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Computed Tomography Findings in Patients with Mild Head Trauma

Background/Objective: To determine the frequency of computed tomography (CT) findings in patients with mild head trauma.

Patients and Methods: In this cross-sectional study conducted between September 2005 and April 2006, 708 patients with mild head trauma as defined by a Glasgow Coma Score (GCS) of 13-15, were underwent standard clinical examination and cranial CT.

Results: The mean±SD age of our patients was 26.8±19.03 years (range: 1 month to 89 years). 489 (68.9%) patients were male and 219 (30.8%) were female. GSC was 13 in 1%, 14 in 4.6% and 15 in 94.4% of patients. The most common mechanism of trauma was car accident and falling down, each of which happened for 132 patients (18.6%).

The most common findings on CT were subgaleal hematomas in 213(30%) and intracranial lesions were seen in 41 patients(5.8%) ;among them 37 were male. Among intracranial lesions, the most common finding was epidural hematoma in 18 patients followed by hemorrhagic contusion in 13 patients. Intracranial lesions were observed in 28.6% of patients with GCS of 13; in 15.2% with GCS of 14 and in 5.1% with GCS of 15 (P=0.002).

Conclusion: Many of patients with GCS equal to 15 after head trauma have considerable intracranial lesions and minor focal neurologic signs revealed by careful physical examination could be a good marker of these lesions.

Keywords: computed tomography, head trauma, Glasgow coma score, mild head trauma

Introduction

Trauma is one of the leading causes of mortality and head trauma is the cause of death in more than half of the injured persons.[1] Mild head injury is one of the most common causes for hospital admission after trauma.[2] Most of these patients do not suffer long-term neurologic complications.[3] No uniform guidelines for the care of patients with mild head injury has been established yet.[2] Management of these cases has been according to in-hospital observation.[4-6] Most evidences show that skull x-ray is less informative than computed tomography (CT) and is of limited value for the management of mild head injuries.[7,8] Early CT for such patients could be result in better management and treatment for them.[4] By using CT, unnecessary admissions of patients with normal CT findings can be avoided.

It has been suggested that head trauma cases can be triaged for admission with an early CT and avoiding unnecessary admissions while findings are normal.

The objective of this study was to define the distribution of positive CT in patients with mild head injury.

Patients and Methods

From September 2005 to April 2006, we prospectively investigated all patients with mild head trauma—*i.e.*, those with a Glasgow coma score (GSC) of 13–15 [9], Who admitted to our center, a university-affiliated hospital

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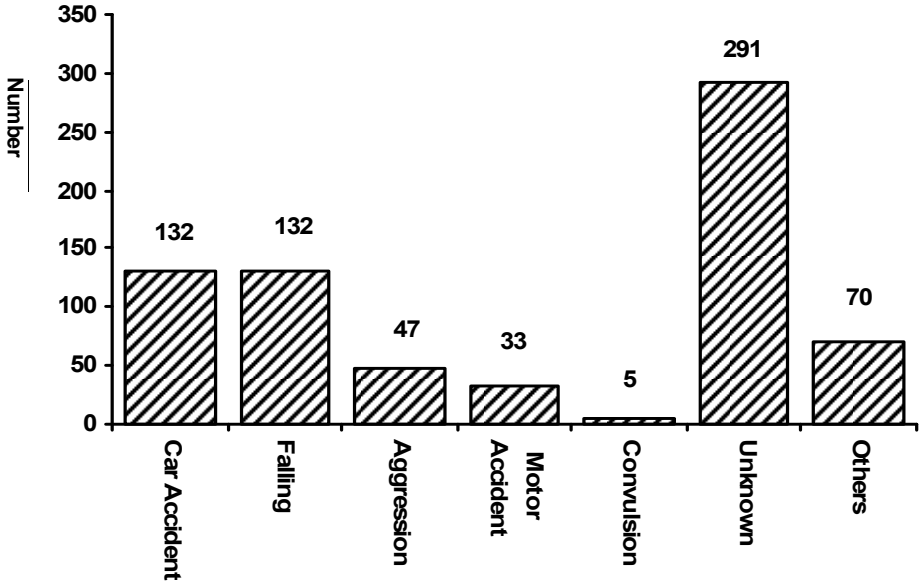

Fig. 1. Mechanisms of trauma in our patients.

All patients received a physical examination, including assessing the GCS on arrival to the emergency department. We included all patients who admitted to our emergency ward due to mild head trauma (*i.e*, admission GCS=13–15) and who had indication for brain CT. These indications included all patients with admission GCS of 13 or 14 and all with admission GCS of 15 who had focal neurologic signs.

Those with severe abdominal, spinal cord, or thoracic trauma, and those with intoxication or other life-threatening injuries were excluded from this study.

Only the first CT of each patient was analyzed. Our study covered all abnormal CT findings that could be attributed to head trauma. This included intracranial bleeding, skull fractures, and edema.

Subjects who met the inclusion criteria were enrolled into the study and underwent a standard physical examination and a non-contrast spiral head CT (Shimadzu 7800- JAPAN). All CT scans were reported by a radiologist at our institution. We also assessed the mechanism of trauma in our patients.

We used SPSS ver 11.5 for statistical analysis. The *Student's t* test and Chi-square tests were used for data analysis. A P-value <0.05 was considered statistically significant.

Results

In this study, 489 (68.9%) patients were male and 219 (30.8%) were female. The mean±SD age of patients was 26.8±19.0 years (range: 1 month–89 years).

Patients included seven (1%) subjects with GCS of 13, 33 (4.6%) with GCS of 14 and 670 (94.4%) with GCS of 15.

The most common mechanism of trauma was car crash and falling down each of which happened in 132 (18.6%) patients (Fig. 1).

We assessed the localization of lesions based on CT findings (Fig. 2).

The most common findings in CT were subgaleal hematomas observed in 213 (30%) patients; obliterated paranasal sinuses in 114 (16%) and skull fractures in 77 (10.9%) patients. We also had 10 (1.4%) patients with incidental findings.

Totally, intracranial injuries were observed in 41

Table 1. Distribution of intracranial lesions in patients with different GCS's

	Brain Swelling	SAH*	SDH†	EDH‡	Hemorrhagic Contusion	Pneumocephalus
GCS 13(n=7)	1	-	-	1	1	-
GCS 14(n=33)	-	-	2	3	1	-
GCS 15(n=670)	5	2	4	14	11	3

*SAH: Subarachnoid hemorrhage, †SDH: Subdural hematoma, ‡EDH: Epidural hematoma

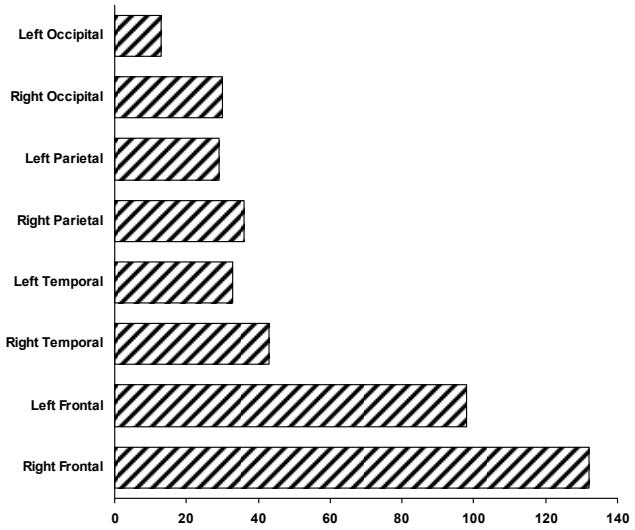

Fig. 2. Localization of lesions based on CT findings.

(5.8%) patients; six had brain swelling (0.8%), two (0.3%) had subarachnoid hemorrhage, six (0.8%) had subdural hematoma, 18 (2.5%) had epidural hematoma, 13 (1.8%) had hemorrhagic contusion and three (0.4%) had pnuemocephalus. Distribution of the intracranial lesions stratified by admission GCS is shown in Table 1.

Intracranial lesions were seen in 28.6% of patients with GCS of 13; in 15.2% with GCS of 14 and in 5.1% with GCS of 15 (P=0.002).

Table 2 shows the local distribution of intracranial lesions in our patients.

The mean±SD age of the patients with intracranial lesions was 28.3±18.2 years; in those without intracranial lesions, it was 26.7±18.9 years (P=0.617).

Among 41 patients with intracranial lesions, 37 (90.2%) patients were male while among 667 patients without intracranial lesions, 452 (67.8%) were male (P=0.003).

Seven of these patients had two intracranial lesions; the remaining had one (Table 3).

Discussion

Head injury is one major health problem in the world, and also is the most common cause of mortality in individuals from 1 to 35 years of age.[10,11]

Stein and his Colleagues recommended routine and immediate head CT scanning in all head trauma patients who have loss of consciousness and amnesia, even if all other physical findings are normal.[12] They also reported a high frequency of intracranial lesions (12.9%) in mild head trauma.[13] Haydel, et al, identified those with mild head trauma in whom CT must be performed based on their clinical findings; they did not recommend performing CT in all with mild head trauma.[1,14]

French and Dublin, in their study, reported CT

Table 2. Anatomical distribution of intracranial lesions

	Frontal	Temporal	Parietal	Occipital
Brain Swelling	5	1	-	-
SAH*	1	-	-	-
SDH†	2	2	6	2
EDH‡	21	10	14	2
Contusion	2	1	-	-
Hemorrhagic Contusion	7	8	8	1
Pneumocephalus	5	-	-	1

*SAH: Subarachnoid hemorrhage, †SDH: Subdural hematoma, ‡EDH: Epidural hematoma

Table 3. Frequency of concurrent lesions in patients

	Frequency	Percent	Valid Percent	Cumulative Percent
No at all	13	1.8	1.8	1.8
One extracranial	574	80.8	80.8	82.7
One intracranial	4	0.6	0.6	83.2
Two extracranial	55	7.7	7.7	91.0
One intracranial+One extracranial	15	2.1	2.1	93.1
Three extracranial	27	3.8	3.8	96.9
Two intracranial	2	0.3	0.3	97.2
One intracranial+Two extracranial	15	2.1	2.1	99.3
Two intracranial+One extracranial	5	0.7	0.7	100.0

findings in 316 patients who were assessed from 1000 consecutive patients who have not had loss of consciousness and also had normal neurologic exams. They found that 13% of such patients had intracranial abnormalities.[15] In another study, Jeret, et al, studied 753 patients with mild head trauma and found intracranial abnormalities identified by CT in 9.4% of patients.[16]

Livingston, et al, reported CT findings from 111 patients who developed loss of consciousness and had GCS of 14 or 15; the base rate of intracranial abnormalities in their sample was 14%.[17] In subsequent studies of mild head trauma, the risk of intracranial lesions on CT was lower than that reported by Stein (6%–9%).[1,18]

The rate of intracranial abnormalities in our study was 6.8%, which was lower than all the above-mentioned studies. (All P-values<0.0001)

One probable reason for this maybe due to that many studies did not include patients with GCS of 15. One limitation of this study was that we did not follow our patients after discharge from our ward.

We found relationships between the presence of CT abnormalities and lower GCS scores.

Many of patients with GCS equal to 15 after head trauma have considerable intracranial lesions and minor focal neurologic signs revealed by careful physical examination could be a good marker of these lesions.

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