Original Research

Evaluating the Usefulness of Glasgow Coma Scale (GCS) in Diagnosing Traumatic Brain Injury: The Role in the Old Age Patients

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Abstract

Background: Several previous studies have questioned on the applicability of Glasgow Coma Scale (GCS) for patients with old age having Traumatic Brain Injury (TBI).

Aims and Objectives: To evaluate the usefulness of GCS in diagnosing TBI in relation to elderly people.

Materials and Method: A prospective study was performed involving 558 patients with brain injury out of that 126 had TBI. The GCS was assessed and compared with patients after dividing them into different age groups. Logistic regression was performed after adjusting for addition classical factors influencing the GCS like sex, Abbreviated Injury Scores (AIS) and mode of injury.

Results: We found a continuously increasing trend for GCS score with age of the patients having TBI. The similar trend was noted at all the level of severity. Logistic regression has shown a significant trend after adjusting for patients' sex and mode of injury. However, level and height of the fall are the determining factors. GCS score increases significantly after the age of 44.

Conclusion: Greater weightage should be given to the age of the patients and the level and mode of injury to patients with TBI during the screening procedure.

Keywords: head injury, brain, age of patients, fall, road traffic accidents

Introduction

Traumatic brain injury (TBI) has become an important challenge faced by the physicians working in the emergency department due to high trauma-related mortality and disability. Though in emergency department (TRAUMA WARD) TBI can be detected using imaging techniques, overload in the TRAUMA

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WARD can make it difficult to diagnose it on time. This can be achieved by performing initial triage by the staff receiving the patients. [1]

Glasgow Coma Scale (GCS) is one of such tools for triage used in the TBI. [2]It was first published in the year 1974 which was designed to assess the severity of the brain injury. It was based on the three main aspects of the behaviour including motor responsiveness, verbal performance, and eye-opening. [3]

This scale score ranges from 3 to 15 and a patient with normal level of consciousness will have a total score of 15.[4]GCS was previously called as Abbreviated Injury Score (AIS)as a defining parameter for TBI, it is still being followed as basic triage tool for determining its presence. [5]

Several recent studies have questioned the ability of the GCS to reflect the situation in some of the patients, mainly in the elders. Hence in present study we tried to study the usefulness of GCS in diagnosing traumatic brain injury.

Materials and Methods

We performed a prospective study including558 patients having age more than 20 years in a tertiary care hospital from 1.1.2023 to 31.12.2023.

All the patients having head injury admitted to trauma ward were included. Out of 558 patients with head injury 126 had TBI defined as AIS diagnosis of internal brain injury. GCS was recorded for all the patients with TBI.

We exclude those injuries which were due to poisoning, drowning, and suffocation. We also excluded those patients who were discharged from the hospital after treatment in the Trauma ward, and those patients with head injury who were declared dead before arriving at the Trauma ward. We included only those patients whose relatives gave written informed consent for using their data in the study. This data was kept anonymous without revealing patient's identity anywhere.

Variables recorded in this study were demographic details of the patients which include age and genders, reasons for head injury were also recorded. GCS was assessed in TRAUMA WARD. We also evaluated AIS for those with AIS score between 3-5. In present study we also excluded AIS 6.

Patients having GCS score of 15 was considered as normal score. Further, we divided patients into different age group viz. 20-44 years, 45-64 years, 65-74 years and more than 75 years to compare the GCS role I different age groups.

All the data analysis was performed using IBM SPSS ver. 20 software. Cross tabulation and frequency distribution were performed to prepare the tables. Chi square test was used to find out the association between the categorical variables. Multivariate logistic regression analysis was performed to examine the probability of possessing a GCS lower than 15, as a function of age, when AIS, gender, and injury mechanism were taken into account, due to these variables being associated with both GCS and age, and therefore being able to confound the association between them. For all analyses performed, a value of $p < 0.01$ was considered statistically significant.

Results

A total 558 patients having brain injury were screened and out of that 126 were found to have TBI. The reported incidence of TBI in our study was 22.58%.

We observed male preponderance in present study [72 (57.14%)]. Majority of the patients with TBI were old having age more than 65 years [88 (69.84%)].

While assessing the severity of the injury, it was found that more than half of the patients had AIS 4 [69 (54.76%)]. Whereas 12 (16.67%) had severe TBI with AIS 5.

Most common mode of injury was fall due to different reasons like sports [52 (41.57%)] and fall from the buildings [34 (26.98%)] followed by road traffic accidents accounting for 40 (31.74%) patients.

Table 1: Showing grouping of GCS score among study cohort

GCS score	No of TBI patients	Percentage
3-8	15	11.90
9-12	4	3.17
13-14	8	6.34
15	99	78.57

Table 2: Logistic regression for predicting the odds of having a GCS lower than 15 (GCS 3–14).*

Variables		Adjusted odds ratio	95%CI
Age	20-44	1.9	1.8-2.4
	45-64	1.3	1.1-1.6
	65-74	1.2	0.9-1.3
	>75	1	
AIS	5	11.4	9.4-11.9
	4	2.1	1.8-2.4
	3	1	
Mode of injury	Falls (sports)	1.4	1.1-1.8
	Falls (building)	1.6	1.2-2.4
	RTA	2.5	2.1-2.8
	Falls (from own height)	1	
Gender	Male	1.4	1.2-1.6
	Female	1	

*C = 0.73. GCS: Glasgow Coma Scale; AIS: Abbreviated Injury Score; RTA: road traffic accident; CI: confidence intervals.

Discussion

Taking the clue from the previous studies which have doubted the applicability of GCS score in patients with old age with TBI. However, still the association between the age and the GCS is unclear. (6, 7, 8)

Previous researchers have tried to analyse the reasons for this disparity between GCS among the elderly people by looking at the clinical, demographic or social parameters of elderly patients. Few explanations for these differences may be due to difference in the prevalence of made of injury among the victims. Other reasons explained by the previous authors were alcohol consumption before the injury, elderly women, higher chances for brain injury to elderly people and chances of delay in seeking the treatment among the elderly due to their anatomical peculiarities. (6, 7, 8)

In present study, we found that a continuous effect of age on the GCS score among the patient's with TBI. This highlight uniqueness of elderly patients insufficient making higher chances of brain injuries. It was also found that GCS score among the TBI patients increases with increasing the age regardless of anatomic injury severity. This is even observed after adjusting for other factors which are significantly associated with GCS such as gender, AIS and mode of injury.

In present study it was found that GCS increases monotonously with increasing age at every AIS level. This trend was mainly observed after the age of 44. Proportion of normal GCS score increased with increasing the severity of the injury assessed by the AIS. This finding is in line with previous studies. Salottolo et al and Kehoe et al in a similar study observed greater age difference in GCS presentation among more severely injured patients. (6, 7)

In present study we found a lower GCS score among male population. The similar findings were reported by previous study done by Kehoe et al in 2015 where author also reported lower GCS among the male population. This highlight the protective effect of female gender in cases of isolated TBI. (7)

When stratified with mode of injury, the age-dependent trends were not as monotonous. For RTA victims having age more than 44 years, the risk of TBI is more as compared to those with age 64 years. Similar findings were reported by previous studies by Kehoe et al (7) and Rau et al. (8)

Patients those who have fall from their own height and hospitalized, patients had similar GCS score who were younger than 65 years of age. However, in later age, the GCs score was observed to grow. In our study proportion of ground level fall (such as sports) is large, this could explain the dichotomic division of the age groups in the previous studies.(9) For those patients who have fall from the building or from the elevation the increase in the GCS scores with age was not found to be significant. This may be due to the large heterogenicity of these groups as hight of the fall depends of the height of the building or elevation. (10)

Based on the findings of the present study we recommend screening procedures for patients with TBI should involve giving a greater weight to the age of adult patients, beyond the level of the basic distinction between "elderly" and "non-elderly", as this factor strongly influences the reliability of triage tools.

Conclusion

Based on the present study findings we conclude that age has a continuous influence on the reliability of GCS among the patients with TBI. The GCS score was found to be higher among the patients with greater age at all the level of severity. However, the trend also depends on the level and different mode of injury.

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Abbreviations

1. GCS – Glasgow Coma Scale
2. TBI - Traumatic Brain Injury
3. RTA – Road Traffic Accident
4. AIS - Abbreviated Injury Score

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