Depressed Skull Fracture over Cranial Venous Sinuses

A Systematic Review

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By

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قال رسول الله ﷺ لعلي رضي الله عنه:

﴿ فوالله لأن يهدي الله بك رجلاً واحداً خير لك من حمر النعم ﴾

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List of Contents

Subject *Page No.*

List of Abbreviations

Abbr.		Full-term
ABC	:	Airway, Breathing, Circulation
ATLS	:	Advanced Trauma Life Support
BBB	:	Blood Brain Barrier
BIH	:	Benign Intracranial Hypertension
CBF	:	Cerebral Blood Flow
CBV	:	Cerebral Blood Volume
CNS	:	Central Nervous System
CPP	:	Cerebral Perfusion Pressure
CSF	:	Cerebro Spinal Fluid
CT	:	Computed Tomography
CTA	:	Computed Tomography Angiography
CVT	:	Cerebral Venous Thrombosis
CNS	:	Central Nervous System
DC	:	Decompressive Craniectomy
DAI	:	Diffuse Axonal Injury
DSF	:	Depressed Skull Fracture
EVD	:	External Ventricular Device
GCS	:	Glasgow Coma Score
HCP	:	Hydrocephalus
HI	:	Head Injury
ICH	:	Intra Cranial Hypertension
ICP	:	Intra Cranial Pressure
LP	:	Lumbar Puncture
MAP	:	Mean Arterial Pressure
MRI	:	Magnatic Resonance Imaging
MRV	:	Magnatic Resonance Venography
PBI	:	Penetrating Brain Injury
PVI	:	Pressure Volume Index
RTA	:	Road Traffic Accident
SSS	:	Superior Sagittal Sinus
TBI	:	Traumatic Brain Injury
TOF	:	Time Of Flight
VST	:	Venous Sinus Thrombosis
WI	:	Weighted Images

List of Tables

List of Figures

Figure No.	Title	Page No.

List of Charts

Introduction

I. Rationale and justification of the study

Trauma in general is a serious problem worldwide. Head trauma continues to be a nightmare, not only for the public but also for the neurosurgeons. It remains one of the most common causes of morbidity and mortality particularly, in developing countries. Commonly seen after road traffic accidents, fall from height, physical attacks and other injuries **(Jennett, 1996)**.

Skull fractures simply classified into linear or depressed types. Linear fracture is the most common type. This type is usually managed none surgically. On the other hand, depressed fractures can be either simple or compound, (closed or open). Most of the depressed fractures are compound fractures. It represents 75 to 90% of these cases. It is one of the most common condition needing emergency operation, because of the high risks of infections. This type of fractures generally accepted to be managed surgically, while the closed type is treated conservatively. Unless there is a significant cosmetic deformity, underlying hematoma or venous sinus injury **(Poon *et al.*, 2007)**.

Significant dural sinus injury occurs in 1.5 to 5% of all head injuries. The superior sagittal sinus (SSS) is the most commonly affected location. It accounts for 70 to 80% of these cases **(Behera *et al.*, 2015)**. Its anterior and central part are involved in 66% of the cases, while the posterior part reported in 8% only. Injuries to the transverse sinus represent 18% of all cases. Furthermore, the combined injuries of different dural sinuses account for 8% only **(Meier *et al.*, 1992)**.

Depressed skull fractures (DSF) overlying a venous sinus represent 11 to 18% of the cases **(LeFeuvre *et al.*, 2004)**. Which may lead to increase in the intracranial pressure (ICP) **(Donovan, 2005)**.

This increase in ICP either from sinus thrombosis and decrease absorption of cerebrospinal fluid (CSF), or from sinus compression and stenosis which leads to venous hypertension **(Donovan, 2005)**.

Therefore, the clinical manifestations range from headache only to seizures, confusion with or without neurologic deficits and death **(Ozevrena & Cevizb, 2016)**. Whereas the visual field defects, papilledema, and finally visual disturbance reported in other cases **(Yokota *et al.*, 2006)**. The location of sinus injury is very important in terms of perioperative mortality and morbidity **(Kim *et al.*, 2015)**. Therefore, a high level of suspicion should arise when an injury occurs in proximity to the midline of the cranial vault or the Torcular Herophili. Specially these patients may present shortly after the initial injury, or may not develop symptoms for days to weeks afterwards **(Wright *et al.*, 2012)**.

Nowadays a highly specific brain imaging modalities are available. It includes the computed tomography angiography (CTA) and the magnetic resonance venography (MRV). These imaging devices play a key role in the diagnosis of venous sinus occlusion. Which make it possible to be detected early. Therefore, it is worthy to investigate any patients with the risk of venous sinus injury **(Yokota *et al.*, 2006).**

Patients with features of intracranial hypertension (ICH) without any focal neurological deficits managed conservatively. Either with anti-edema measures, Acetazolamide or by repeated lumbar punctures (LP) **(Brink *et al.*, 1996)**.

However, some authors have reported persistence of features of ICH with these conservative measures. In addition, if untreated the venous sinus thrombosis (VST), it can extend proximally or distally leading to venous infarction, which is irreversible **(Mathew *et al.*, 2017)**.

By contrast, the use of surgical management is still a matter of controversy. In addition, the role played here by neurosurgeons in the integral treatment remains critical. Because of the fear of high probability of massive blood loss. Either at the time of trauma or at the emergency operation. In both situations, the risk of mortality is high. That is why the classical teaching with the common neurosurgical wisdom is to treat such cases conservatively **(Uzan *et al.*, 1998)**.

Recently, the concept regarding this theory of conservative treatment is changing. It started to be weighed against the benefits of surgery. In which, the elevation of the depressed fragment restores patency of the venous flow. Moreover, lead to resolution of the symptoms caused by raised ICP **(Fuentes *et al.*, 2005)**.

II. Aim of the Work

To review and provide a complete exhaustive summary of the current literatures regarding the proper management of depressed skull fracture over the cranial venous sinuses either conservatively or surgically.

III. Objectives

To compare the efficacy and effectiveness of conservative treatment versus surgical intervention in the management of depressed skull fracture involving the cranial venous sinuses as regards improvement of symptoms and gaining the benefits of better recovery as a primary outcomes. While complications dependent on the intervention being considered with the plan carrying the high risk of morbidity and mortality as the secondary outcomes.