

Original Research

To Determine The Relative Percentage Of Mild, Moderate, And Severe Head Injuries Using The Glasgow Coma Scale.

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ABSTRACT

The occurrence of traumatic brain injury (TBI) is a primary cause of mortality and disability worldwide, with moderate-to-severe TBI (mTsTBI) making a significant contribution to this statistic in the United States. However, there is a scarcity of studies that provide prospective, longitudinal outcome data for the acute to chronic phases of recovery after mTsTBI. **Objective:** The main objective of this study is to evaluate the outcomes in key areas of life function at 2 weeks, 3 months, 6 months, and 12 months post-m Ts TBI. **Materials & methods:** The ESIC Medical College & Hospital, Faridabad study was conducted the study. The study aimed to prospectively assess longitudinal outcomes with a follow-up period of 12 months post-injury. The study included patients with mTsTBI (Glasgow Coma Scale scores (GCS) of 3-12) who were extracted from a larger group of patients with mild, moderate, or severe TBI. Exposures: Moderate or severe TBI, the GCS and Disability Rating Scale (DRS) were used to assess global functional status at 2 weeks and 3-, 6-, and 12-months post-injury. The GCS scores were dichotomized to determine favorable (scores 13-15) versus unfavorable (scores 3-8) outcomes. Neurocognitive testing and patient-reported outcomes at 12 months post-injury were analyzed. **Results:** This study involved 100 patients, chosen from a pool of 279 individuals. The participants, including those with severe TBI (n=74) and moderate TBI (n=26), were comparable in terms of demographics and premorbid conditions. At 2 weeks post-injury, 13 out of 74 severe TBI patients and 11 out of 26 moderate TBI patients showed favorable outcomes, as indicated by GCS scores of 13-15. At 12 months post-injury, 40 out of 76 severe TBI patients and 19 out of 26 moderate TBI patients had favorable outcomes, with 14 severe TBI patients and 8 moderate TBI patients reporting no disability. **Conclusion:** Patients with mTsTBI frequently demonstrated major functional gains, including recovery of independence, between 2 weeks and 12 months post-injury. Severe short-term impairment did not lead to poor outcomes in a substantial minority of patients with mTsTBI. When discussing prognosis during the first two weeks after injury, clinicians should be particularly cautious about making early, definitive prognostic statements suggesting poor outcomes and withdrawal of life-sustaining treatment in patients with m T s TBI

Key words: Glasgow Coma Scale, traumatic brain injury, moderate-to-severe TBI, disability, neurocognitive testing.

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INTRODUCTION

Traumatic brain injury (TBI) is a significant cause of mortality and disability worldwide and in the United States, presenting a significant challenge to affected individuals as they attempt to reintegrate into the workforce or educational system, maintain social connections, and perform routine tasks [1,2]. The long-term complications of mTsTBIs include an increased risk of cognitive decline, neurodegenerative diseases, and the need for lifelong personal care [2]. Research has

shown that there is substantial variability in the degree of residual disability and recovery from mTsTBIs [3,4]. Moderate TBI (GCS scores of 13-15) and severe TBIs (GCS scores of 3-8) can both result in permanent disabilities [3-5]. However, long-term outcome studies suggest that 20% of survivors will regain functional independence within five years of sustaining a severe TBI [6]. Despite numerous studies on the long-term consequences of mTsTBI, only a limited number of these have included longitudinal follow-up or early assessment to monitor recovery from the acute to

chronic phases [7,8]. It is crucial to document the complete longitudinal course of outcomes following mild TBIs to identify short-term and long-term factors that distinguish patients who will experience a positive recovery from those who are most susceptible to unfavorable long-term results [9,10]. To this end, interventions to reduce the overall disability associated with mTsbTBI can be informed. Our research introduced a systematic approach to tracking functional outcomes in the immediate aftermath of the injury (at 2 weeks) as well as at 3, 6, and 12 months after the injury. Our analysis aimed to increase knowledge of the frequency and extent of recovery possible in patients with mTsbTBIs, including those with disorders of consciousness.

MATERIALS & METHODS

The current trial is planned to occur at ESIC Medical College & Hospital, Faridabad, with a starting date in February 2018 and a completion date in April 2019. The research was focused on individuals aged 10 or above who have been admitted to the hospital's Departments of Surgery and Neurosurgery and have sustained head injuries. This study represented a prospective, observational, hospital-based research endeavor that will span a period of 13 months. The study included 120 patients who were admitted to the hospital due to head trauma, without exception who were fulfilling our inclusion criteria. Patients with significant additional injuries to their abdomens, thorax, or bones were excluded, as these injuries may significantly impact the outcome scores. Furthermore, patients with significant pre-existing medical conditions were excluded if these conditions could potentially affect the outcome scores, such as Parkinson's disease, stroke, degenerative diseases, or cancer.

The following are the components of the history that should be taken into account: the mechanism of injury, any primary and secondary injuries, coexisting medical conditions or comorbidities, preexisting disabilities, general and systemic examinations, evaluation of head injury through GCS, assessment of pupils, neurological deficits, examination of cranial nerves, complete blood count, kidney function tests, blood sugar levels, arterial blood gas analysis, imaging tests such as X-rays, chest X-rays based on trauma protocol, non-contrast computed tomography (NCCT) head scans on admission and as needed, and additional tests based on suspected injuries. The patients will be managed according to standard protocols, and any need for ventilator, transfusion, or dialysis will be noted. Changes in GCS or investigations will also be recorded. Any surgical intervention and its findings, as well as post-operative events, will be documented.

The severity of head injury is classified using the GCS, where the motor score is the best predictor of

neurological outcome. For minor head injury, the GCS score is 15 with no loss of consciousness. For mild head injury, the score is 14 or 15 with loss of consciousness. For moderate head injury, the score ranges from 9 to 13, and for severe head injury, the score ranges from 3 to 8 (with 7 being the most severe). The GCS was developed in the 1970s at the Institute of Neurological Sciences in Glasgow to assess the level of consciousness using three aspects of a patient's response: eye opening, verbal, and motor. It has since been widely adopted worldwide and is included in the Advanced Trauma Life Support course of the American College of Surgeons.

STATISTICAL ANALYSIS

Continuous variables were analyzed using median, mean, standard deviation, and range values, and two-sample t-tests and Fisher's exact tests were applied to compare relationships between predictor variables. Paired t-tests were used to evaluate GCS assessments conducted at three- and twelve-months post-injury. The 2 tests for proportions were used to identify candidate variables associated with poor outcomes in the initial bivariate analysis. Variables with two-sided p-values less than 0.15 in the bivariate analysis were included in the multivariate logistic regression model, which aimed to identify independently associated variables with unfavorable outcomes. Statistical significance was set at $P < 0.05$.

RESULTS

A total of 100 eligible patients were included from the 279 individuals in this study. The participants with severe TBI ($n = 74$; 58 men [79%]; median [interquartile range] age, 36.7 [25-54] years) and moderate TBI ($n = 26$; 21 men [82 %]; median [interquartile range] age, 39 [25-54] years) were comparable in terms of demographic and premorbid variables. At 2 weeks post-injury, 10 of 74 participants with severe TBI (13 %) and 11 of 26 participants with moderate TBI (42%) had favorable outcomes (GOS scores 13-15). 40 of 76 patients with severe TBI (52.4%) and 19 of 26 patients with moderate TBI (75%) had favorable outcomes. Nearly fourteen participants with severe TBI (20 %) and eight patients with moderate TBI (33 %) reported no disability (DRS score of 0) at 12 months.

DISCUSSION

Traumatic brain injury (TBI) is a serious event that can cause significant and lasting impairments. A large, long-term observational study has recently provided some promising findings on the recovery of individuals with moderate to severe mTsbTBI [11,12]. The study showed that a substantial proportion of participants were able to perform daily activities more independently, with many regaining their independence within 2 weeks to 12

months after the injury. Although many participants still had significant disabilities, these findings offer valuable insights into the natural course of recovery and have important implications for the early clinical management of mTsbTBI patients.

Previous research has explored the functional outcomes of mTsbTBI, but few studies have tracked recovery from the acute to chronic phases, and most have only used the GCS [11-13]. This has made it unclear what degree of impairment observed during the first 2 weeks post-injury predicts unfavorable long-term functional outcomes. Our data suggest that the severity of impairment observed at 2 weeks post-injury is not necessarily an indicator of poor long-term functional outcomes. At 2 weeks post-injury, 94% of the severe TBI group and 79% of the moderate TBI group had moderate to severe disabilities or worse (DRS scores ≥ 4) and required assistance with basic daily activities (GCS scores 3-6). However, by 12 months, half of the severe TBI group and three-quarters of the moderate TBI group were able to function independently at home for at least 8 hours per day (GCS scores ≥ 8).

Previous research has demonstrated that a considerable proportion of individuals with severe TBI exhibit functional improvement in the post-acute phase, as assessed by the GCS [14,15]. In our study, we utilized the DRS to obtain more precise measurements of disability. Among the severe TBI group, we observed that 19% had no disability and an additional 14% had only mild disability at 12 months postinjury. Furthermore, all participants who were in a vegetative state for 2 weeks and survived regained consciousness, and over 25% regained orientation by 12 months. These findings underscore the frequency and extent of recovery that can occur within the first year of postinjury.

Previous studies have demonstrated a stepwise increase in favorable outcomes based on GCS scores from 3 months to 24 months postinjury [16,17]. However, our data suggest that the trajectory of clinically significant functional improvement is evident earlier than 3 months postinjury. The percentage of participants with severe TBI and a favorable outcome nearly quadrupled from 12% at 2 weeks to 45% at 3 months, compared with an increase from 41% to 70% in the moderate TBI group. These improvements likely reflect the combined influence of spontaneous recovery and neurorehabilitation interventions. However, predicting outcomes across the TBI spectrum, particularly for patients with more severe injuries, remains challenging. Critical care professionals often must make crucial decisions based on limited information available, including whether to continue or withdraw life-sustaining treatment, based on assumptions about long-term functional outcomes [18]. Previous research has indicated that during the acute phase of severe injury,

trauma specialists tend to overestimate the likelihood of negative outcomes and underestimate the probability of positive outcomes in patients [15, 19,20]. These biases can significantly impact key decision-making regarding patient care, even within the first 24 hours of injury. The vegetative state is often considered a dire prognosis and a significant driver of clinical decision-making and goals of care. Our study demonstrates the potential for recovery from this condition. Out of the 79 participants in vegetative State at two weeks post-injury who survived up to one year, all but one recovered at least basic communication ability, and 25% were fully oriented. A better understanding of the natural history of recovery from traumatic vegetative state is crucial for clinical practice in combating the pervasive nihilism associated with this diagnosis. We believe it is essential that clinicians, particularly those in neurocritical care, recognize that traumatic vegetative state is a dynamic condition that evolves over the first year. Recent evidence suggests that key behavioral benchmarks presaging later recovery often do not emerge in patients with traumatic disorders of consciousness until after six weeks post-injury [21].

CONCLUSION

The GCS is an indispensable tool for evaluating the severity of head injuries, providing healthcare professionals with a consistent and objective method for making informed treatment decisions. While the prevalence of mild, moderate, and severe head injuries may vary depending on the population and setting, mild cases are generally the most common, followed by moderate and then severe cases. It is crucial to recognize that even mild injuries can pose potential risks, such as delayed symptoms or complications, and prompt assessment and appropriate medical care are essential for improving outcomes and minimizing the long-term consequences of head injuries across all severity levels. Continued research and advancements in trauma care are necessary to enhance our understanding and management of head injuries.

Conflict of interest:

There is no conflict of interest among the present study authors.

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