ORIGINAL ARTICLE

Correlation among the GCS Score, CT Scan Findings and Early Clinical Outcome of Traumatic Brain Injury- Study of Fifty Cases

Ahmed Sami-Al-Hasan[1], Koushik Sikder[2], Md. Rashidul Hoq[3], Md.Reazul Alam[4], Md. Mosharraf Hossain[5]

Abstract:

Traumatic brain injury (TBI) is defined as an assault to the brain caused by an external physical force that may produce a state of diminished or altered consciousness and consequently, affecting cognitive abilities or physical function. According to the GCS, traumatic brain injuries are classified as mild, moderate or severe. Currently the imaging method of choice for the diagnosis and prognosis of TBI is CT scan. According to the disease profile in SBMCH about 30% patient is admitted in surgery ward in every admission due to traumatic injury. Out of them about 10% have traumatic head injury. The aim of the study was to evaluate an association among the GCS score, CT scan findings and clinical outcome of head injury. It is a prospective observational study at Sher-E-Bangla Medical college Hospital, Barisal. In this study 72% patients were with no CT scan findings (haemorrhagic / nonhaemorghagic). Rest of the patients had CT scan findings (intracerebral haemorrhage, extradural haematoma, subdural hematoma etc.). In severe TBI there was a significant increase in the incidence of CT findings, with a rate of 100% of abnormalities. In this study it was observed that, on admission patients with low GCS (severe TBI) deteriorate more in comparison to moderate and mild TBI on admission. This association is significant (p = .049). Patients in the severe TBI group (according to GCS) showed the highest mortality (2 out of 5). This association is also statistically significant (p = .002).

1. Junior Consultant, Department of Surgery, SBMCH, Barisal.
2. Assistant Registrar, Department of Surgery, SBMCH, Barisal.
3. Assistant Professor, Department of Surgery, HFRCMCH, Dhaka.
4. IMO, Department of Surgery, SBMCH, Barisal.
5. Senior Consultant(Surgery), Mugda Medical College Hospital, Dhaka

Introduction :

Traumatic brain injury (TBI) is defined as an aggression to the brain caused by an external physical force that may produce a state of diminished or altered consciousness and, consequently, affecting cognitive abilities or physical function. It may be temporary or permanent and may cause partial or total impairment of such functions[1]. Traumatic brain injury constitutes one of the main health problems worldwide, currently with a high and increasing incidence, representing an important cause of morbimortality among adolescents and young adults. It directly contributes to deaths by external causes, the main ones being car accidents, falls, aggressions and pedestrian run over.[2]

The principal mechanisms of TBI are classified as (a) focal brain damage due to contact injury types resulting in contusion, laceration, and intracranial haemorrhage or (b) diffuse brain damage due to acceleration/deceleration injury types resulting in diffuse axonal injury or brain swelling.[3,4] Lee JH et al.[5] and Oertel M et al.[6] showed that outcome from head injury is determined by two substantially different mechanisms/stages: (a) the primary insult (primary damage, mechanical damage) occurring at the moment of impact. In treatment terms, this type of injury is exclusively sensitive to preventive but not therapeutic measures. (b) The secondary insult (secondary damage, delayed non-mechanical damage) represents consecutive pathological processes initiated at the moment of injury with delayed clinical presentation. Cerebral ischaemia and intracranial hypertension refer to secondary insults and, in treatment terms, these types of injury are sensitive to therapeutic interventions. Post-traumatic cerebral vasospasm is an important secondary insult that determines ultimate patient outcome. C. Werner et al.[7] described that vasospasm occurs in more than one-third of patients with TBI and indicates severe damage to the brain.

The uncertainty that exists about the likely outcome after traumatic brain injury (TBI) is encapsulated in the Hippocratic aphorism: "No head injury is so serious that it should be despaired of nor so trivial that it can be ignored." Today, physicians' estimates of prognosis are still often unduly optimistic, unnecessarily pessimistic, or inappropriately ambiguous.[8,9,10,11] Randall M. Chesnut et al. noticed that It still remains impossible to predict certainty what will be the future course of events in an individual patient, but intensive research in the last two decades has made it possible to be much more confident about what is likely to happen, and to consider prognosis in terms of probabilities rather than prophecies.

The initial assessment of a patient with TBI includes the Glasgow Coma Scale (GCS), data regarding the accident and computed tomography (CT). Nitrini R et al.[13] described that it is essential to determine the cause of the trauma, the impact intensity, presence of neurological symptoms, convulsion, and particularly document any reports on loss of consciousness, time elapsed between the accident and the examination, vomits and seizures. According to the GCS, traumatic brain injuries are classified as mild, moderate or severe. The GCS was initially described by Teasdale & Jennet[13] in 1974, and is currently the most widely used parameter for assessment of consciousness level, as amongst its advantages, it comprises a set of very simple and easy-to-perform physical examinations.[12]

Currently the imaging method of choice for the diagnosis and prognosis of TBI is CT scan. The indications of cranial CT in cases of TBI are controversial. Several studies attempt to establish clinical indicators to justify the non use of cranial CT in certain cases of TBI as a contribution to costs reduction in the health system. The most recent protocols indicate CT within the first three hours following trauma in patients with GCS < 15 and GCS = 15 presenting with one or more of the following findings: convulsion, headache, vomiting, amnesia and/or syncope, age group extremes, focal neurological deficit, suspicion of intoxication, visible cranial trauma and history of coagulopathies.[2] Computed tomography findings in TBI vary according to the trauma severity, that is, in accordance with the GCS score. Difficulties were experienced in the comparison of tomographic findings, as there are only few scientific studies with that purpose in the literature. In the present study, effort was made to investigate such findings. The relationship among types of brain lesions demonstrated at CT, type of TBI (severity of the lesion) and prognosis are described by several authors in the literature, all of them reporting approximately the same variation: the more severe the TBI is, more numerous and severe are the findings at CT.

This study identifies the correlation among Glasgow Coma Scale, Computed Tomography imaging findings and early clinical outcome in patients, who will be admitted with traumatic brain injury and will be treated conservatively.

Materials and Method:

It is a prospective observational study carried out at Sher-E-Bangla Medical college Hospital(SBMCH) Barisal from January, 2015 to June, 2015 (Six months) Study population is Patients admitted in surgery ward with traumatic brain injury and went for CT scan. Sample size was Fifty (50). Method of Data collection was by Questionnaire, Physical examination and CT scan reports analysis. . Patients who will be admitted with TBI and there will be no indication for CT scan and Age <12 year were excluded from the study. After collection of data several variables were analyzed with regard to outcome to see any strong co-relation. Data is incorporated in Microsoft excel and analysis is done by software package SPSS. For the safety of validity informed written consent was taken from all study subjects. Ethical clearance was taken from appropriate authority.

Results :

Age incidence varied from 12 to >50 years. Maximum incidence was between 12 – 30 years and minimum incidence was after 50 years of age.

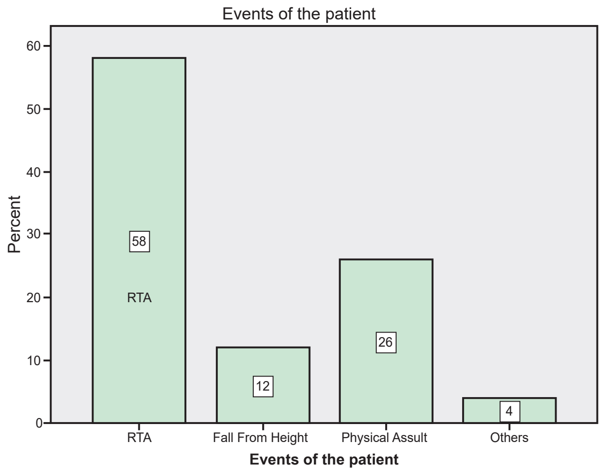

Figure 1: Events of TBI

This figure shows 58% patients were with history of RTA, 26% patients were with history of physical assault, 12% patients were with history of fall from height and 4% patients were with other history (fall on the floor, marine injury etc.)

Table – I: Age of injury

Age of injury	Frequency	Percent
0-12 hours	31	62.0
12-24 hours	10	20.0
24-48 hours	7	14.0
> 48 hours	2	4.0
Total	50	100.0

The table shows that 62% patients were admitted within 0 – 12 hours of incident, 20% patients were admitted within 12 – 24 hours of incident, 7% patients were admitted within 24 – 48 hours and 2% patients were admitted after 48 hours of incident.

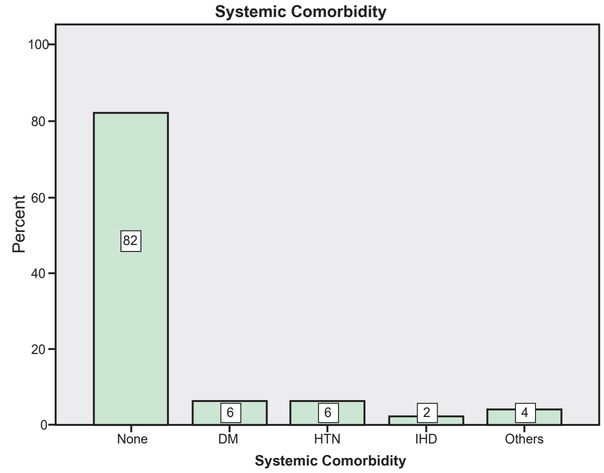

Figure 2: Systemic Comorbidity

This figure shows that 82% patients were with no systemic comorbidity, 6% patients were diabetic, 6% patients were hypertensive, 2% patients were with IHD and 4% patients were with other systemic comorbidity (bronchial asthma, rheumatoid arthritis etc.)

Patients on medication: 82% patients were taking no medication, 6% patients were taking antidiabetic drug, 2% patients were taking steroid, 2% patients were taking anticoagulant and 8% patients were taking other drugs.

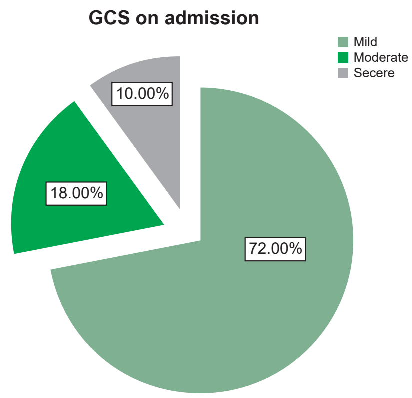

Figure 3: Severity of TBI patients on admission (According to GCS)

Associated injury: 72% patients were with no associated injury, 4% patients were with chest trauma, 2% patient were with haemoperitoneum, 2% patients were with long bone fracture, 2% patients were with spinal injury and 9% patients were with other injuries (Bruish, abrasion etc.).

Fracture of the skull: 76% patients were admitted with no skull fracture, 10% patients were admitted with base of the skull fracture and 14% patients were admitted with other skull fracture.

Sign of fracture of base of the skull: 90% patients were with no sign of fracture of the base of skull, 6% patients were with racoon eye, 2% patients were with otorrhoea and 2% patients were with rhinorrhea.

Table – II: CT scan findings

CT scan findings	Frequency	Percentage
Normal	36	72.0
ICH	6	12.0
EDH	2	4.0
SDH	2	4.0
Diffuse axonal injury	2	4.0
Cerebral oedema	1	2.0
Pneumocele	1	2.0
Total	50	100.0

This table shows that CT scan findings of 72% patients were normal, CT scan of 12% patients had ICH, CT scan of 4% patients had EDH, CT scan of 4% patients had SDH, CT scan of 4% patients had diffuse axonal injury, CT scan of 2% patients had cerebral oedema, CT scan of 2% patients had pneumocele. 6% patients were referred to higher centre for further management.

Table – III: Statistical correlation between grading of TBI (on admission) and CT scan findings

	Normal	ICH	EDH	SDH	Diffuse axonal injury	Cerebral oedema	Pneumocele
Mild TBI	31	3	1	1	0	0	0
Moderate TBI	4	3	1	1	0	0	0
Severe TBI	0	1	0	1	1	1	1

This table shows the correlation between grading of TBI of the patient during admission and their CT scan findings. This indicates that CT scan findings influence severity of TBI and this association is statistically significant (p= .006)

Table – IV: Statistical correlation between grading of TBI (on admission) and skull injuries

	None	Fracture of the base of skull	Others bony injuries of skull	p
Mild TBI	30	0	6	0.00
Moderate TBI	5	2	2	
Severe TBI	3	2	0	

This table shows that severity of TBI depends on association with skull injuries and this association is statistically significant (p = 0.00)

Table -V: Statistical correlation between grading of TBI (on admission) and GCS on subsequent days

	GCS on subsequent days		p
	Improved	Deteriorating	
Mild TBI	34	2	.049
Moderate TBI	7	2	
Severe TBI	3	2	

This table shows the correlation between grading of TBI of the patient during admission and condition of GCS on subsequent days. It describes that prognosis depends on the severity of initial TBI and this association is significant (p = .049).

Table – VI: Statistical correlation between grading of TBI (on admission) and death

	Death of the patient		p
	Yes	No	
Mild TBI	0	36	.002
Moderate TBI	1	8	
Severe TBI	2	3	

This table shows that death of the patients depends on severity of TBI and it is statistically significant ($p = .002$)

Discussions :

Traumatic brain injury is an important public health problem. International mortality statistics show that accidents are accountable for 3% to 10% of all deaths for all causes, and the problem takes on greater magnitude considering that most of these deaths occur in young patients.[2]

This study was done in Surgery department Sher-E-Bangla Medical College Hospital from January, 2015 to June, 2015. Fifty cases of TBI were studied in this study. Our study had similarities in patient profile; symptom and treatment used but also had dissimilarity with cause and nature of the injury with the other studies done on TBI.[2]

The age incidence of the patient in this study ranged from 12 to > 50 years. The highest incidence ass in between 12 - 30 years. The injury occurred most commonly among young persons and the incidence declined rapidly with the advancing age. In a similar study[2] showed that the most vulnerable age group was younger than 50 years, in which there was a higher incidence of trauma occurred. The decrease in the incidence of TBI in the age group > 50 years is due to the lesser exposure to external factors, such as violence and traffic accidents.

In our study male to female ratio is 5.25 : 1. Males were predominated in our study probably because of their more mobile lifestyle, use of high-speed vehicles and involvement in civil violence and crime. In the above mentioned study 80.4% (82/102) of the patients with TBI were men. Similar statistics were observed in several epidemiological studies available in the literature.[2]

In this study RTA related TBI (58%) dominant over other injury. It is now the most common cause of preventable death and major public health issue in Bangladesh. Lack of knowledge of traffic rules, driving skills and unfit vehicles are main causes of RTA and related health issue. Physical assault (26%) is the next common cause. In our country violence for dispute land properties, personal enmity, political violence, social unrest etc. are the most important causes of traumatic brain injury in rural areas.

In this study it found that most of the patients (62%) were admitted with first 12 hours of the occurrence of incidence. Most of the patients (82%) had no history of systemic comorbidity like diabetes, hypertension, ishchaemic heart disease. Most of the patients gave no history of taking any medication. Few of them were on antidiabetic, antihypertensive, steroid, anticoagulant drugs. Most of the patients were with mild TBI 72%. This finding is similar to other studies (82.4%).[2] Most of the patients were with no associated injuries.

Here 76% patients were admitted with no skull fracture. But rest of the patients were with skull fracture and it played a significant role in determining the severity of initial TBI ($p = 0.00$). 72% patients were with no CT scan findings (haemorrhagic / nonhaemorghagic). Rest of the patients had CT scan findings (intracerebral haemorrhage, extradural haematoma, subdural haematoma etc.). Of them 12% patients had intracerebral haemorrhage. These CT scan findings had significant influence on the severity of initial TBI ($p = .006$). In severe TBI there was a significant increase in the incidence of CT findings, with a rate of 100% of abnormalities. This observation is similar to other studies.[2]

In this study it was observed that, on admission patients with low GCS (severe TBI) deteriorate more in comparison to moderate and mild TBI on admission. This association is significant ($p = .049$). Patients in the severe TBI group (according to GCS) showed the highest mortality (2 out of 5). This association is also statistically significant ($p = .002$).

Conclusion :

In the present study, statistical significance was observed between GCS and the CT findings. The lower the GCS score, the more severe were the TBI and CT findings, with the predominance of intracranial haemorrhagic lesion and skull fracture.

Thus, it is concluded that the use of CT is critical in the initial evaluation and prognosis of patients with TBI and it should be done on urgent basis to look for operable mass lesions. Early recognition and management of complications is of paramount important for the good outcome of immediate management of traumatic head injuries.

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