ACRM
AMERICAN CONGRESS OF REHABILITATION MEDICINE

Archives of Physical Medicine and Rehabilitation

journal homepage: www.archives-pmr.org

Archives of Physical Medicine and Rehabilitation 2015;96:956-9

BRIEF REPORT

Identifying Posttraumatic Amnesia in Individuals With a Glasgow Coma Scale of 15 After Mild Traumatic Brain Injury

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Abstract

Objective: To examine the utility of the Abbreviated Westmead Post-traumatic Amnesia Scale, which includes the Glasgow Coma Scale (GCS) and 3 picture cards used to measure amnesia, in identifying the presence or absence of posttraumatic amnesia in individuals with mild traumatic brain injury (mTBI).

Design: Prospective study using data from the Abbreviated Westmead Post-traumatic Amnesia Scale.

Setting: Trauma hospital.

Participants: Individuals with possible mTBI who presented between April and September 2011 (N=252; age range, 18−65y; mean age, 37.4±13.9y; 77% men).

Intervention: Administration of the Abbreviated Westmead Post-traumatic Amnesia Scale.

Main Outcome Measures: GCS and Abbreviated Westmead Post-traumatic Amnesia Scale pass/fail rates.

Results: Of the individuals, 169 (mean age, 35.1±13.6y; 77% men) received the scale. A pass/fail performance was achieved a median 121 minutes (interquartile range, 89−205min) after triage. Of the 45 who failed, 31 (69%) had a GCS score of 15. The likelihood of failing was associated with being older (odds ratio [OR], 1.03; 95% confidence interval [CI], 1.02−1.06; $P<.05$), having consumed alcohol (OR, 3.09; 95% CI, 1.42−6.74; $P<.01$), and the scale being administered closer to the time of the injury (OR, 0.99; 95% CI, 0.99−1.00; $P<.05$). Nineteen (42%) of those who failed had consumed alcohol, 11 had a GCS score of 15, and 8 had a GCS score of 14.

Conclusions: A GCS score of 15 does not always signify return to normative cognitive function. Individuals with a GCS score of 15 who are acutely cognitively impaired are at risk of not being accurately identified. The addition of an amnesia score to the GCS in the Abbreviated Westmead Post-traumatic Amnesia Scale will assist in making a diagnosis of mTBI.

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Prospective identification of the presence of posttraumatic amnesia (PTA) is a reliable guide for the classification of patients with mild traumatic brain injury (mTBI).[1,2] Accurate classification assists in clinical decision-making, assists in rehabilitation management, and is important for epidemiologic purposes.[3] A recent systematic review of evidence-based clinical practice guidelines (EBCPGs) for the management of mTBI indicated that the Glasgow Coma Scale (GCS) was consistently recommended for use in assessing level of consciousness and for categorizing the severity of mTBI.[4] Three of the EBCPGs reviewed recommended PTA be prospectively measured, and one included the resolution of PTA as a requirement for safe discharge.[4] The presence or absence of PTA, however, is not routinely examined in the emergency department (ED).[3]

PTA is more sensitive than the GCS alone in classifying mTBI.[2,5] The International Collaboration on Mild Traumatic Brain Injury Prognosis has called for further study on the utility of

Presented as a poster to the International Neuropsychological Society, July 13, 2013, Amsterdam, The Netherlands.

Supported by the Motor Accidents Authority of New South Wales (grant no. 09/915).

Disclosures: none.

0003-9993/15/$36 - see front matter © 2015 by the American Congress of Rehabilitation Medicine
http://dx.doi.org/10.1016/j.apmr.2014.12.014

clinical indicators (eg, GCS, PTA) in classifying mTBI.[6] The Abbreviated Westmead Post-traumatic Amnesia Scale is a valid measure of PTA in mTBI and extends the GCS with the addition of 3 picture cards.[7] The scale is used to assess amnesia, confusion, and disorientation, key indicators of PTA.[1,6,8] Here we describe the introduction of the Abbreviated Westmead Post-traumatic Amnesia Scale in an ED to examine the utility of the GCS and the amnesia items in identifying PTA in individuals with mTBI. Additionally, we examined whether individuals, as suggested by previous research, with an apparently normative level of consciousness (GCS score of 15), may fail the amnesia items from the Abbreviated Westmead Post-traumatic Amnesia Scale.[2,5]

Methods

Design and study setting

This was a prospective study using data collected from the Abbreviated Westmead Post-traumatic Amnesia Scale. The study was conducted at a level I trauma center for a 6-month period (April−September 2011). Local institutional review boards approved the study with a waiver of informed consent.

Participants

Possible participants were patients with mTBI (age range, 18−65y) from consecutive daily ED presentations who were identified from the electronic medical record using the following World Health Organization operational criteria for mTBI[8]: (1) confusion or disorientation, loss of consciousness for ≤30 minutes, any loss of memory for events immediately before or after the injury, and/or transient neurologic deficit; and (2) acute GCS score of 13 to 15 on presentation to hospital. Additional criteria included the following: (1) a diagnosis of head trauma, head injury, or brain injury; (2) a mechanism of injury consistent with a possible mTBI (transport-related accident, assault, fall)[3]; (3) an injury description that included head lacerations, bruising, swelling, or facial fractures[3]; and (4) investigations such as brain computerized tomography (CT) scan or facial or skull radiograph. Clinical records were examined to confirm individuals met criteria and to document alcohol and illicit drug use at the time of injury.[5,9] Exclusion criteria included the following: penetrating brain injury, concomitant TBI and spinal cord injury, and preexisting cognitive impairment.

The proportion identified with possible mTBI was 1.3% (N=252; of 20,024 attendances). Of these, 12 were excluded (they did not wait, left against medical advice, refused the scale). Seventy-one patients were missed, and they did not receive the scale (28% of eligible participants). There were 169 individuals who received the scale. These data formed 2 independent groups (those who received the scale, those who did not receive the scale) (table 1).

List of abbreviations:

CT	**computerized tomography**
EBCPG	**evidence-based clinical practice guideline**
ED	**emergency department**
GCS	**Glasgow Coma Scale**
mTBI	**mild traumatic brain injury**
PTA	**posttraumatic amnesia**

Procedures

Treating clinical staff evaluated mTBI according to current EBCPGs that require all presentations to undergo a 4-hour observation period.[10] Our trained and supervised research officer provided pre-study and ongoing training to nursing staff who administered and scored the Abbreviated Westmead Post-traumatic Amnesia Scale.

Measures

The Abbreviated Westmead Post-traumatic Amnesia Scale,[7] derived from the Revised Westmead Post-Traumatic Amnesia Scale,[2] includes the eye opening and motor components, the 5 verbal orientation items from the GCS, and 3 picture cards to measure amnesia.[7] Results from the validation study indicated the relation between a pass/fail score and an independent memory test (shown to differentiate between mTBI and nonbrain injured controls; Cohen $d=.98$)[2] was the same on the Abbreviated Westmead Post-traumatic Amnesia Scale and the Revised Westmead PTA Scale (ß=−.034).[7] The scale is administered at hourly intervals. A patient is considered to be out of PTA the first time they attain scores of 18 out of 18.

The Australasian Triage Scale[11] is used to prioritize ED presentations in terms of clinical urgency. A time is designated when a proportion of cases should be seen within each category (range, 1 [immediate] to 5 [120min]).

Statistical analysis

Mann-Whitney *U* tests were used to investigate differences in demographic, disposition, and injury characteristics in the 2 groups who received or did not receive the scale because the data were not normally distributed. Chi-square analyses or Fisher exact tests were used for categorical data. To control for multiple comparisons, an alpha level of .005 was applied. Binary pass/fail classifications on trial 2 were calculated for those who received the scale, where a score of <18 was used to categorize a pass/fail performance. The relation between age, sex, documented alcohol use, and time from injury to a pass/fail performance was determined using logistic regression analyses. SPSS[a] was used for analyses.

Results

Demographic, disposition, and injury characteristics were comparable between the 2 groups who received or did not receive the scale (see table 1). In those who received the scale, the Abbreviated Westmead Post-traumatic Amnesia Scale was commenced a median 58 minutes (interquartile range, 27−140min) after triage. A pass/fail performance on trial 2 (the first time memory is measured) was achieved a median 121 minutes (interquartile range, 89−205min) after triage. At this time the number of patients with a GCS score of 15 was 154 (92%), and the number of patients with a GCS score of 14 was 14 (8%); none had a GCS score of 13 (1 individual did not complete trial 2). Most patients (n=123; 73%; including 11 of 15 with abnormal brain CT scans) passed, indicating that their PTA had resolved. Of the 45 patients who failed, 31 (69%) had a GCS score of 15, and 14 had a GCS score of 14. Ten of those with a GCS score of 14 also failed ≥1 of the picture cards. The likelihood of failing was associated with being older, having consumed alcohol, and the scale being administered closer to the time of injury (table 2). Nineteen (42%) of the 45 patients who had consumed alcohol failed; 11 had a GCS score of 15 (1 with abnormal brain CT), and 8 had a GCS score of 14 (1 with abnormal brain CT).