PROGNOSTIC VALUE OF CLINICAL EXAMINATION AND SOMATOENSORY EVOKED POTENTIALS IN COMA DUE TO STROKE

Thesis

Submitted for Complete Fulfillment of The Master Degree (M.Sc.) in

Neuropsychiatry

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2014

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وأنزل اللـه عليـك الكتــاب

والحكمة وعَلَّمَكَ مَا لَمْ تَكُن تَعْلَمُ

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صدق الله العظيم

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Acknowledgment

*First, and foremost, all thanks and gratitude to **GOD**, most gracious and most merciful.*

*I would like to express my sincere gratitude to my **Prof. Dr. Sadek Helmy**, Professor of Neurology, Cairo University, for his continuous support and, for his patience, motivation.*

*I am extremely grateful to **Prof. Dr. Hanan Amer**, Professor of Neurology, Cairo University, for her continuous guidance and suggestions, saving no effort or time to make this work better. Really, this work could not be finished without her support and help.*

*I would like to express my appreciation to **prof. Dr. Nehal Alshazly**, Professor of Neurophysiology, Cairo University, for her great cooperation, assistance.*

*I would like to thank **Prof. Dr. Ann Abdulkader**, Professor of neurophysiology and **Prof. Dr. Montasar Hegazy**, Professor of neurology for their sincere help and support.*

ABESTRACT

Background*:** Coma is one of the serious complications of stroke, which is a leading cause of death and disability in the world. Early and accurate evaluation and prediction of the prognosis of coma due to stroke enables proper medical management, help physicians and patient's family to make decisions about the medical care. ***Objective: to evaluate the utility of clinical examination and SSEP for the prediction of awakening from coma due to stroke and the prediction of the functional outcome after stroke, and compare it to the usually used clinical scales as GCS. ***Methods:***30 patients with recent disturbed conscious level due to stroke were studied on admission by full neurological examination and somatosensory evoked potential study for each patient. The patients were re-evaluated after 1 month of admission by full neurological examination, assessment of their disability by Barthel Index and MRC scale, and follow up SSEP. ***Results***: The mean N20 latency was shortest (19.56 ±0.7 SD) in patients who survived with no disability while it was longest in patients who died (25.31± 2.8) , GCS has a significant predictive value in outcome among all cases, At a cut-off level ≤ 6, it differentiates between died and survived cases with specificity 84.6% and sensitivity 82.4 %.(p.= 0.0001). N20 latency has a fairly good predictive value in outcome among all cases, at a cut-off level of no response, it differentiates between died and survived cases with specificity 100% and sensitivity 41.2 %. N20 latency has the most specific predictor (100%) but with low sensitivity and it doesn't differ much than GCS (84.6% specificity).***conclusion:*** SSEP may be affected in coma patients due to cerebrovascular causes. It can have a predictive value of bad prognosis especially in absent response, but it is not superior over clinical parameters including GCS in predicting bad outcome.

Keywords:

Stroke – Coma – Somatosensory Evoked Potential - Glasgow Coma Scale Outcome – Predictive Value.

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Abbreviations

5-HT	**Serotonin, 5-hydroxytryptamine**
ACH	**Acetylcholine**
AEP	**Auditory evoked potential**
AF	**Atrial fibirilation**
AM	**Akinetic mutism**
AMPA	**α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid**
AMPT	**α-methylparatyrosine**
ARAS	**Ascending reticular activating system**
ATP	**Adenosine triphosphate**
BAEPs	**Brainstem auditory evoked potentials**
BF	**Basal forebrain**
BP	**Blood pressure**
CNS	**Central nervous system**
CPP	**Cerebral perfusion pressure**
CPR	**Cardiopulmonary resuscitation**
CSF	**Cerebrospinal fluid**
CT	**Computed tomography**
DM	**Diabetes mellitus**
DRN	**Dorsal raphe nuclei**
EEG	**Electroencephalography**
EMG	**Electromyography**
EPs	**Evoked potentials**
GABA	**Gamma-aminobutyric acid**
GCS	**Glasgow coma scale**
HCRT	**Hypocretin**
ICP	**Intracranial pressure**

ICU	Intensive care unit
LA	Leukoaraiosis
LC	Locus ceruleus
L-DOPA	L-3,4-dihydroxyphenylalanine
LDT	Laterodorsal nuclei
LH	Lateral hypothalamus
MAO- B	Monoamine oxidase B
MCH	Melanin-concentrating hormone
MEP	Motor evoked potential
MLSEP	Middle-latency somatosensory evoked potentials
MMN	Mismatch Negativity
MRI	Magnetic resonance imaging
MRN	Median raphe nuclei
MS	Multiple sclerosis
NA	Noradrenaline
NCSE	Nonconvulsive status epilepticus
NIHSS	The National Institutes of Health Stroke Scale
NMDA	N-methyl-D-aspartate receptor
NREM	Non rapid eye movement
NSE	Neuron-specific enolase
ORX	Orexin
PLC	Phospholipase C
PPT	Pedunculopontine tegmental
RAS	Reticular activating system
REM	Rapid eye movements
RF	Reticular formation
RN	Raphe nucleus
SEPs	Somatosensory evoked potentials

SGOT	**Serum glutamic oxaloacetic transaminase**
SI	**Substantia innominata**
SLSEP	**Short latency somatosensory evoked potential**
SN	**Substantia nigra**
SNPC	**Substantia nigra pars compacta**
SSEPs	**Short latency somatosensory evoked potentials**
TMN	**Tuberomammillary nucleus**
TMS	**Transcranial magnetic stimulation**
VEP	**Visual evoked potential**
VLPO	**Ventrolateral preoptic nucleus**
VOR	**Vestibuloocular reflexe**
VS	**Vegetative state**
VTA	**Ventral tegmental area**

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INTRODUCTION

Coma is a serious complication in patients with medical illness, particularly among elderly people. There is an increased interest in proper management of coma caused by acute conditions (e.g. survivors of cardiopulmonary resuscitation) or chronic conditions (e.g. persistent vegetative state). Clinicians in emergency departments and intensive care units commonly assess patients with impaired consciousness and have used clinical tools that have withstood the test of time. (**Koehler & Wijdicks, 2008).**

Over the centuries, several terms were used to describe the phenomena that were observed and to grade the level of unconsciousness. In 1977, a landmark paper on aspects of coma following severe head injury was published, presenting **Glasgow Coma Scale (GCS)** as a new scale for grading the level of consciousness after head trauma by **Jennett and Teasdale**, **1977**. Because physicians are concerned with the difficulties of the interpretation of the prolongation of the comatose states. Recently, a few case studies with functional MRI have claimed to be able to identify 'awareness' where none was expected. (**Koehler & Wijdicks, 2008).**

Since the development of intensive care treatments has allowed extremely brain-damaged patients to survive, intensivists became increasingly concerned about predicting return to consciousness and recovery in such patients, both for medical management and ethical reasons **(Logi et al., 2003).**

Evoked potentials (EPs) are more promising in the evaluation of comatose patients since they are less affected than

Electroencephalography (EEG) by sedative drugs frequently used inintensive care unit (ICU). They are less global than EEG and thus, allow assessing the topography of dysfunctions. Brainstem auditory evoked potentials (BAEPs) evaluate the functional state of brainstem auditory pathways in the pons, the lower part of the mesencephalon including the lateral lemniscus up to the inferior colliculi and are commonly used as a screening test for poor prognosis. The short latency somatosensory evoked potentials (SSEPs) have been the object of many more clinical studies since; they provide information about the brainstem somatosensory pathways, thalamo-cortical projections and primary somatosensory cortex itself. Since the first reports on BAEPs and short latency SEPs in the prognosis of coma by (**Rappaport et al., 1977)** and (**Greenberg et al., 1981),** the use of multimodality EPs as prognostic tool has progressively increased **(Logiet al., 2003).**

Accurately predicting the chances of awakening is important to help families make decisions about continued medical care. Falsely pessimistic predictions of never awakening (when awakening may have occurred if the patient was supported long enough) should be avoided. **(Tirschwel, 2006).**

AIM OF WORK

The objective of this study is to evaluate the utility of the clinical signs and short latency SSEP (N20) for the prediction of awakening from coma due to stroke and the prediction of the functional outcome after stroke and compare it to the usually used clinical scales as GCS.

DEFINITION AND ETIOLOGY OF COMA

Coma and other states of impaired consciousness represent a severe derangement in cerebral function that may be structural or nonstructural (toxic metabolic,pharmacologic, seizures) in origin.

Many of the underlying processes leading to coma can be both life-threatening and potentially reversible with the timely institution of medical or surgical therapy **(Stevens &Bhardwaj, 2006).**

Brain injury from global cerebral ischemia is a significant worldwide clinical problem. Global cerebral ischemia can occur in the setting of cardiac arrest, open heart surgery, prolonged hypoxia or hypoglycemia, pathologically elevated cerebral metabolic rate, or decreased cerebral perfusion pressure. The annual incidence of cardiac arrest alone, with concomitant global cerebral ischemia, is in excess of 400,000, and more than 80%of these patients are expected to have poor neurological outcomes. Thus, the medical, financial, and emotional burdens of global cerebral ischemia are enormous **(Robert et al., 2008).**

Definitions

Consciousness is an active process with multiple components. Wakefulness or alertness is a precondition for consciousness.

Stupor and coma are clinical states in which patients have impaired responsiveness (or are unresponsive) to external stimulation and are either difficult to arouse or are unarousable. Coma is defined as "unarousable unresponsiveness" .An alert patient has a normal state of arousal. The