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Implementation of therapeutic hypothermia to improve patient's outcome after traumatic brain injury & cardiac arrest in Intensive Care Units

Essay

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BY

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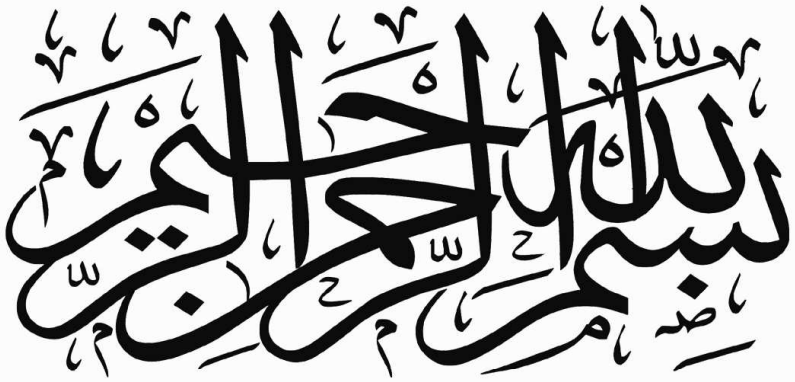

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا
إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

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Moustafa Gaber

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List Of Abbreviations

5HT	**:**	5-Hydroxytryptamine
ACCF	**:**	American College of Cardiology Foundation
ACLS	**:**	Advanced Cardiac Life Support
AED	**:**	Anti-epileptic drug
AHA	**:**	American Heart Association
ARDS	**:**	Acute respiratory distress syndrome
ATLS	**:**	Advanced Trauma Life Support
BLS	**:**	Basic Life Support
BP	**:**	Blood pressure
CBF	**:**	Cerebral blood flow
CDC	**:**	The Center for Disease Control and Prevention
CMRO2	**:**	Cerebral metabolic rate of oxygen
CPP	**:**	Cerebral perfusion pressure
CPR	**:**	Cardio pulmonary resuscitation
CSF	**:**	Cerebrospinal fluid
CT	**:**	Computed tomography
DAI	**:**	Diffuse axonal injury
DC	**:**	Defibrilator
DVT	**:**	Deep vein thrombosis
ECG	**:**	Electrocardiogram
EEG	**:**	Electroencephalogram
FOUR	**:**	Full Outline of Unresponsiveness Score
GCS	**:**	Glasgow Coma Scale
GCS-E	**:**	Glasgow Coma Scale-Extended
GI	**:**	Gastrointestinal
GOS	**:**	Glasgow outcome score
ICD	**:**	Implantable Cardioverter-Defibrilator
ICP	**:**	Intracranial pressure
ICU	**:**	Intensive care unit
IJV	**:**	Internal jugular vein
MAP	**:**	Mean arterial blood pressure
NFkB	**:**	Neuclear Factor Kappa B
NICHD	**:**	The National Institute of Child Health and Human Development
NMDA	**:**	N-methyl-D-aspartate
NRP	**:**	Neonatal Resuscitation Program
NSE	**:**	Neuron Specific Enolase
PaCO2	**:**	Partial pressure of arterial carbon dioxide concentration
PaO2	**:**	Partial pressure of arterial oxygen concentration
PbtO2	**:**	Brain tissue oxygen tension
PRINCE	**:**	Preclinical Trans-Nasal Cooling with Evaporated Perfluorcarbon
RISK	**:**	Reperfusion Injury Salvage Kinase

ROSC	**:**	Restoration Of Spontaneous Circulation
SCA	**:**	Sudden Cardiac Arrest
SCI	**:**	Spinal cord injury
ScVO2	**:**	Central venous oxygen saturation
SjVO2	**:**	Jugular venous oxygen saturation
SSEP	**:**	Somatosensory Evoked Potentials
STEMI	**:**	ST segment elevation myocardial infarction
TBI	**:**	Traumatic brain injury
TH	**:**	Therapeutic hypothermia
VF	**:**	Ventricular fibrillation
VT	**:**	Ventricular tachycardia

Introduction

INTRODUCTION

Traumatic brain injury and Cardiac arrest are a major worldwide public health concern. Survival rate remains very low despite early access to emergency medical care, cardiopulmonary resuscitation (CPR), defibrillation, and advanced cardiac life support (ACLS). Extracorporeal life support (ECLS) is a well-recognized cardiac support technique in a growing number of primary cardiomyopathies and postoperative cardiac surgical cases or traumatic brain injury. Post-cardiac arrest care has significant potential to reduce early mortality caused by hemodynamic instability and later morbidity and mortality from multiorgan failure and brain injury ***(Peberdy et al., 2010).***

There are more than 1500000 Traumatic brain injury and cardiac arrests per year in the United States alone. More than 250 000 of them die and many survivors have significant neurologic deficits ***(Gaieski et al., 2009)***. The outcome among patients admitted to hospital after out-of-hospital cardiac arrest is still relatively poor. However, induced mild hypothermia can improve survival and the neurological outcome ***(Larsson et al., 2010).***

Therapeutic hypothermia currently represents the most efficacious treatment option to reduce neurologic injury and mortality in comatose patients who have restoration of spontaneous circulation (ROSC) after cardiac arrest. It is unknown whether adjunctive therapies used in concert with therapeutic hypothermia (TH) further improve outcomes ***(Gaieski et al., 2009).***

Therapeutic hypothermia (TH) involves the controlled reduction of a patient's core temperature in an attempt to protect an organ at risk of injury ***(Moore et al., 2011).***

Hypothermia and temperature management for severe traumatic brain injury and cardiac arrest divided into trials in which hypothermia is used to

treat elevated intracranial pressure (ICP) & others in which hypothermia is intended as a neuroprotective irrespective of intracranial pressure as initial line in treatment for witnessed cardiac arrest with initial ventricular tachycardia/ventricular fibrillation (VT/VF) and should be considered in other initial ECG rhythms according to current cardiopulmonary resuscitation (CPR) guidelines ***(Larsson et al., 2010).***

The effect of hypothermia on the neurological outcome would seem to be most beneficial when the treatment is initiated as early as possible after restoration of spontaneous circulation (ROSC) and maintained for 12-24 h (***Polderman and Herold, 2009).***

Despite its recommendation in current CPR guidelines; therapeutic hypothermia after cardiac arrest is not used in clinical practice in all hospitals caring for these patients, for reasons based on scientific, technical, logistical and economic issues ***(Larsson et al., 2010).***

Aim Of The Work

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The aim of this work is to spotlight on the role of implementation of therapeutic hypothermia on outcome of patients of traumatic brain injury & cardiac arrest in intensive care unit.

Chapter I

Therapeutic hypothermia

Therapeutic hypothermia

The term therapeutic hypothermia (TH) has a long history; hypothermia was mentioned by ancient Egyptians in the so called Ebers Papyrus, the Greek physician Hippocrates advocated the packing of wounded soldiers in snow and ice. In the last decade, TH has been explored in a number of acute critical conditions, including acute myocardial infarction, stroke, and head trauma and after cardiac arrest***(Faul M, et al 2010).***

✍ Thermoregulation:

Thermoregulation is the ability of an organism to keep its body temperature within certain boundaries, even when the surrounding temperature is very different. The human body keeps its core temperature constant at about by 37.5°C by physiological adjustments controlled by the hypothalamus (thermostat center) where there are neurons sensitive to changes in skin and blood temperatures. The temperature-regulating centers are found in the preoptic area (the anterior portion of the hypothalamus). This area receives input from temperature receptors in the skin and mucous membranes (peripheral thermo receptors) and from internal structures (central thermo receptors), which include the hypothalamus itself***(Sinclair and Andrews ,2010).***The temperature sensory signals from the preoptic area and form the periphery are combined in the posterior hypothalamus to control the heat producing and conserving reactions of the body. The hypothalamic thermostat works in conjunction with other hypothalamic, autonomic and higher nervous thermoregulatory centers to keep the core temperature constant. Some of these thermoregulatory responses are involuntary, mediated by the autonomic nervous system, some are neurohormonal and others are semi-voluntary or voluntary behavioral responses***(Sinclair and Andrews ,2010).***