UPDATES IN MANAGEMENT OF POST- TRAUMATIC BRAIN INJURY IN ICU

Essay

Submitted for partial fulfillment of Master Degree in Intensive Care

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المستحدثات في علاج مرضى اصابات المخ ما بعد صدمات الرأس في وحدة الرعاية المركزة

رسالة
تمهيداً للحصول علي درجة الماجستير فى
الرعاية المركزة

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٢٠١٢


بسم الله الرحمن الرحيم
قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا
إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ
صدق الله العظيم
سورة البقرة (٣٢)

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ACA	**:**	Anterior Cerebral Artery
ARDS	**:**	Acute Respiratory Distress Syndrome
ALI	**:**	Acute Lung Injury
ATLS	**:**	Advanced Trauma Life Support
AVDO2	**:**	Arteriovenous Difference Of Oxygen
BBB	**:**	Blood Brain Barrier
CBF	**:**	Cerebral Blood Flow
CMR	**:**	Cerebral Metabolic Rate
CMRO2	**:**	Cerebral Metabolic Rate of Oxygen
CNS	**:**	Central Nervous System
CO2	**:**	Carbon Dioxide
COX	**:**	Cyclooxygenase
CPP	**:**	Cerebral Perfusion Pressure
CSF	**:**	Cerebrospinal Fluid
CT	**:**	Computed Tomography
CVP	**:**	Central Venous Pressure
CVR	**:**	Cerebral Vascular Resistance
DBP	**:**	Diastolic Blood Pressure
DIC	**:**	Disseminated intravascular coagulopathy
DVT	**:**	Deep vein thrombosis
EEG	**:**	Electroencephalography
ELISA	**:**	Enzyme Linked Immunosorbent Assay

EMS	**:**	Emergency Medical Service
EMT	**:**	Emergency Medical Team
EPO	**:**	Erythropoietin
ETCO2	**:**	End Tidal Carbon Dioxide
FAST	**:**	Focused Assessment By Sonography In Trauma
FiO2	**:**	Fraction of inspired oxygen
GABA	**:**	Gamma-Aminobutyric Acid
GCS	**:**	Glasgow Coma Scale
HES	**:**	Hydroxyethyl Starch
HMGCoA	**:**	3hydroxy 3methyl glut aryl coenzyme A
ICA	**:**	Internal Carotid Artery
ICAM	**:**	Intercellular Adhesion Molecules
ICP	**:**	Intracranial Pressure
ICU	**:**	Intensive Care Unit
IgG/M	**:**	Immunoglobin G/M
IL	**:**	Interleukin
LMA	**:**	Laryngeal Mask Airway
LMWH	**:**	Low Molecular Weight Heparin
MAP	**:**	Mean Arterial Blood Pressure
MCA	**:**	Middle Cerebral Artery
MgSO4	**:**	Magnisium sulphate
MgCl2	**:**	Magnisium chloride
MILS	**:**	Manual In Line Stabilization
MRI	**:**	Magnetic Resonance Imaging

MRS	**:**	Magnetic Resonance Spectroscopy
MSC	**:**	Mesenchymal Stromal Cells
MV	**:**	Mechanical ventilation
N2O	**:**	Nitrous Dioxide
NGF	**:**	Nerve Growth Factor
NIRS	**:**	Near Infrared Spectroscopy
NMDA	**:**	N-Methyl-D-Aspartate
NO	**:**	Nitric Oxide
NOS	**:**	Nitric Oxide Synthase
NTF	**:**	Neurotrophic Factor
O2	**:**	Oxygen
PaCO2	**:**	Arterial Carbon Dioxide Tension
PaO2	**:**	Arterial Oxygen Tension
PCA	**:**	Posterior Cerebral Artery
PET	**:**	Positron Emission Tomography
PEEP	**:**	Positiveend Expiratory Pressure
PGE2	**:**	Prostaglandin E2
pH	**:**	Potential Of Hydrogen
PT	**:**	Prothrombin Time
PTiO2	**:**	Brain Tissue Oxygen Tension
PTT	**:**	Partial Thromboplastin Time
RBC	**:**	Red Blood Cells
RVM	**:**	Rostral Ventrolateral Medulla
SAH	**:**	Subarachnoid Hemorrhage

SBP	**:**	Systolic Blood Pressure
SCI	**:**	Spinal Cord Injury
SjvO2	**:**	Jugular Venous Oxygen Saturation
SPECT	**:**	Single Photon Emission Computed Tomography
Sao2	**:**	Arterial Oxygen Saturation
SpO2	**:**	Oxygen Saturation
TBI	**:**	Traumatic Brain Injury
TCD	**:**	transcranial doppler
TH	**:**	Therapeutic Hypothermia
TNF	**:**	Tumor Necrosis Factor
UH	**:**	Unfractionated Heparin
VC	**:**	Vital Capacity
VILI	**:**	Ventilator Induced Lun g Injury
VIP	**:**	Vasoactive Intestinal Pe ptide
VT	**:**	Tidal Volume

INTRODUCTION

Traumatic brain injury (TBI) reflects an insult to the brain from an external mechanical force (high–energy acceleration or deceleration) that might cause a temporary or permanent impairment of physical and cognitive functions along with changes in mental status. TBI resulting from head injury is the leading cause of death in individuals younger than 45 years and accounts for approximately 40% of all deaths from acute injuries in the United States.

Neurological complications from TBI can occur as a direct result of the primary injury or may be caused by secondary injuries that follow within minutes to days. The primary injury is typically the result of a direct initial insult and secondary injury is caused by subsequent cascade of biochemical changes that are triggered by ischemia and result in disruption of the normal central nervous system balance between oxygen supply and demand. The entire secondary injury process is a vicious cascade of biochemical changes that leads to further spread of the ischemic injury and neurological deficits.

Critical care of head injured patients is complex and based on recognition and treatment of hazardous increase in intracranial pressure, with therapeutic targets for neuroprotection following TBI.

AIM OF THE WORK

This essay aims to provide an overview of the current management of traumatic brain injury in intensive care unit.

CHAPTER 1

ANATOMY OF THE BRAIN

The central nervous system (CNS) can be divided into brain and spinal cord .The brain, is contained within the cranium, and constitutes the upper, greatly expanded part of the central nervous system. The average weight of the brain, in the adult male, is about 1380 gm; that of the female, about 1250 gm. ***(Mendoza JE, and Foundas AL 2008)***.

The Cerebral Hemispheres

The cerebral hemispheres constitute the largest part of the brain. The hemispheres are separated medially by the longitudinal cerebral fissure .They are connected across the middle line by the corpus callosum. Each possesses a central cavity (the lateral ventricle) and presents three surfaces: lateral, medial, and inferior. These three surfaces are separated from each other by the borders: supero-medial, infero-lateral, medial occipital and medial orbital. The surfaces of the hemispheres are moulded into a number of irregular eminences, named gyri or convolutions, and separated by furrows termed fissures or sulci. By means of these fissures and sulci, assisted by certain arbitrary lines, each hemisphere is divided into the following lobes: the frontal, the parietal, the temporal, and the occipital. ***(Mendoza JE, and Foundas AL 2008)***.

The anterior end of the hemisphere is named the frontal pole; the posterior end, the occipital pole; and the anterior end of the temporal lobe, the temporal pole.

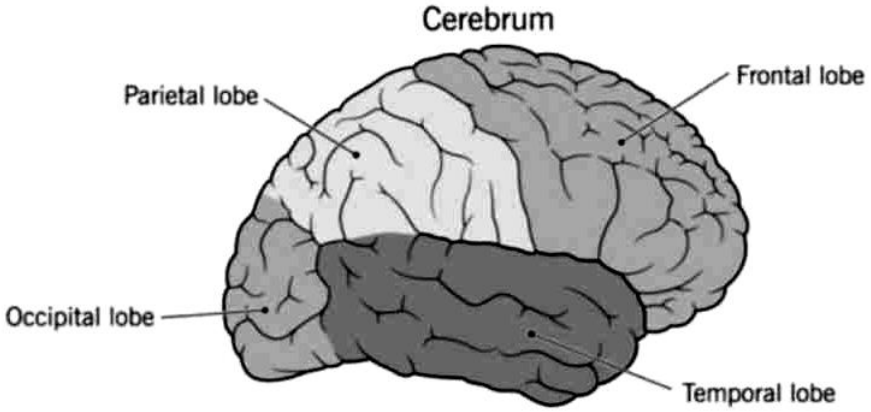

Figure1- Principal Fissures and lobes of the cerebrum viewed laterally. (Fine C, 2008)

Structure of the Cerebral Hemispheres:

The cerebral hemispheres are composed of gray and white substance. The former covers their surface, and is termed the cortex; the latter occupies the interior of the hemispheres. The white substance consists of medullated fibers, varying in size, and arranged in bundles separated by neuroglia. They may be divided, according to their course and connections, into three distinct systems. ***(Fine C, 2008)***

1. Projection fibers connect the hemisphere with the lower parts of the brain and with the spinal cord.
2. Transverse or commissural fibers unite the two hemispheres.