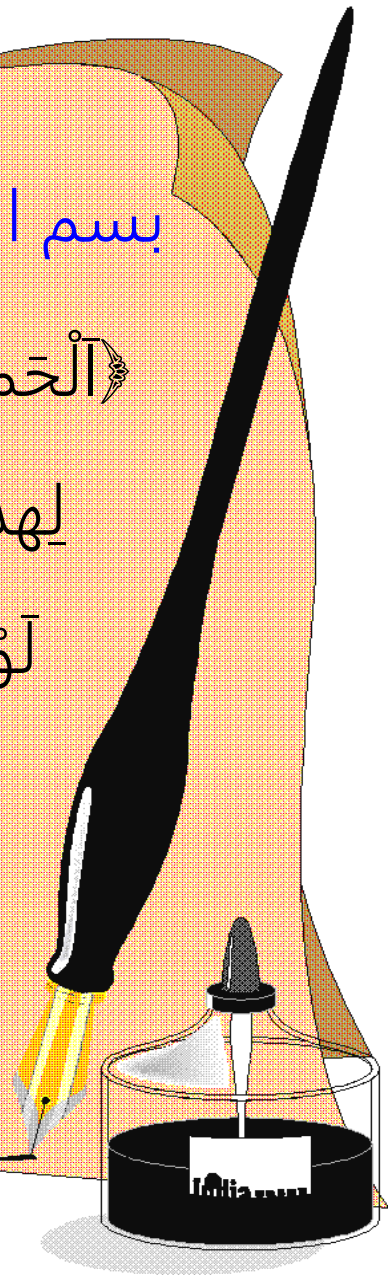
﴿الْحَمْدُ لِلَّهِ الَّذِي هَدَانَا

لِهَذَا وَمَا كُنَّا لِنَهْتَدِيَ

لَوْلَا أَنْ هَدَانَا اللَّهُ﴾

صدق الله العظيم

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Contents

Subject	Page
• List of Abbreviation	I
• List of Tables	V
• List of Figures	VII
• Introduction	1
• Aim of the work	5
• Review Of Literature	
- Predictors of early neurological deterioration	6
- Mechanisms of early neurological deterioration	18
- Management of early neurological deterioration	32
- Outcome	37
• Patients And Methods	38
• Results	48
• Discussion	93
• Conclusion	110
• Recommendations	111
• Summary	112
• References	115
• Appendix	140
• Arabic summary	١

List of Abbreviations

ACA	Anterior Cerebral Artery
ACWSI	Anterior Cortical Watershed infarction
AF	Atrial Fibrillation
AIS	Acute Ischemic Stroke
ALT	Alanine Transaminase
AST	Aspartate Transaminase
BA	Basilar Artery
BBB	Blood Brain Barrier
BP	Blood Pressure
BUN	Blood Urea Nitrogen
CA	Calcium
CCA	Common Carotid Artery
CPP	Cerebral Perfusion Pressure
CT	Computed Tomography
DBP	Diastolic Blood Pressure
DM	Diabetes Mellitus
DNA	Deoxyribo Nucleic Acid
DVT	Deep Venous Thrombosis
DWI	Diffusion-Weighted Imaging
DWI	Diffusion-Weighted Image

DWSI	Deep Watershed Infarction
ECAS	Extracranial Arterial Stenosis
EEG	Electroencephalogram
EF	Ejection Fraction
END	Early Neurological Deterioration
EPSS	European Progressing Stroke Study
SSS	Scandinavian Stroke Scale
NIHSS	National Institute of Health Stroke Scale
EVT	Endovascular Treatment
EXPRESS	Existing Preventive Stroke Study
FLAIR	Fluid Attenuated Inversion Recovery
FSE	Fast Spin Echo
GCS	Glasgow Coma Scale
HB	Hemoglobin
HbA_{1c}	Glycosylated Hemoglobin
HDL	High Density Lipoprotein
HS	Highly Significant
HTN	Hypertension
IAT	Intra Arterial Thrombolysis
ICA	Internal Carotid Artery
ICAS	Intracranial arterial Stenosis
ICU	Intensive Care Unit
IHD	Ischaemic Heart Disease

INR	International Normalized Ratio
IQR	Inter-Quartile Range
K	Potassium
LAD	Left Atrial Diameter
LDL	Low Density Lipoprotein
LT	Left
MCA	Middle Cerebral Artery
MI	Myocardial Infarction
MRA	Magnetic Resonance Angiography
MRI	Magnetic Resonance Imaging
MRS	Modified Rankin Scale
MT	Mechanical Thrombectomy
MTT	Mean Transit Time
NA	Sodium
NADPH	Nicotinamide Adenine Dinucleotide Phosphate
NCSE	Non Convulsive Status Epileptics
ND	No Deterioration
NS	Non Significant
PCA	Posterior Cerebral Artery
PCWSI	Posterior Cortical Watershed
PLT	Platelets
PSV	Peak Systolic Velocity

PVEEG	Prolonged Video EEG
PWI	Perfusion Weighted Image
RBS	Random Blood Sugar
RNA	Ribo Nucleic Acid
ROS	Reactive Oxygen Species
RT	Right
rT-PA	Recombinant Tissue Plasminogen Activator
S	Significant
SAP	Stroke Associated Pneumonia
SBP	Systolic Blood Pressure
SD	Standard Deviation
SE	Status Epilepticus
sICH	Symptomatic Intracerebral Hemorrhage
TCD	Transcranial Doppler
TG	Triglycerides
TIA	Transient Ischemic Attack
TLC	Total Leucocytic Count.
TOF	Time-Of-Flight
TTP	Time To Peak
UTI	Urinary Tract Infection
VA	Vertebral Artery
WSI	Watershed Infarction

List of Tables

Table No.	Title	Page
1	Basic demographic data among 300 AIS patients.	48
2	Co-morbidities among 300 AIS patients	50
3	Baseline clinical and neurological data among 300 AIS patients.	51
4	Laboratory data among 300 AIS patients.	52
5	Echocardiography and Carotid Duplex data among 300 AIS patients.	53
6	Follow up clinical data among 300 AIS patients.	56
7	Follow up neurological outcomes among 300 AIS patients.	57
8	Comparison between the 2 groups as regards basic demographic data.	58
9	Comparison between the 2 groups as regards co-morbidities.	59
10	Comparison between the 2 groups as regards clinical and neurological data.	62
11	Comparison between the 2 groups as regards laboratory data.	64
12	Comparison between the 2 groups as regards Echocardiography and Carotid Duplex data.	66
13	Comparison between the 2 groups as regards MRI data (Type of stroke).	67

Table No.	Title	Page
14	Comparison between the 2 groups as regards MRA data.	69
15	Comparison between the 2 groups as regards Follow up clinical outcomes (Causes of END).	71
16	Follow up imaging for patients with END.	72
17	Causes of END.	72
18	Comparison between the 2 groups as regards Follow up neurological outcomes.	75
19	Relation between seasons and (3-month mRS) and END using Mann-Whitney's U and Chi square tests	78
20	Spearman's correlation analysis for some baseline Factors associated with NIHSS change.	80
21	Spearman's correlation analysis for some baseline Factors associated with MRS (3-month).	85
22	Logistic regression model for the Factors affecting END occurrence.	92

List of Figures

Figure No.	Title	Page
1	Summary of pathophysiological cascade in diabetic stroke	12
2	proposed mechanisms by which hyperglycemia worsens stroke related brain injury	13
3	Impact of collateral flow on clot lysis and reperfusion	19
4	Imaging data in 3 patient showing clot progression	20
5	Non contrast CT brain of showing malignant brain edema	23
6	Subtype of hemorrhagic transformation	25
7	Mechanisms oh hypoxia in Ischemic Stroke Damage	28
8	Reperfusion therapy in acute ischemic stroke	34
9	Digital subtraction angiography (DSA) showing Parts of major intracerebral arteries.	43
10	Gender among 300 AIS patients.	49
11	MRI data (type of stroke) among 300 AIS patients	54
12	Site of arterial disease among 300 AIS patients.	55
13	Comparison between the 2 groups as regards duration of DM.	60
14	Comparison between the 2 groups as regards AF.	61

Figure No.	Title	Page
15	Comparison between the 2 groups as regards IHD.	61
16	Comparison between the 2 groups as regards SBB-1 and DBP-1.	63
17	Comparison between the 2 groups as regards uric acid.	65
18	Comparison between the 2 groups as regards Territorial strokes.	68
19	Comparison between the 2 groups as regards MCA stenosis or occlusion.	70
20	Comparison between the 2 groups as regards day-2 SBP and DBP.	72
21	Comparison between the 2 groups as regards day-3 SBP and DBP.	73
22	Comparison between the 2 groups as regards chest complications.	73
23	Comparison between the 2 groups as regards day-2 and 3 NIHSS scores.	76
24	Comparison between the 2 groups as regards MRS (3-months).	77
25	Correlation between NIHSS change and Duration of DM.	81
26	Correlation between NIHSS change and AIS duration.	82
27	Correlation between NIHSS change and DBP-1.	82
28	Correlation between NIHSS change and NIHSS-1.	83

Figure No.	Title	Page
29	Correlation between NIHSS change and uric acid.	83
30	Correlation between NIHSS change and RBS.	84
31	Correlation between NIHSS change and HbA1C.	84
32	Correlation between MRS (3-month) and age.	87
33	Correlation between MRS (3-month) and Duration of HTN.	87
34	Correlation between MRS (3-month) and Duration of DM.	88
35	Correlation between MRS (3-month) and DBP-1.	88
36	Correlation between MRS (3-month) and NIHSS-1.	89
37	Correlation between MRS (3-month) and TLC.	89
38	Correlation between MRS (3-month) and albumin.	90
39	Correlation between MRS (3-month) and RBS.	90
40	Correlation between MRS (3-month) and LAD.	91

Early Neurological Deterioration in Acute Ischemic Stroke: potential Predictors, causes and relation to infarct growth

Abstract

Background: Worsening of acute stroke early in its course (within 48–72 h of its onset) is a common occurrence and has potentially serious short term and long term consequences. The incidence of early neurological deterioration (END) among hospitalized patients varies widely in different studies between 13% and 38%.

Aim of the Work: To define incidence and timing of END in relation to acute ischemic stroke (AIS) onset. To identify possible causes and predictors associated with END. To assess the relation between END and the patient functional level at three months post stroke.

Patients and Methods: Three hundred patients were recruited into this hospital prospective comparative study. Clinical history, laboratory indices, structural brain imaging, Magnetic Resonance Angiography (MRA) and Carotid Duplex ultrasonography were done. Patients were examined on NIHSS and Glasgow Coma Scale (GCS) in day 1, 2, 3 and patients with END did a follow up (MRI diffusion film or CT brain) at day4 or 5 and all patients were followed up by Modified Rankin scale (MRs) at three-month post stroke.

Results: Of the Three hundred patients included in the study, the incidence of END was 16.7%. The median NIHSS on admission was 9.25. END was associated with long duration of DM (P 0.012), IHD (p 0.015), AF (p 0.048), severe stroke (p 0.0044), low blood pressure on admission (p 0.0079), high uric acid (p 0.033) and MCA occlusion (p 0.0007). END was associated with significant increase in MRS at 3 month (p<0.0001) and mortality rate (44% vs 4.4). Patients with END are more prone for aspiration pneumonia (p 0.0001) and hemorrhagic transformation.

Conclusion: Early neurological deterioration is a frequent complication after acute stroke, with a poor short-term prognosis. This study provides that hyperglycemia, hyperuricemia and cardiac disease (IHD and AF) may increase the risk of END.

Keywords: Early Neurological Deterioration, Acute Ischemic Stroke.

Worsening of acute stroke early in its course (within 48–72 h of its onset) is common and has potentially serious short term and long term consequences for the patient (*Thanvi et al., 2008*). Various terms, such as “progressive stroke”, “stroke in evolution”, and “stroke in progression” have been used to describe this worsening (*Sumer et al., 2003*). Now most commonly termed early neurological deterioration (END) (*Helleberg et al., 2014*).

In one of the earlier studies, neurologic worsening was determined to be present if worsening of the neurologic condition, including consciousness level, was observed by trained neurologists and nurses at and after admission to the stroke unit (*Yamamoto et al., 1998*).

END was defined in the European progressing stroke study (EPSS) as any significant neurological deterioration from baseline to 72 hours (*Brichel et al., 2004*).

A significant neurological deterioration was primarily defined as a decrease in the Scandinavian stroke scale (SSS) items score for consciousness, speech, gaze, arm, or leg by at least 2 points. Consciousness was given precedence over the other signs (*Brichel et al., 2004*).