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ORIGINAL ARTICLE

Mild Head Injury Patients; Correlation between admission Computed Tomography Brain Scan and Outcome

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ABSTRACT

Background: Traumatic injuries of brain is considered the damage of the brain which result from external force, like impact, deceleration, blast_waves, rapid acceleration, and penetration by a projectile. Brain function is permanently or temporarily impaired and the damage of the structure could or could not be revealable with recent technology. **Objectives:** To assess post-traumatic CT scan brain changes to patients with mild head injuries in correlation to clinical sequelae. **Patients and Methods:** This prospective cohort study was conducted at Neurosurgery Department, Zigzag University Hospitals, on 75 patients of mild traumatic brain injury (mTBI) presented to emergency department at zagazig university hospital with mean age of 26.7 years, during the period from April 2018 to September 2018. **Results:** The most common CT finding in patients with mild head injury in our study was a skull fracture by 43% then contusion by32% and Epidural hemorrhage by 21.5% and least one was Subarachnoid hemorrhage by10.7% none of the participants in our current study had a subdural hemorrhage. percent of positive findings on CT scan was 9.3% and 2.6% need surgical intervention , the outcome of the patient was assessed by Glasgow outcome score (GOS) and most of the patient score was 5 which a good score. **Conclusion:** Patients with mild traumatic head injury with a presenting GCS score of 13 or 14 should undergo a CT scan examination and to be admitted for observation and management.

Keywords: Glasgow coma scale, mild traumatic head injury, loss of consciousness, computed tomoghraphy.

INTRODUCTION

Traumatic brain injury (TBI) was classified to mild, moderate or severe depending on the level of patient's consciousness and neurologic functioning levels. The Glasgow Coma Scale (GCS) always used scale to determine the severity. The good eye opening response, verbal response and the motor responses, determine the score on a scale of 3-15 (EMV-score). The sum of the numeric scores of each of the categories is the represented score. Also, the score can be documented by the individual components. The patient with a Glasgow Coma Score of 15 could be documented as E4-M6-V5, while the intubated patient would be scored as E4-M6-Vtube. A TBI with a GCS of 13-15 considered a mild TBI, 9-12 considered a moderate TBI while 3-8 considered a severe TBI. The GCS has limited ability for outcome prediction. The motor response considered the significant outcome predictor. Many classifications for the severity of injury including the loss of consciousness (LOC) and the duration of post-traumatic amnesia

(PTA). The PTA reflects the overall severity of injury[1].

The TBI severity determined by the speed, nature and location of the impact, in addition to complications like hypoxemia, intracranial hemorrhage hypotension, or the increase of intracranial pressure, which may cause secondary injury, hours or days after the trauma [2].

Studies find individuals with mild head injuries have abnormal findings in CT scans 10-20% of the time [3].

CT imaging is typically used as a day-of-injury assessment tool and has a categorical rating similar to a Glasgow Coma Scale (GCS). However, these scores from brain imaging do not correlate to long-term neuropsychological outcomes due to the fact that they are not sensitive enough to detect microscopic changes in the CNS[4].

Just as important, the lack of sensitivity of CT imaging detecting mild damage could be a function of the type of injury within mTBI. As described before, mild TBI is usually associated with a brief loss of consciousness (LOC) which is referred to as uncomplicated mTBI. When this LOC is brief with the presence of a space-occupying lesion, however, this is referred to as mild-complicated TBI. Some research has shown that patients with complicated mTBI will perform worse on the neuropsychological test than uncomplicated mTBI patients [5].

PATIENTS AND METHODS

This prospective cohort study was conducted at Neurosurgery Department, Zigzag University Hospitals, on 75 patients of mild traumatic brain injury (mTBI) presented to emergency department at zagazig university hospital with mean age of 26.7 years, during the period from April 2018 to September 2018. Sample was calculated using open EPI program with confidence level 95% and power 80%.

Inclusion criteria

The patients who presented with mild head injury (GCS between 13to15 with History of consciousness loss, vomiting, headache, amnesia, focal neurological deficits). Mild head injury with History of coagulopathy, consumption of drug or alcohol, previous neurosurgical operations, pre-trauma epilepsy. Patients consent to enter the study.

Written informed consent was obtained from all children' parents, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Inclusion Criteria: patients who presented with mild head injury (GCS between 13to15 with History of loss of consciousness, vomiting, amnesia, diffuse headache, focal neurological deficits), Mild head injury with History of coagulopathy, drug or alcohol consumption, previous neurosurgical procedures, pre-trauma epilepsy.

Exclusion Criteria: Patients with GCS <13, multi trauma patient

All subjects in the study were subjected to full history taking, clinical examination and CT scan brain.

All patients in the study were subjected to the following:

General physical condition: [Blood pressure, respiratory rate, heart rate, oxygen saturation, Inspection of the cranium for (Evidence of basal fractures, CSF rhinorrhea/otorrhea, Raccoon eyes, Battle sign, Hemotympanum or external auditory canal laceration), Peri-orbital edema and proptosis, Facial fractures, Scalp wound (laceration/incised or contused], Palpation of Scalp wounds to check cranial defect or depressed fractures, Orbital rim fractures, Maxillofacial fractures to check instability of facial bones, Physical signs of spine injury.

Neurological examination: Cranial nerve examination, Fundus examination, Pupils: size and reaction to light, Glasgow coma scale (GCS) , Motor examination, Sensory examination, Reflexes, Signs of lateralization.

Signs of intracranial hypertension and associated herniation syndromes (Pupillary dilatation, Miosis, Hemiparesis, Lateral gaze palsy, Decerebrate posturing, Hypertension and bradycardia, Abnormal breathing patter)

Radiological investigations: Plain X-ray for skull [(linear or depressed fracture), chest, cervical , dorsal , lumbar spine and others], **Computed tomography of the spine** If there is suspicious lesion in plain X-ray imaging, **CT brain** to define intracranial pathologies and skull fractures

Statistical Analysis: The collected data was entered to and analyzed by computer using Statistical Package of Social Services, version 25 (SPSS) , Results were presented by tables and graphs. Quantitative data was presented as mean and standard deviation. Qualitative data was presented as frequencies and proportions. Pearson Chi square test (χ^2) and fisher's exact were used to analyze qualitative independent data. P value of ≤0.05 was taken as significant.

RESULT

Table (1), showed that Demographic data of the study with a number of males was 61 and the number of females was 14, with a mean age 26.7years. Table (2), showed that the main complain in our patients was headache (66.7%) followed by a headache, loss of conscious, nausea and vomting (24.0%),then nausea and vomting (6.7%) and headache and nausea and vomting (2.6%) were the least presenting complain. Table (3), showed that the main cause of mild traumatic head injury in this study was road traffic accident (50.0%) then falling dawn (34%) while direct head injury was (14.6%). Table (4), showed the clinical examination variables in studied patient where cerebro spinal fluid leak and focal neurological deficit was (1.3%) for each variable, abnormal pupils was (0%) and Glasgow Coma Scale range between (13-15). Table (5), showed that the CT scan was the main imaging modality and it is positive in (9.3%) from total number of patient ,The common radiological finding was skull fracture by (43%) then contusion by (32%) and epidural haemorrhage by(21%) and Subarachnoid hemorrhage the least one by (14.3).about 90.7% of patients have negative CT brain

Table 1: Age and sex distribution of the studied patients

Variables	Studied patients (n=75)
Age (years):	
Mean ± SD	26.7 ± 11.3
Median	25.0
Range	1.0 – 55.0
Sex:	
Males	61 (81.3%)
Females	14 (18.7%)

Table 2: Presenting complaint of the studied patients

Variables	*Studied patients (n=75)*	
	No.	%
Headache only	50	66.7%
Headache, nausea & vomiting	2	2.6%
Headache, nausea, vomiting & loss of consciousness	18	24.0%
Nausea & vomiting	5	6.7%

Table 3: Cause of TBI in the studied patients

Variables	Studied patients (n=75)	
	No.	%
Road traffic accident	38	50.7
Fulling dawn	26	34.7
Direct head injury	11	14.6

Table 4: Clinical examination of the studied patients

Variables	Studied patients (n=75)
Glasgow Coma Scale:	
Median	15
Range	13 – 15
CSF leak	1 (1.3%)
FND	1(1.3%)
Abnormal pupils	0 (0.0%)

Table 5: CT findings of the studied patients

Variables	Studied patients (n=75)	
	No.	%
Positive CT findings:	7	9.3
skull fracture	4	43.%
Contusion	3	32.2%
Epidural hemorrhage	2	21.%
Subarachnoid hemorrhage	1	14.3
Negative CT findings	68	90.7

DISCUSSION

The current study includes 75 patient with mild head injury presented to emergency department at zagazig university hospital with mean age of study participants was 26.7 years, with a predilection of male gender (81.3%) and female was (18.7%) and the main cause of mild traumatic head injury was road traffic accident in 50.7% then falling dawn in 34% , direct head injury in 14.6%. computed tomoghraphy was done for all the included patients.

Percent of positive findings on CT scan were 9.3% in which 2.6% need surgical intervention. the outcome for the included participants were assessed by Glasgow outcome score (GOS) with a result of GOS 5 for the most of the patients.

The most common CT findings in patients with mild head injury in our study was skull fracture by 43% then contusion by32% and Epidural hemorrhage by 21.5% and the least finding was Subarachnoid hemorrhage by10.7%. None of the participants in our current study had subdural hemorrhage or intracerebral hematoma.

Demographically, our results were in agreement with **Taha and Barakat [6]**, they examined 1756 patients with traumatic head injury, in which the males were (82.7%) and the females were (17.3%) with a mean age of 26.57 ± 18.4 years·

A study of **Haydel et al.** [7], who examined and scanned a mild head injury patients were at emergency unit to find intracranial injuries. 78.2% of patients were males and (21%) were females, their age ranged between 6 to 85.

Comper et al. [8] reported that age more than 60 years is high-risk factor in patients with minor head injury. But, there is no specific age in which the risk suddenly increases. The underlying pattern of a gradual progressive increase in intracranial complications, and became notable and clinically relevant over 60 years of age.

In our study most of the patient's age below 60 being the oldest one was 55 years. Patient with positive CT findings, their median age were 18.0 ranging from 1.0 to 45.0.

In our study, we found that the major cause of mild head injury is road traffic accident in 50.7%, then fall down in 34.7% and the least one is a direct head injury in 14.6%.

These results is agreement with results reported from a study done by **Taha and**

Barakat [6] in which the commonest cause of trauma was a road traffic accident recorded in 73.7% of the patients in Egypt.

The most common causes of head injury were motor vehicle accident (88.2%), Fall (7.1%) and assault (3%) respectively in another study of **Haydel et al. [7]**.

In another study by **Lagares et al. [9]** who found that (35.5%) patients suffered from fall, (22.8%) had a direct head blow, (5.3%) were pedestrians and (36.4%) motor vehicle accident.

A study of **Langlois et al. [10],** revealed that the four main causes of TBI were falls, motor vehicle accidents (MVA), struck by/against events, and assaults. the fall is a major cause of head injury 28% ,then MVA 20% and assault by 11%,struck by 19% and other 22% .

Hsiang et al. [11] reported a high correlation between headache and mild head injury. Nausea and vomiting are however non-specific symptoms that may, for example, be associated with intoxication and substance abuse rather than as a direct consequence of head injury. In our study, patients with significant findings on CT also reported a higher incidence of vomiting (15%) and headache (21%) than those with insignificant or negative CT finding.

A study of **Willer et al. [12]** reported that a headache and vomiting was significantly (p, 0.001) in relation to the occurrence of subsequent clinical deterioration in patients with a GCS of 15 on hospital admission.

In our study, headache was associated with positive CT findings in 28.6% of patients with a P value of 0.03 which is significant, but nausea and vomiting seen with positive CT in 14.3% which is insignificant.

In the study of **Saboori et al.** [13], the recording of "questionable" LOC/amnesia was not correlated with a higher incidence of abnormalities on CT scans. It is recognized that patients without LOC but with a skull fracture may develop an epidural hematoma. Moreover, in children, an epidural hematoma can develop in the absence of either LOC or skull fracture.

The current study, the occurrence of LOC is associated with nausea and vomiting in (24.0%) with p value 0.3 which is insignificant to positive CT brain.

Our findings in the current study revealed that out of 9.3% of the participants who had positive CT findings, the skull fractures were 43% then contusion by 32% and Epidural hemorrhage by 21.5% and least one was Subarachnoid hemorrhage by10.7%. none of the participants in our current study had subdural hemorrhage.

A meta-analysis study of **Geijerstam and Britton [14]** revealed that the most frequent CT findings were (based on 11) studies that differentiated the pathological findings: Skull fracture (3.2%), intracranial haemorrhage/ contusion (2.8%), subdural- (1.3%), epidural- (1.0%) and subarachnoid haemorrhage (1.0%).

Hsiang et al. [11] reported, in a series of patients whose GCS was 15 when first seen at the hospital but who subsequently developed an intracranial hematoma, that one-third of cases had a focal neurological deficit on arrival at the hospital .

The present study patients with GCS 15 and were complaining of headache, their headache considered significant with a p-value of (0.01) to positive CT brain.

In a multicenter series of 2,766 patients with a GCS of 13–15 with reported that at the time of admission, an abnormal neurological examination increased by a factor of 3 the risk of subsequent surgical intervention [15].

Borg et al [16], reported approximately 16% to 21% of patients with GCS 13 to 15 have an acute intracranial hemorrhage on initial head CT. However, this has been shown to vary with the GCS score. They also reported that 5% of patients with GCS score of 15 and 30% of patients with GCS score of 13 had an acute intracranial hemorrhage on the initial head CT and 1% had intracranial findings that might warrant neurosurgical intervention.

In the current study, GCS range from 13-15 and we found a significant relationship between a patient with GCS 13 with LOC,

nausea and vomiting, headache and positive CT brain p-value (0.005).

One of the important clinical findings is the skull fracture, Although the topic is controversial, the prevailing finding in reports made from a neurosurgical perspective is that the accompanying skull fracture in a patient with a mild head injury increases the risk of intracranial lesions by a factor that is both statistically and clinically highly significant. In one study, in patients with a comparable level of consciousness, the finding of a fracture was associated with an increased risk of intracranial hematomas[11].·

Hofman et al. [15] reported that the frequency of skull fractures is below5% in treated patients with MTBI. In patients with a trivial head injury, i.e. in patients without altered consciousness or amnesia, the reported frequency of skull fracture is around 1%.

Conclusion : Patients with mild traumatic head injury with a presenting GCS score of 13 or 14 should undergo a CT scan examination and to be admitted for observation and management.

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