

INTRODUCTION

Head trauma is a frequent presenting complaint for visits to the emergency room in young children. The majority of presenting head trauma falls under the category of mild head injury (MHI). Over 40,000 pediatric head injuries result in emergency department (ED) visits each year most are mild and the result of fall from height (FFH) *Thiessen and Woolridge, 2006*).

Trauma is the leading cause of death and disability in childhood, with approximately 3000 deaths, 50,000 hospitalizations, and 650,000 emergency department (ED) visits per year in the United States *(Palchak et al., 2003)*.

The increased risk of pediatric patients from repeated imaging has been approximated as 1 cancer fatality resulting from every 1,000 CT examinations performed *(Brenner et al., 2001)*.

The term concussion has been used interchangeably with mild head injury (MHI) or mild traumatic brain injury (TBI) and has been defined as a trauma-induced alteration in mental status that may or may not involve the loss of consciousness (LOC). Controversy exists over the use of clinical predictors of intracranial injury in pediatric MHI; nevertheless, authors have devised decision trees to help guide the management of minor

head injury. Many authors recommend imaging younger children because these children have a higher risk of significant brain injury after blunt head trauma (*Haydel and Shembekar, 2003*).

It is the leading cause of mortality and disability among young individuals in high-income countries, and globally the incidence of TBI is rising sharply, mainly due to increasing motor-vehicle use in low-income and middle-income countries .WHO has projected that, by 2020, traffic accidents will be the third greatest cause of the global burden of disease and injury (*Finfer and Cohen, 2001*).

In higher income countries, traffic safety laws and preventive measures have reduced the incidence of TBI due to traffic accidents (*Redelmeier, 2001*).

People with head injury scoring 5 or less on the Glasgow Coma Scale (GCS) on admission have a poor prognosis. The high incidences of death and disability among such cases have been well documented (*Demetriades et al., 2004; Gan et al., 2004*).

These individuals need intensive treatment in the Intensive Care Unit (ICU), and their management puts enormous strain on ICU resources which are particularly scarce in developing countries such as India .The authors' institution,

which is a major tertiary referral center, deals with on average 2500 major trauma cases every year. Approximately 95% of these cases involve blunt trauma and 50% head trauma; 25% of the latter are severe, with 75% mortality, and occupy over 75% of trauma ICU beds at any given time. Trauma surgeons are faced with the challenge of allocating limited resources to people with the best chance of survival. A number of studies have identified predictors of outcome after severe head injury. These predictors include clinical parameters such as age, gender, GCS score, mechanism of injury, pupillary reactivity, Abbreviated Injury Scale (AIS) score and pre-hospital airway management (*Demetriades et al., 2004; Lieberman et al., 2002; Ono et al., 2001 and Susman et al., 2002*).

The GCS is the most widely used predictive variable because of its facility, repeatability and familiarity. However, the relationship of pre-resuscitative GCS with mortality is non-linear, which casts doubt over its use as a continuous measure incorporated into outcome prediction models. (*Demetriades et al., 2004; Pillai et al., 2003; White et al., 2001*).

Some trauma centers do not admit cases of head trauma with GCS less than 5 into the ICU, in order to make best use of limited resources. It has been the authors' observation that

although the overall mortality among such individuals is high. Some of them do survive with an acceptable Glasgow Outcome Scale GOS score. The policy of not admitting patients with GCS score of less than 5 means denying them a chance of survival that is real. A limited number of studies have followed patients with GCS scores of 5 or less (*Demetriades et al., 2004*).

On average, 39% of patients with severe traumatic brain injury (TBI) die from their injury, and 60% have an unfavorable outcome on the Glasgow Outcome Scale. The incidence of traumatic brain injury (TBI) is rising in low-income and middle-income countries because of increased transport-related injuries (*Maas et al., 2008*).

Survivors of severe traumatic brain injury (TBI) have a low life expectancy, dying 3.2 times faster than the general population (*Baguley et al., 2012*).

Furthermore, survivors face prolonged care and rehabilitation, and have consequent long-term physical, cognitive, and psychological disorders that affect their independence, relationships, and employment. In 2007, a conservative estimate of lifetime costs per case of severe traumatic brain injury (TBI) was USA\$396 331, with costs for disability and lost productivity (\$330 827) outweighing those for medical care and rehabilitation (\$65 504) (*Faulet et al., 2007*).

AIM OF THE WORK

To focus the light of a serious life threatening closed head injury regarding the, pathophysiology, complication and different methods of management. And hence we will study the morbidity and mortality outcome with respect surgical/conservative plane of management.

DIAGNOSIS OF HEAD INJURY

Optimum resuscitation and evaluation of the trauma patient involves a repetitive, systematic approach. The American College of Surgeons (ACS) Advanced Trauma Life Support (ATLS) course provides a framework for the systematic evaluation of injured patients which involves primary and secondary survey (SS) of the patient. The primary survey (PS) is designed to recognize and treat immediately patient's life-threatening conditions at the scene and arrival. The secondary survey (SS) is described as a head-to-toe examination, and is intended to diagnose all injuries before formulating a definitive management strategy (*Merlino et al., 2007*).

In other words the first thing doctors do when assessing a head injury is to determine whether the person is in imminent danger of death. Once the person's vital functions are stabilized, physicians examine the individual from a neurological perspective, checking:

Level of consciousness
Function of the cranial nerves (through pupillary responses to light, eye movements, and facial symmetry),
Motor function (strength, symmetry, and any abnormality of movements),
Breathing rate and pattern (linked to brain stem function),
Deep tendon reflexes, such as the knee jerk,
sensory function, such as response to a pinprick,
external signs

of trauma, fracture, deformity, and bruising in the head and neck. Each of these parts of the physical exam will give the physician clues about the extent and location of any brain injury (**Gargollo et al., 2007**).

The Glasgow Coma Scale GCS is based on eye opening and the patient's best verbal and motor responses. It is widely used as a semi quantitative, clinical measure of the severity of brain injury; it also provides a guide to prognosis (**Mayer, 2005**).

History

Specific details of the mechanism of injury may change the neurosurgeon's index of suspicion that a significant neurological injury is present. For instance, the speed limit, the amount of damage the car sustained, the severity of injuries to other people involved in the accident, the patient's location in relation to the vehicle (driver or passenger, inside or thrown from the vehicle), and the presence of airbags or seatbelts all influence the evaluation of the possible forces the victim was subjected to during the accident (**Sinson et al., 2004**).

Patients who have "*talked and deteriorated*" should be assumed to have an expanding intracranial hematoma until proven otherwise. Reports of headache, nausea, vomiting, confusion, or seizure activity must be noted. A medical history,

including medications, and drug and alcohol abuse, should be obtained (*Mayer, 2005*).

Witnesses may be able to describe seizure activity, an awake but confused state, flaccid unconsciousness, focal weakness, or posturing (*Sinson et al., 2004*).

General examination

The vital signs are reported and should include the heart rate, blood pressure, respiratory rate, pulse oximetry readings and GCS . Temperature should always be reported, especially when there is prolonged environmental exposure in a cold (or hot) location (*Christensen et al., 2007*).

The examination begins at the head with close palpation of the scalp and the head for fractures, lacerations, or contusions. The face is examined for areas of ecchymosis or leakage of spinal fluid from the ears or nose. Confirmation of an appropriate airway is also performed at this time (*Sinson et al., 2004*).

The several signs of occult basilar fractures may include **Battle's sign** (ecchymosis behind the ear), representing a likely petrous fracture; **raccoon's eyes**, suggesting an anterior basilar fracture; CSF rhinorrhea or otorrhea; and hemotympanum (*Turner, 1996*).

Examination of the abdomen includes inspection, palpation, and auscultation. A significant injury can be present in a patient with a normal examination, and a patient with a head injury may have an abdominal examination that is quite limited. Adjuvant diagnostic tests include focused abdominal sonography for trauma (FAST) , peritoneal lavage, and CT. (*Sinson et al., 2004*).

Neurological Examination

The neurological examination includes the elements of state of consciousness and awareness, the cranial nerve examination (particularly the pupillary function), motor response and spontaneous movements, sensory responses that can be detected, the presence of normal and abnormal reflexes, and the status and rhythm of respiration(*Turner, 1996*).

1-State of consciousness:

The Glasgow Coma Scale is a quick, reproducible scoring system to be used during the initial examination to estimate severity of TBI. It is based on eye opening, verbal response, and the best motor response. The lowest total score (3) indicates likely fatal damage, especially if both pupils fail to respond to light.

Table 1: Adult Glasgow Coma Scale.

Area Assessed	Response	Points
Eye opening	Open spontaneously	4
	Open to verbal command	3
	Open in response to pain applied to the limbs or sternum	2
	None	1
Verbal	Oriented	5
	Disoriented, but able to answer questions	4
	Inappropriate answers to questions; words discernible	3
	Incomprehensible speech	2
	None	1
Motor	Obeys commands	6
	Localizing to painful stimuli	5
	Withdraws from pain stimuli	4
	Responds to pain with abnormal flexion (decorticate posture)	3
	Responds to pain with abnormal (rigid) extension (decerebrate posture)	2
	None	1

- 14 or 15 is mild TBI
- 9 to 13 is moderate TBI
- 3 to 8 is severe TBI (*Matís et al., 2008*).

The Pediatric Glasgow Coma Score (PGCS) was developed for children younger than 5 years of age as a more accurate tool to avoid errors that occur when the GCS is applied to children and infants with limited verbal skills (*Singh and Stock, 2006*).

However, the severity and prognosis are predicted more accurately by also considering CT scan findings and other factors. For infants and young children, the Modified Glasgow Coma Scale for Infants and Children is used. Because hypoxia and hypotension can decrease the GCS, GCS values after resuscitation from cardiopulmonary insults are more specific for brain dysfunction than values determined before resuscitation. Similarly, sedating drugs can decrease GCS values and should be avoided prior to full neurologic evaluation.

Table 2: Modified Glasgow Coma Scale for Infants and Children.

Area Assessed	Infants	Children	Score*
Eye opening	Open spontaneously	Open spontaneously	4
	Open in response to verbal stimuli	Open in response to verbal stimuli	3
	Open in response to pain only	Open in response to pain only	2
	No response	No response	1
Verbal response	Coos and babbles	Oriented, appropriate	5
	Irritable cries	Confused	4
	Cries in response to pain	Inappropriate words	3
	Moans in response to pain	Incomprehensible words or nonspecific sounds	2
	No response	No response	1
Motor response	Moves spontaneously and purposefully	Obeys commands	6
	Withdraws to touch	Localizes painful stimulus	5
	Withdraws in response to pain	Withdraws in response to pain	4
	Responds to pain with decorticate posturing (abnormal flexion)	Responds to pain with decorticate posturing (abnormal flexion)	3
	Responds to pain with decerebrate posturing (abnormal extension)	Responds to pain with decerebrate posturing (abnormal extension)	2
	No response	No response	1

(Matis et al., 2008)

The "**comatosed state**" constitutes an acute neurosurgical emergency and is one of the most frequent

reasons for a neurosurgical consultation in the emergency room (**Rengachary, 2005**).

2-Pupils and Cranial Nerves Examination:

A rapid evaluation of ocular movements, pupils, facial symmetry and laryngeal function establishes the functional integrity of the cranial nerves. Complete evaluation of individual cranial nerves, a time-consuming and elaborate exercise even in a conscious patient, may not be feasible in a comatose patient or in one with altered sensorium. Subjective information cannot be obtained in an unconscious patient, and history from witnesses, other medical personnel and police can supply valuable information (**Bhatoe HS., 2007**).

Examination of the pupillary size, equality, and response to light (both direct and consensual) gives valuable information regarding the integrity of the brainstem, especially the midbrain area. Pupillary abnormality is one of the cardinal features differentiating surgical disorders from medical disorders; pupillary abnormalities in a comatose patient generally herald structural changes in the brain, especially the brainstem, whereas in metabolic coma such abnormalities are not observed.

A significant pupillary abnormality that can be encountered in neurosurgical practice is the unilateral dilated and fixed pupil.

This generally indicates uncal herniation with compression of the third cranial nerve at the tentorial edge, resulting in impairment of the parasympathetic pupillary constrictor fibers within the nerve. In extreme midbrain compression both pupils become fixed and dilated. Fixed and dilated pupils also characterize the terminal stages of brain death, whatever the etiology. Pontine tegmental lesions produce small pinpoint pupils with a flicker of reaction to light, which sometimes can be appreciated only with a magnifying lens (*Rengachary, 2005*).

Traumatic oculomotor nerve injury is the diagnosis in patients with a history of dilated pupil from the onset of the injury, an improving level of consciousness, and appropriate ocular muscle weakness. A mydriatic pupil occurs occasionally with direct trauma to the globe of the eye. This traumatic mydriasis is usually unilateral and is not accompanied by ocular muscle paresis.

Ocular movements are an important index of the functional activity of that is present within the brainstem reticular formation. If the patient is sufficiently alert to follow simple commands, a full range of eye movements is easily obtained and the integrity of the entire ocular motor system within the brainstem can be confirmed. In states of depressed consciousness, voluntary eye movement is lost and there may be dysfunction of the neural structures activating

eye movements. In these instances, oculocephalic or oculovestibular responses are used to determine the presence or absence of an eye- movement disorder (*Narayan and Kempisty, 2005*).

3-Motor Responses

The motor output of the extremities is tightly linked to the level of alertness and the functioning circuits within the brainstem (*Turner, 1996*).

The basic examination is completed by a gross test of motor strength, since severely head-injured patients are not sufficiently responsive for such a determination to be reliably made. Each extremity is examined and graded on the internationally used scale (*Narayan and Kempisty, 2005*).

Table 3: Motor function scale

Motor power	Grading
- Normal power	G5
- Moderate weakness	G4
- Severe weakness(antigravity)	G3
- Severe weakness (not antigravity)	G2
- Trace movement	G1
- No movement	G0

(*Narayan and Kempisty, 2005*)