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Original Article

C. T Scan Findings in Mild Traumatic Head Injury in Adults

Alamgir Khan[1], Sultan Jalal-ud-din Faisal [2]
1.Department of Neurosurgery, Pakistan Institute of Medical Sciences, Islamabad;
2. Department of Neurosurgery , Liaquat National Hospital Karachi[2]

Abstract

Background: To determine the frequency of CT scan findings in patients having mild traumatic head injury (THI).

Methods: In this cross sectional study all cases with mild traumatic injury to head were included . All the included patients were assessed by taking detailed history, especially about mode of injury and clinical examination including assessment of consciousness with Glasgow coma scale. CT scan of brain was done of all patients in order to detect any injury like Acute subdural hematoma, skull fractures, subgaleal hematoma, brain swelling, sub arachnoid hemorrhage, brain contusions and extradural hematoma.

Results:- A total of 396 cases were studied, their average age was 26.93±7.07 years. CT scan findings in mild TBI are; brain swelling (3.28%), skull fracture (6.31%), subgaleal hematoma (13.13%), subarachnoid hemorrhage (13.38%), brain contusion (14.9%), acute subdural hematoma. No significant difference was found in CT scan findings according to age groups, gender and duration of injury.

Conclusion: Commonest finding of CT in present study is subdural hematoma followed by extradural hematoma.

Key Words: Mild traumatic head injury, Subarachnoid hemorrhage,Brain swelling, Subgaleal hematoma.

Introduction

Traumatic injury to brain (TBI) is a common factor of mortality and morbidity world around.[1] The prevalence of traumatic injury to brain within industrialized and non-industrialized countries varies from 150-250 patients per 100,000 populace per individualized year. In Pakistan, annual rate for TBI stands to be eighty one per million individuals with 15% mortality rate.[2,3] Mostly males are affected, within their peak potential years of life lost , where road traffic accidents is the commonest factor after that of falls and assault. [4,5] Mild head injury is defined as Glasgow Coma Score of 13-15 with or without loss of consciousness, moderate injury to head as Glasgow Coma Score of 9-12 and severe injury to head is defined as Glasgow Coma Score of <8.[6]Mild traumatic-injury to brain is also termed "Concussion". Previously, the word concussion was demarcated as a clinical-syndrome characterized by transient and immediate posttraumatic damage to neural functions, for example, consciousness alteration and equilibrium- or vision- disturbance because of brain-stem contribution.[7] In fresh literature, the definition of concussion is given as a trauma-provoked modification in the status of mind that can possibly or can possibly not involve an unconsciousness.[8,9] Head injuries are usually divided into two groups, Open head injury (OHI) represents the injuries to head distinguished via skull damage. Whereas, closed head injury represents the traumatic-injury to brain with no fracture to skull or loss of mucous membranes continuity.[10] Trauma is a leading cause of death among children and young adults, and traumatic-injury to head is a factor of death among >50% of traumatic-cases.[11] CT-scan is possibly suggested for every patient with head injury because 1/5th will have an acute lesion that can be detected by scan.[12,13]An early CT-scan of head is not normal among around 25% individuals and exhibits lesions needing neurosurgical interventions.[14]Using only Glasgow Coma Score can possibly be false to both the clinician and the patient, in that a few cases with mild TBI harbor a life threatening intracranial lesions and other patients with mild TBI develops persistent and/or delayed symptoms. Around 10% of mild TBI cases assessed in emergency department with a Glasgow Coma Score13-15 will present with an acute lesion on CT-scan; though, <3% of them will need neurosurgical interventions. The goal of early assessment of these

cases is to decide the patients with acute traumatic-injury to skull and to determine the patients who can safely be released from the acute care background.[15]
If a scan is done too early in mild TBI with GCS 13-15, this can possibly be normal or exhibit non-significant findings. In such a case, there is contribution of repeat or delayed CT scan. Lesions, needing urgent surgical procedure, can be distinguished in the initial three days.[16]The rationale of this study is to emphasize that CT scan brain plain should be performed in every mild head injury as there are very high chances of missing any trauma, because missed head injuries can be dangerous.An early CT can help to save from complications of head injury as for example, a small fracture hematoma, a small extradural and even subarachnoid hemorrhage can increase in size within 24 hours and patient will deteriorate suddenly and may become neurosurgical emergency.

Patients and Methods

This cross-sectional study was carried out in Neurosurgery Department of PIMS Hospital, Islamabad from July to December 2016. WHO software was used to calculate sample size. A total 396 patients were involved in this study. The calculation of sample size was carried out considering p= 4.3%[14],d=2%, with 95% confidence interval. All the patients with age of from 15 years to 45 years, mild traumatic head injury (GCS 13-15) and presented within 24 hour of injury either gender were included. All the patients with history of previous neurosurgical procedure, moderate (Glasgow Coma Score 9-12) and severe head injury (Glasgow Coma Score <8) and those who presented after 24 hour of injury were excluded. Informed consent was taken from patient and family. All cases included were assessed by taking detailed history, especially about mode of injury and clinical examination including assessment of consciousness with Glasgow coma scale. CT scan of brain was done of all patients in order to detect any injury. Effect modifiers and bias was regulated via strictly following the criteria for inclusion and exclusion. Stratification was done to control effect modifier such as gender, age, and time period of injury. Post stratification Chi square test was used, p value ≤0.05 was considered as significant.

Results

Overall 396 cases with Mild traumatic head injury were included in current study. Most subjects were aged between 21 and 40 years . The mean age for the subjects was 26.9±7.1 years. Out of 396 cases, 294(74.24%) were male and 102(25.76%) female (Table 1). Acute subdural haematoma (31.81%) was the commonest finding (Table 2&3;Figure 1-3).No significant difference was found in CT scan finding, when compared according to gender (Table 4).

Table 1. Patient distribution according to age and gender (n=396)

Variables	Frequency	Percent
Age groups		
>40 years	17	4.29%
31-40 years	78	19.70%
21-30 years	217	54.80%
<20 years	84	21.21%
Total	396	100%
Gender		
Female	294	74.24%
Male	102	25.76%
Total	396	100.0%
Duration of injury		
<12 hours	378	80.31%
>12 hours	78	19.69%
Total	396	100%

Mean+SD=26.93+7.07 years

Table 2: CT scan findings (n=123)

Variables	Frequency	Percent
Subgaleal hematoma	52	13.13%
Brain swelling	13	03.38%
Subarachnoid hemorrhage	53	13.38%
Skull fracture	25	06.31%
Acute subdural hematoma	126	31.81%
Extradural Hematoma	68	17.17%

Table 3: CT scan finding according to age groups(n=396)

CT Scan findings	Age Groups (Years)				P-Value
	≤20 n=84	21-30 n=217	31-40 n=78	>40 n=17	
Subgaleal Hematoma	15(17.9%)	23(10.6%)	12(15.4%)	2(11.8%)	0.356
Skull Fracture	3(3.6%)	17(7.8%)	5(6.4%)	0(0%)	0.382
Brain Swelling	0(0%)	7(3.2%)	6(7.7%)	0(0%)	0.052
Subarachnoid Hemorrhage	14(16.7%)	30(13.8%)	7(9%)	2(11.8%)	0.539
Brain Contusion	11(13.1%)	34(15.7%)	11(14.1%)	3(17.6%)	0.928
Acute Subdural Hematoma	28(33.3%)	70(32.3%)	22(28.2%)	6(35.3%)	0.880
Extradural Hematoma	13(15.5%)	36(16.6%)	15(19.2%)	4(23.5%)	0.816

Table 4: CT scan finding according to gender duration of injury (n=396)

CT scan finding	Gender		P-Value
	Male N=102	Female n=294	
Subgaleal Hematoma	36(12.2%)	16(15.7%)	0.37
Skull Fracture	19(6.5%)	6(5.9%)	0.83
Brain Swelling	10(3.4%)	3(2.9%)	0.82
Subarachnoid Hemorrhage	38(12.9%)	15(14.7%)	0.64
Brain Contusion	46(15.6%)	13(12.7%)	0.47
Acute Subdural Hematoma	90(30.6%)	36(35.3%)	0.38
Extradural Hematoma	55(18.7%)	13(12.7%)	0.16
CT Scan findings	Duration of injury		
	≤12 hours n=318	>12hours n=78	
Subgaleal Hematoma	43(13.5%)	9(11.5%)	0.64
Skull Fracture	21(6.6%)	4(5.1%)	0.63
Brain Swelling	9(2.8%)	4(5.1%)	0.31
Subarachnoid Hemorrhage	44(13.8%)	9(11.5%)	0.59
Brain Contusion	49(15.4%)	10(12.8%)	0.56
Acute Subdural Hematoma	100(31.4%)	26(33.3%)	0.74
Extradural Hematoma	52(16.4%)	16(20.5%)	0.38

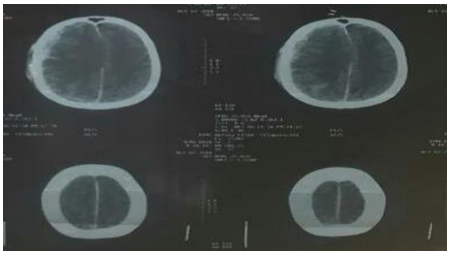

Figure 1:CT brain axial cut showing DAI, brain edema and midline shift

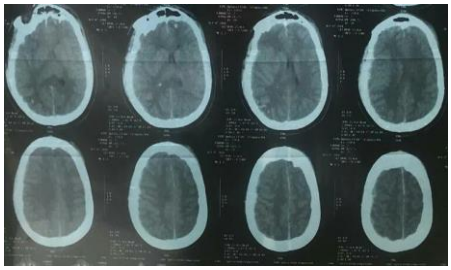

Figure 2:CT brain axial cut showing brain edema

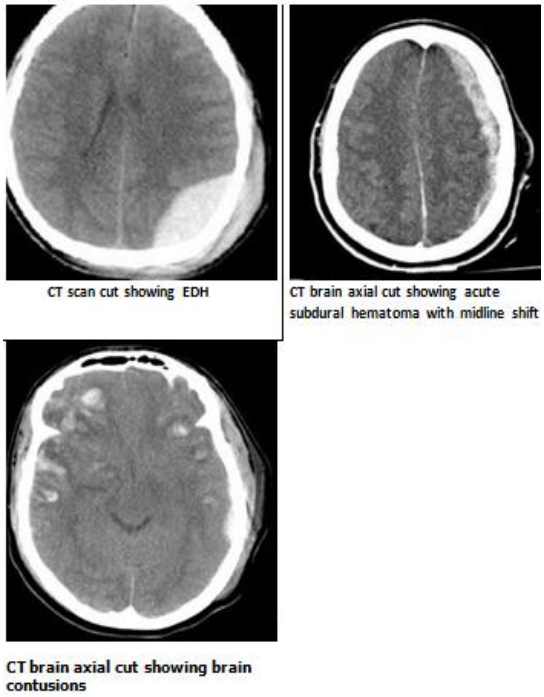

Figure 3: CT scan showing EDH, midline shift and contusions

Discussion

Head injury represents trauma to the head. It can possibly be due to open or closed injuries and is a significant factor of mortality and morbidity. [17] Neuro-imaging procedures offer a few most significant prognostic, pathophysiologic and diagnostic data to manage head injury cases.[18] Computerized Tomography (CT), being a method of cross sectional imaging can precisely detect and localize likely pathologies such as hemorrhages (subarachnoid, subdural, extradural, Intracerebral), cerebral edema and contusion. Soft tissue anomalies and cranial fractures can also be detected. CT is the choice first line modality for investigation due to its faster imaging time: This is much beneficial when managing emergencies / severe injuries.[19]

Annually, millions of individuals around the world undergo head injuries particularly young males.[20]

According to current study majority of the subjects were aged between 21 and 40 years, mean age for subjects remained 26.9±7.1 years, while 74.2% were males . In this study, the preference for young males with age 20 to 40 years had been previously documented by a number of authors. This high predilection of young individuals is not unforeseen, as they represent an adventurous and active group which is further likely to be concerned in accidents.[21,22] Majority of the males can be justified by the reality that males are further involved in outdoor activities and also driving. [23,24]

The most frequent CT finding in our study was subdural hematoma (31.82%).In accordance to our results, Asaleye CM et al in their study reported that SDH was found to be in 36% of cases.[25]. Ayrak et al found SDH to be in 10.7% of patients.[26] Naseri et al found in their studies the percentage of SDH to be 13.3%.[27].Extradural hematoma was found in 17.1% of the patients on CT scan in our study. Similar results were reported by Ayrak et al, who found in their study 15.1% of patients have EDH while in other studies the frequency of EDH is 16.5%, 8.0% and 14%.[10,25,26] The reason for variation in these result s is not clearly understood although they are all in close range in all these studies. 13.3% patients in our study were having subarachnoid haemorrhage. This percentage was 16% in a study conducted by Ayrak L et al and 11.4% by study of Naseri et al.[26,27] SAH was found isolated findings on CT but mostly in association with other intracranial pathologies like intracranial hematomas and linear or depressed skull fractures. Brain contusions were found in 14.9% of patients in our study. Similarly in other studies reported those pure cerebral contusions are relatively frequent, established among 8% of all traumatic brain injury and 13% to 35% of severe injuries.[31,32]

Contusions were found to be 32.9% by Naseri et al in their study.[27] Brain edema was found in 3.2% of our patients. Brain edema can possibly take place as a unique finding and appears as a region of reduced density. It usually takes place 24 hours following injury, elevates and become maximum at 3-5 days and then progressively resolves.

Skull fracture was found to be 6.3% in our study. A result of 16.1% was reported by by Naseri et al.[27] Accessible data from a case series and a cohort study, exhibit that the rate of skull fractures remains <5% in MTBI treated cases.[28,29]

In subjects with a trivial head injury, specifically in cases without amnesia or changed consciousness, the documented rates of skull fracture is nearly 1%.[28-30]

Conclusion

1.The commonest finding of CT in present study is subdural hematoma followed by extradural hematoma.

2 Brain lesions are evident even without any visible fracture and if CT scan is not carried out these lesion might be missed. The high prevalence of CT scan findings in head trauma justifies CT scan application

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