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Research Paper

A Study Showing Correlation Between Glasgow Coma Scale And Brain Computed Tomography Scan Findings In Head Trauma Patients

Medical Science

KEYWORDS : : CT head, Glasgow Coma Scale

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ABSTRACT

Background: The study aimed to assess the relationship between computed tomography (CT) scan findings and Glasgow Coma Scale (GCS) score with the purpose of introducing GCS scoring system as an acceptable alternative for CT scan for clinical management of brain injuries in head trauma patients.

Materials and Methods: This study was conducted on hospitalized patients with the complaints of head trauma. The severity of the head injury was assessed on admission by the GCS score and categorized as mild, moderate, or severe head injury; which was followed by brain CT.

Results: Of all study subjects, 80.5% had GCS 13–15 that among those, 45% had GCS 15. Furthermore, 10.5% had GCS ranged 9–12 and 9% had GCS <9. Of all subjects, 54.5% had abnormal CT findings that of them, 77.1% categorized as mild head injury, 11.0% had a moderate head injury, and 11.9% had a severe head injury. Furthermore, of those with GCS 15, 41.0% had abnormal CT scan.

Conclusion: The combination of this scoring system and other applicable scoring systems may be more applicable to stratify brain injury level.

Introduction

Head trauma accounts for a high proportion of work in emergency centers and includes high workloads of primary cares and clinical services. According to the published reports, head trauma is a major cause of death in young adults, as well as physical and psychological disabilities in more than half of the affected individuals with head injury [1,2,3,4]. The management of patients with head trauma is clinically based on the Glasgow Coma Scale (GCS) that can present a comprehensive framework for assessing the three clinical aspects of verbal, visual, and motor responsiveness leading proper stratifying neural impairment and head injury severity [5,6]. In this regard, the degree of head injury can be scored as mild (GCS score 13–15), moderate (GCS score 9–12), and severe (GCS score equal to or <8). According to the great observational studies, of all attendance to clinical settings because of head trauma, 93% of adults and 94% of children suffer mild head injury, 6% of adults and around 5% of children suffer moderate head injury and only 1% of adults and 0.5% of children suffer severe head injury according to the GCS stratification rule [7,8,9,10].

Beside the clinical management of head trauma patients, intracranial lesions in these patients can be detected aided by imaging methods even before appearing clinical manifestations. In this context, studies could demonstrate that early detection of neurological lesions by these modalities have resulted in achieving the appropriate clinical outcome and also preventing unnecessary interventional treatments [11,12]. In this regard, the optimal time point for performing computed tomography (CT) scanning was produced to be 8 h of head trauma especially in the elderly; or the evidences of skull fracture, seizure appearance or retrograde amnesia [13,14,15].

Despite high advantages of CT scanning in patients with head trauma especially in detecting brain lesions particularly in early stages, the use of this procedure may be unavailable in some settings and also may be contraindicated in many conditions. Furthermore, although CT scan is necessary before and after treatment intervention in these patients, applying appropriate clinical alternatives can result in dissuading clinicians from obtaining unnecessary follow-up CT scans. The present study aimed to assess the relationship between CT scan findings and GCS score with the purpose of introducing GCS scoring system as an acceptable alternative for CT scan for clinical management of brain injuries in head trauma patients.

Materials and Methods

This retrospective study was conducted on 200 hospitalized patients with the complaints of head trauma and admitted in a tertiary care hospital between 1st February, 2011 to 31st July 2015. From an operational point of view, the head injury was defined as a history of a blow to the head or the presence of a scalp wound or those with evidence of altered consciousness after a relevant injury; as was done by Lee at el [16]. All patients' information was retrospectively collected by reviewing the hospital recorded files. In all subjects, the level of consciousness was assessed on admission by the GCS and its severity was categorized as mild head injury if GCS score set as 13–15, moderate head injury if GCS score set as 9–12 and severe head injury if GCS score equal to or <8. Also, the documents of CT scans and the recorded reports were assessed by a radiologist who was blinded to results of the patients' GCS score and the types of lesions were also determined. For statistical analysis, mean ± standard deviation was determined to describe continuous variables and frequency (percentage) was used to describe categorical variables.

Results

In total, the recorded information of 200 patients with head injury (107 men, 17 women & 76 children less than 12 years of age) was retrospectively assessed. The age wise distribution was as follows: 76 were children younger than 12 years while 22 aged 13–18 years, 39 aged 19–30 years, and 63 aged more than 30 years. The most common causes of head injury amongst men was a (road traffic) accident (69/107), followed by falling (21/107) & hitting of objects to the head (11/107) respectively. The most common causes of head injury in women were an accident (8/17), falling (5/17) and hitting of objects to the head (3/17). Falling (52/76) was the most common cause for injury in children followed by accident (20/76) and hitting of objects to the head (3/17) respectively. Thus, there was great difference in the distribution of causes, according to age and gender. Regarding types of lesions in CT scans, the most common type of lesion was epidural hematoma (38.5%), followed by cerebral contusion (29.4%), and pneumocephaly (17.4%) [Table1]. As shown in Table 2, brain lesion type A was detected in 47.9% of patients with mild brain injury, 42.9% of patients with moderate brain injury,

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and 27.7% of patients with severe brain injury. In this regard, lesion type B was detected in 5.5% of patients with mild brain injury, 4.8% of patients with moderate brain injury, and none of the patients with severe brain injury. Using the test for agreement between CT findings and GCS severity scoring, a weak correlation was revealed between the two modalities to determine brain lesions (Somers'd value = –0.097 ± 0.065, P = 0.142).

(TABLE 1 COMES HERE)
(TABLE 2 COMES HERE)

Discussion

Association between the severity of brain lesion assessed by the level of consciousness on GCS scoring system and presence or absence of brain lesions in CT scan is now considered as a new subject to minimize unnecessary CT following in patients with head trauma. Our study attempted to determine the association between CT findings and GCS categorization to test the possibility of predicting brain lesions by determining GCS score on admission. In our observation and among those with positive CT findings on brain abnormality, 77.1 patients had a mild brain injury, 11.0% had a moderate brain injury, and 11.9% had a severe brain injury.

A few recent studies assessed correlation between GCS score and CT scan to assess brain lesions. In a study by Lee *et al.*,[16] the change in CT scans was compared with the GCS, in which on the day of the scan positive correlation was reported between the two modalities. In this regard, in patients with unchanged or improved GCS, 73.1% had improved or had the same CT appearance; while in those with a worse GCS, the CT was worse in 77.9%. Finally, the authors concluded that due to good correlation between the CT scan appearance and the clinical status, the use of follow-up CT scans was recommended only in patients with clinical deterioration unexplained by intracranial pressure changes alone. Farshchian *et al.*[17] showed that only three lesions of extra-axial hematoma, subarachnoid hemorrhage, and hemorrhagic contusion might be associated with low GCS scores.

Conclusion

Considering CT findings as the gold standard, the combination of this scoring system and other applicable scoring systems such as traumatic brain injury classification and also considering clinical signs like depressed fracture may be more applicable to stratifying brain injury levels.

Tables:

Table 1: Different types of brain lesions in patients with head injury

Brain lesions:	
Epidural hematoma	42
Cerebral contusion	32
Pneumocephaly	19
Acute subdural hematoma	18
Intracranial hemorrhage	15
Chronic subdural hematoma	4
Subarachnoid hemorrhage	3
Subdural hygroma	3
Subdural hydroma	2
Intraventricular hemorrhage	1

Table 2: Types of brain lesions according to severity of injury on GCS scoring

	A	B	C	D	E	B,E	B,C	B,D
Mild	47.9	5.5	23.6	13.7	3.7	0.6	3.1	1.9
Moderate	42.9	4.8	9.5	19	9.5	0	9.5	4.8
Severe	27.7	0	44.4	5.5	11.1	0	5.5	0

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