NEW TRENDS IN MANAGEMENT OF HEAD INJURY

An essay submitted for partial fulfillment of master degree in anesthesiology

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DEDICATION

I dedicate this work to

My **parents** and my **sister**

And all members of my family

For their help and assistance.

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LIST OF ABBREVIATIONS

Å	angstrom
A-VDO2	Arteriovenous oxygen difference
BAPEs	Brain stem auditory evoked potential
BBB	Blood brain barrier
ºC	Celsius
CBF	Cerebral blood flow
CBV	Cerebral blood volume
c(GMP)	Cyclic guanosine monophosphate
CMR	Cerebral metabolic rate
CMRO2	Cerebral metabolic rate for oxygen
CNS	Central nervous system
CO2	Carbon dioxide
CPAP	Continuous positive airway pressure
CPP	Cerebral perfusion pressure
CPR	Cardio pulmonary resustation
D5W	5% Dextrose in wate*r*
ECF	Extracellular fluid
ECG	Electrocardiography
EEG	Electroencephalograph**y**
EPs	Evoked potentials
GCS	Glasgow coma score

H_2O	Water
H_2O_2	Hydrogen peroxide
ICP	Intracranial pressure
ICU	Intensive care unit
HES	Hetastarch
I.V.	Intravenous
MAP	Mean arterial pressure
MRI	Magnetic resonant imaging
NaCl	Sodium chloride
NMDA	N-methyl-D-aspartate
NO	Nitric oxide
N 2O	Nitrous oxide
O_2	Oxygen
PaO_2	Arterial partial pressure of oxygen
PACUs	Post anesthesia care units
SAH	Subarachnoid hemorrhage
SEPs	Sensory evoked potentials
$SJVO_2$	Jugular bulb venous oxygen saturation
SSEPs	Somatosensory evoked potentials
TBI	Traumatic brain injury
TCD	Transcranial Doppler
VEPs	Visual evoked potentials

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INTRODUCTION

Head Injury is damage to living brain tissue caused by an external mechanical force. It is usually characterized by a period of unconsciousness lasting minutes, months or indefinitely. The resulting damage to the brain tissue impairs the individual's abilities both physically and mentally. **(Jones et al, 1994).**

Traumatic injury is a major health problem, both in terms of human death and disability, as well as financial costs. Injuries to the head (resulting in disabilities that surpass in severity injuries to any other body system injuries) are the most frequent cause of death due to trauma**.** With current knowledge head injury is the leading cause of death among people younger than 24 Years of age. **(Sauaia et al, 1995**).

The aim of therapy is to improve outcome by preventing secondary CNS damage. These secondary insults may cause permanent neurological damage and worsening of outcome if undetected and untreated. The purpose of continuous monitoring of the brain in the critical care unit is detection of these secondary insults, allowing for a more informed approach to treatment. (**Chestnut et al, 1993).**

The development in monitoring technology, in concern with our rapidly growing understanding of the function and malfunction of CNS, offer exciting new ways of monitoring the brain. Many of these methods are still experimental. But some provide important information that may have a dramatic effect on the outcome of head trauma patients. **(Jones et al, 1994).**

There was marked improvement in the outcome of head trauma patients in the past two decades. Thus, improvement can be related to the new trends in the management of head trauma patients which have changed recently. (**Chestnut et al, 1993).**

CEREBRAL ANATOMY

The nervous system is commonly divided into the central nervous system and the peripheral nervous system. The central nervous system is made up of the brain, its cranial nerves and the spinal cord. The peripheral nervous system is composed of the spinal nerves that branch from the spinal cord and the autonomic nervous system (divided into the sympathetic and parasympathetic nervous system); it controls response to stressful situations.
(Wada,et al ,1999).

The Brain:

Is the part of CNS enclosed inside the skull (figure 1).
Morphological subdivision:

I- THE CEREBRUM : Rt. &Lt. hemispheres.

II- THE CEREBELLUM: below the posterior part of cerebrum.

III- THE BRAIN STEM : formed of the following parts:

(From below upward):

a) Medulla oblongata.

b) Pons.

c) Midbrain.

d) Diencephalons (thalamus& related structure).

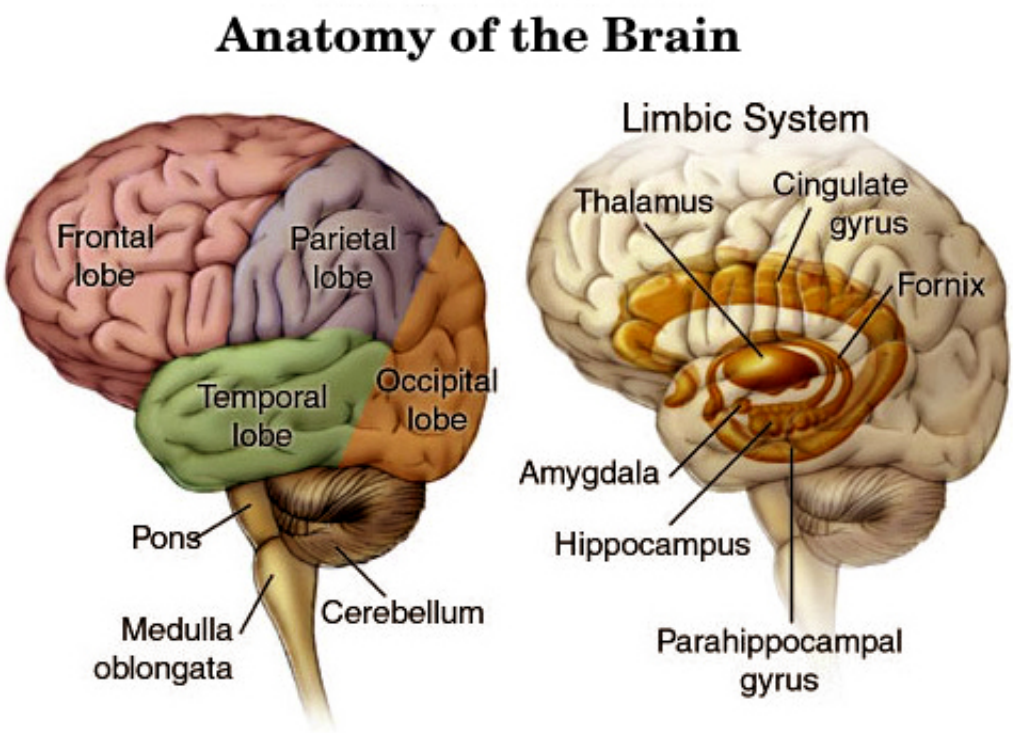

Figure 1. Anatomy of the brain (Wada et al., 1999).

PREHOSPITAL MANAGEMENT

The prehospital phase is perhaps the most critical interval in determining the ultimate outcome after clinical TBI. Critical to the outcome of acute head injury are rapid interventions to prevent secondary brain damage. A recent Study indicated that: the implementation of helicopter emergency service staffed by physicians who are expert in trauma care might reduce head-injured mortality rates (about a third of deaths occur after a brief period sometimes called "the golden hour")**. (Prough et al, 1995).**

Systemic parameters:

Owing to impaired cerebral autoregulation after trauma, hypovolemic hypotension that would not otherwise reduce CBF may lead to brain ischemia **(Witt et al, 1992).**

Thus, prompt application of basic life support, i. e., tracheal intubation, positive pressure ventilation with oxygen, and intravenous fluid resuscitation may limit secondary hypoxic brain damage. Concerns that adequate fluid resuscitation results in increased ICP after head injury appear to be unfounded. On a purely physiologic basis, it is reasonable to argue that cerebral circulation is so pressure – dependent immediately after TBI that even short – term support with vasopressors might be defensible. (**Gross1990).**