Conservative management of closed head injury

Thesis
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TO MY FATHER'S MEMORY……

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Content

List of abbreviations

3DCTA	3 Dimensions CT Angiography
ABCDE	Airway, Breathing, Circulation, Disability, Exposure
ACS	American College of Surgeons
ADH	Antidiuretic hormone
ADP	Adenosine diphosphate
ATLS	Advanced Trauma Life Support
ATP	Adenosine triphosphate
$AVDO_2$	Arteriovenous difference of oxygen
BCVI	Blunt cerebrovascular injury
CBF	Cerebral blood flow
CMRG	Cerebral metabolic rate of glucose
$CMRO_2$	Cerebral metabolic rate of oxygen
CNS	Central nervous system
CPP	Cerebral perfusion pressure
CSF	Cerebrospinal fluid
CT	Computed Tomography
DIC	Disseminated Intravascular Coagulation
DVT	Deep vein thrombosis
EDH	Extradural hematoma
ER	Emergency room
GCS	Glasgow Coma Score
GI	Gastrointestinal
GU	Genitourinary
ICA	Internal carotid artery
IC-HTN	Intracranial hypertension
ICP	Intra cerebral pressure
ICU	Intensive care unit
IVC	Intraventricular catheter
IVH	Intraventricular hemorrhage
LOC	Loss of consciousness

MAP	Mean arterial pressure
MCP	Mean carotid pressure
MgSO4	Magnesium sulphate
MRA	Magnetic Resonance Angiography
MRI	Magnetic Resonance Imaging
mTBI	Mild traumatic brain injury
NPH	Normal-pressure hydrocephalus
$Paco_2$	Arterial carbon dioxide tension
PE	Pulmonary embolism
PGCS	Pediatric Glasgow Coma Score
Po2	Arterial oxygen tension
PPI	Proton pump inhibitors
PS	Primary survey
PTA	Post-traumatic amnesia
PTH	Post-traumatic hydrocephalus
PVI	Pressure volume index
RBC	Red blood cell
ROM	Range of motion
SAH	Subarachnoid hemorrhage
SAP	Systemic arterial pressure
SDH	Subdural hematoma
SIADH	Syndrome of inappropriate antidiuretic hormones secretion
SS	Secondary survey
TBI	Traumatic brain injury
TCDB	Traumatic Coma Data Bank
TSAH	Traumatic subarachnoid hemorrhage
V i/c	Intracranial volume

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INTRODUCTION AND AIM OF THE WORK

Introduction

Brain injury is the most common cause of death in trauma victims accounting for about half of deaths at the accident site. The head injuries are generally blunt and motor vehicle accidents are most frequent. Of particular significance are motorcycle accidents involving passengers without helmet, which produce severe injuries. As many as two thirds of all motor vehicle accident victims sustain some head injury. Complications from closed head injuries are the single largest cause of morbidity and mortality in patients who reach the hospital alive. Of patients who require long term rehabilitation, head trauma is usually the primary injury. Although the mechanisms vary, head injuries are the major cause of morbidity and mortality in childhood trauma victims, accounting for an annual mortality rate of 1 per 1000 in childhood age group. (42)

Closed head injury defined as injury due to a blunt blow to the head and/or associated with acceleration and deceleration without skull fracture. The brain whips around inside the skull and is damaged by shearing and impact on its protrusions. Closed head injury is the result of variety of mechanisms including motor vehicle and motor cycle accidents, falls from heights; blunt objects can violate the skull. Traumatic brain injury can be occurs in the presence of additional injuries to other major organ systems but it can also occur in isolation. (2)

Today we have a better understanding of the mechanisms of both primary damage caused by the critical insult and the destructive process which are triggered by it. The monitoring technology required to detect adverse secondary events has evolved considerably in the past few years. Significant reduction in mortality and morbidity associated with severe head injury has been achieved with aggressive management protocols that emphasize maintenance of blood pressure, prompt evacuation of mass lesion and control of intracranial pressure. Current efforts in the field are directed at the development and clinical testing of new drugs and physiological intervention. It is anticipated that further improvements in outcome will be derived from the cumulative benefits of several such interventions. (58)

In those with mild or minor head injury, decision-making centers around deciding if a patient should be admitted for observation or discharged home, based on their risk for a life-threatening intracranial lesion. Such lesions are seen in about 2% of these patients and generally present in the first 12-24 hours. Authors recommend the Canadian CT Head Rule for assistance in determining which patients should be imaged. All patients with an anomaly on CT or x-ray should be admitted for 24h of observation with a CT repeated prior to discharge if possible. Those meeting criteria for observation at home may be discharged if the attending physician feels it is prudent to do so. Patients with moderate and severe head injuries must be admitted and are generally monitored in an intensive care setting. (141)

Conservative management in patients with head injury can be a viable alternative in certain cases. Radiological findings should be evaluated in light of the age, co-morbidities, and the neurological and overall clinical condition of the patient. It is essential to take into consideration a prudent period of observation, inpatient radiological follow-up as well as adequate outpatient surveillance when applicable. Close observation at an intensive care unit should be provided, with intracranial monitoring when needed. (17)

Aim of the work:

To focus the light of a serious life threatening closed head injury regarding the incidence, mechanism, pathophysiology, complication and different methods of management with special attention in conservative methods in management.

Prospective study of 20 cases admitted and managed at kasr elaini hospital and ministry of health hospitals.

ANATOMICAL CONSIDERATION

Anatomical consideration

The brain is surrounded by cerebrospinal fluid (CSF), enclosed in meningeal covering, and protected inside the skull. Furthermore, the fascia and muscles of the scalp provide additional cushioning to the brain. Test results have shown that 10 times more force is required to fracture a cadaveric skull with overlying scalp than the one without (18).

The scalp consists of five distinct anatomic layers. Listed from the most superficial to the deepest, these layers include: (1) the skin with its characteristic thick dermis; (2) the subcutaneous tissue; (3) the relatively rigid galea aponeurotica, which is continuous with the superficial musculoaponeurotic system, frontalis, occipitalis, and superficial temporal fascia; (4) underlying areolar tissue; and (5) skull periosteum. The rich vascular supply of the subcutaneous layer, in which there is an abundant communication of vessels, can result in significant blood loss when the scalp is lacerated. The relatively poor fixation of the galea to the underlying periosteum of the skull provides little resistance to shear injuries, resulting in large flaps or "scalping" injuries. This layer's resultant potential space also provides little resistance to hematoma or abscess formation. As a result, extensive fluid collections related to scalp injury tend to accumulate in the subgaleal plane (144).

Skull consisting of frontal bone which divided into two main portions, a vertical squamous portion which articulates with the paired parietals along the Coronal Suture and forms the forehead, and two orbital plates, which contribute to the ceiling and lateral walls of the left and right eye orbits. On the external surface the squamous portion frequently possesses a left and right frontal eminence. Additionally, the bone possesses two Supra-Orbital Ridges (i.e., Superciliary or Brow Ridges) which are bumps above each of the eye orbits. Associated with each Superior Orbital Margin of the eye orbit the frontal bone may possess a Supra-Orbital Notch or if completely surrounded by bone, a Supra-Orbital Foramen. Above the fronto-nasal suture which allows articulation between the frontal and nasal bones there is generally a trace of the vertical Metopic Suture. In early life the metopic suture divided the frontal bone into left and right halves. Within the bone, and above and the metopic suture, is the Frontal Sinus. The left and right Frontal Crest, begins at each zygomatic process of the frontal bone, and provides the anterior origin of the Temporal Line to which the left and right temporal muscle is attached, Internally, the frontal bone possesses the Median sagittal (i.e., sagittal-frontal) Crest which separates the two frontal hemispheres of the brain.