بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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جامعة عين شمس

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قسم

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Monitoring osmotherapy in traumatic brain injury patients: correlation between ultrasound assessment of optic nerve sheath diameter and computed tomography scan

Thesis

Submitted for Partial Fulfillment of Master Degree in Intensive Care

By

Hossam Mohammed Mohammed Elmorshedy

M.B.B.CH

Under supervision of

Prof. Dr. Galal Adel Alkady

Professor of Anesthesiology, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr. Salwa Omar Elkhattab Amin

Assistant Professor of Anesthesiology, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Dr. Waleed Abdallah Ibrahim

Assistant Professor of Anesthesiology, Intensive Care and Pain Management
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
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Abb.	Full term
ABG	Arterial blood gases
AMPA	α -amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid
AMS	Acute Mountain sickness
ASDH	Acute subdural hematoma
AUC	Area under curve
AV fistula	Arteriovenous fistula
BBB	Blood-brain barrier
CBC	Complete blood count
CBF	Cerebral blood flow
CDC	Centers for Disease Control and Prevention
CNS	Central nervous system
CPP	Cerebral perfusion pressure
CSF	Cerebrospinal fluid
CT	Computed tomography
DAI	Diffuse axonal injury
DKA	Diabetic ketoacidosis
EDH	Epidural Hematoma
EVD	External ventricular drain
FLAIR	Fluid-attenuated inversion recovery
FV	Flow velocity
GCS	Glasgow Coma Scale
HACE	High-altitude cerebral edema
ICH	Intracerebral haemorrhage
ICP	Intracranial pressure
IOP	Intraocular pressure
MAP	Mean systemic arterial pressure
MRI	Magnetic resonance imaging

List of Abbreviations Cont...

Abb.	Full term
NMDA	N- Methyl D- Aspartate
ON	Optic nerve
ONSD	Optic nerve sheath diameter
RBS	Random blood glucose
RGC	Retinal ganglion cell
SAH	Subarachnoid haemorrhage
SS	Single Shot
TBI	Traumatic brain injury
TCD	Transcranial Doppler
TMD	Tympanic membrane displacement
US	Ultrasound
USG	Ultrasonography
VRIs	Ventriculostomy-related infections

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INTRODUCTION

Elevated intracranial pressure (ICP) and cerebral edema are common neurologic complications of various cerebral disorders, such as traumatic brain injury (TBI), intracerebral haemorrhage (ICH) & subarachnoid haemorrhage (SAH) ***(Wang et al., 2020).***

Early detection, evaluation and treatment of elevated ICP improve outcome of TBI. Invasive ICP monitoring is the gold standard method for ICP monitoring, but invasive techniques are associated with risk of complications such as hemorrhage and infection, also, it is not available in all places and requires high expertise ***(Raboel et al., 2012).***

Some non-invasive methods for measuring ICP can be used as alternatives to invasive techniques, including transcranial Doppler, optic nerve sheath diameter (ONSD), computed tomography (CT), magnetic resonance imaging (MRI), and fundoscopy ***(Raboel et al., 2012).***

These non-invasive techniques do not carry the risk of complications as with invasive methods. Recently, adult studies have reported that measuring ONSD with non-invasive imaging technologies such as CT, MRI and ultrasound can be used as an alternative method to evaluate increased ICP ***(Kimberly et al., 2008).***

However, CT and MRI for ONSD measurements are time consuming, costly and usually require patient transportation.

Thus, ultrasound assessments of ONSD could be a better option because reliable, accessible, easy to learn, low cost and rapid bedside operation without the need for radiation exposure, especially for cases that are unstable and require real-time monitoring of ICP in an intensive care unit ***(Tayal et al., 2007).***

The optic nerve sheath is continuous with the meninges of the central nervous system and is encased with the subarachnoid membrane. Cerebrospinal fluid (CSF), located in the subarachnoid space, accumulates in the optic nerve sheath thereby widening its diameter in the setting of increased ICP and limited intracranial compliance ***(Sekhon et al., 2014).***

Osmotherapy is one treatment intervention in the care of patients with severe head injury resulting in cerebral edema and intracranial hypertension. The effect of hyperosmolar solutions on brain tissue was first studied nearly 90 years ago. Since that time, mannitol has become the most widely used hyperosmolar solution to treat elevated intracranial pressure ***(Knapp & James, 2005).***

Aim of the Work

To compare ultrasound assessment of optic nerve sheath diameter as a monitoring tool of adequacy of brain dehydration by osmotherapy in traumatic brain injury in comparison to the current standard of using brain CT.