



Glasgow Coma Scale Score in Pediatric Patients with Traumatic Brain Injury; Limitations and Reliability

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Traumatic brain injuries in pediatrics are among the most common causes of pediatric emergency room visits and is usually associated with long-term disability and neurological sequelae [1]. Despite advances in prevention, diagnosis and management of traumatic brain injuries, the mortality and morbidity rates are high among pediatric population [2]. The epidemiological studies have revealed that falls, motor vehicle accidents and recreational activities are the most common causes of traumatic brain injuries in pediatrics [3,4]. The management of moderate to severe traumatic brain injuries include prolonged intensive care and rehabilitation although the prognosis and the outcome remains elusive. Thus, several scoring systems have been introduced and validated in order to determine the outcome of the pediatric patients with traumatic brain injuries [2]. Several factors have been reported to be related to the patient outcome including age, the duration of the coma, the type of the brain lesion, the pattern of the pupils, injury severity score, the motor patterns, impaired reflexes of the brain stem, hypotension, hypoxia and the Glasgow Coma Scale (GCS) [5]. Some laboratory and paraclinical investigations have also been used to predict the outcome including brainstem auditory evoked potentials and cognitive

event-related potentials [6]. For instance, it has been shown that event-related potentials such as N400 could be reliably used to predict the post-traumatic language skills (subcortical and cortical systems) in those with severe traumatic brain injury suffering from aphasia [6].

Several lines of evidence suggest that pediatric patients suffering from severe traumatic brain injury have better prognosis when compared to adults [7]. In other words, the recovery of pediatric patients with traumatic brain injury is significantly better than adults [8]. In addition, it has been demonstrated that younger children have better outcome compared to older ones [7]. The later fact, however, is a controversial issue while some studies have shown that younger children have worst prognosis after traumatic brain injuries [4]. Younger children have incomplete myelination which makes them more susceptible to shearing injury [9]. It was shown that pediatric patients older than 6 years have better motor and cognitive function after traumatic brain injury [4]. The prognosis and mechanism of injury of the central nervous system depends extensively on the patients' age at the time injury. This makes it hard for the physicians to predict the outcome of traumatic brain injury in pediatric population. Thus predicting

the outcome of traumatic brain injury in pediatrics is of important value both clinically and morally [7].

The Glasgow Coma Scale (GCS) score is the most commonly and widely used indicator of severity of traumatic brain injury in both adults and pediatrics [10]. GCS is also used to predict the outcome of brain injuries [11]. The GCS score less than 8 is referred to "severe traumatic brain injury" which is associated with less favorable outcome and poor recovery [11]. Although the GCS is reliable in adult population, the reliability remain elusive in pediatrics. This is because the scoring system is based on the consciousness and patients' understanding of the orders and commands which is not applicable to pediatrics. Thus some modifications have been made in the GCS scoring system in order to be suitable for the children as well as neonates. In pediatrics another important issue that should be kept in mind when predicting the outcome is the hypoxic-ischemic insult at the time of injury which could be considered a confounding factors in calculating GCS score and assessing the outcome [2].

In order to adjust the GCS scoring system for pediatrics, it has been suggested that the cut-off value be set at 5 as severe traumatic brain injury. In other words, the threshold for neurophysiologic dysfunction should be decreased in pediatric population [12]. It

has also been reported that precise calculation of GCS is a reliable indicator of the patients' outcome [2,12]. It has been reported by Lai *et al.* [2] that the mortality rate was higher for traumatic brain injury children with GCS scores of 3-5 than those with scores greater than 5. Children with GCS scores of 3-5 subsequently died or developed severe disabilities, whereas those with a GCS score more than 5 had better outcomes [2]. Bruce *et al.* found that a GCS more than 5 was always associated with excellent recovery [13]. It has also been reported that the decision making for performing decompressive craniectomy in pediatric population should be based on the GCS scoring and brain CT-scan findings [14]. However this point should be kept in mind that the cut-off value for pediatrics should be decreased to 5 in order to be able to assess good reliability.

Taking all these together, this should be mentioned that GCS score is the most feasible, accessible and reliable predictor of traumatic brain injury outcome in pediatrics and despite its shortcomings, could be adjusted for this group. The cut-off value for severe traumatic injury should be set as 5 instead of 8 in order to be able to predict the outcome more precisely.

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