The Mini-Mental State Examination and The Montreal Cognitive Assessment After Traumatic Brain Injury: An early prediction study

Elaine de Guise Ph.D; Abdulrahman Yaqub Al Turki MD

[Institution]

1. The Montreal General Hospital, Montreal, QC, Canada. 2. The National Neuroscience Institute, Riyadh, Saudi Arabia

Learning Objectives

Participants should be able to understand that the MoCA is not a better predictor of outcome as assessed with the DRS than the MMSE.

Introduction

to compare results of the Montreal Cognitive Assessment (MoCA) to those of the Mini-Mental State Examination (MMSE) in persons with traumatic brain injury (TBI) and to predict outcome at discharge from the acute care setting.

Subjects

Patients with TBI of all severity admitted to the TBI program at the Montreal General Hospital. Admission criteria included being 18 years and older and medically able to participate in cognitive testing. Patients who were not English or French speaking and patients with dementia were excluded. In addition, patients requiring intensive care (ICU) due to medical instability and those using narcotics were also excluded. On a total of 357 admitted TBI patients, 44 died in the ICU and 214 (68%) met the selection criteria.

Methods

Charts of all patients were reviewed to gather data on the following predictive factors: age, education, premorbid psychiatric diagnosis and antecedent of substance abuse or drug abuse history. Data was collected through both chart review and interviews with relatives by a social worker. Initial CT scans results classified according to the Marshall classification were collected by a neurosurgeon blinded to the testing procedure. The Glasgow Coma Scale (GCS) score upon presentation to the ER was used for as an indicator of severity of trauma.

The Montreal Cognitive Assessment (MoCA):

Cognitive screening test that assesses several domains (short-term memory, orientation, visuospatial abilities, executive functions, attention, concentration and working memory, language).

The Mini-Mental State Examination (MMSE):

Cognitive screening test that focus on the assessment of attention and memory (orientation, recall, recognition of sentences, drawings, initiation and maintenance of verbal response).

each exam is administered in 10 minutes and scored on a maximum of 30 points. A cut-off of 26 is associated with cognitive impairments.

The Disability Rating Scale (DRS)

used to evaluate patient's level of disability.Four parameters are evaluated; 1) arousability, awareness and responsiveness ; 2) cognitive ability for self-care activities in: feeding, toileting and grooming; 3) dependence on others and level of functioning and 4) psychosocial adaptability and employability. The higher the score the greater the level of disability is (1-30).

all exams were performed within the first three weeks post injury and were administered by an occupational therapist.

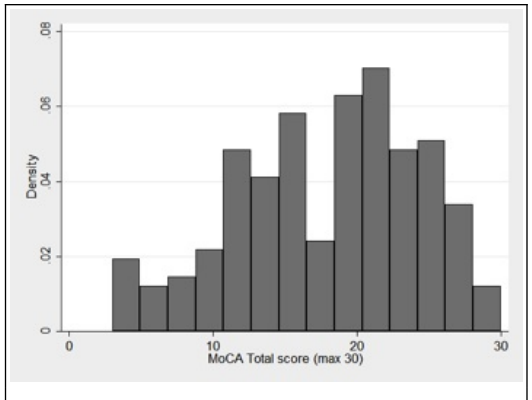
Results

Descriptive statistics

The sample was composed of 214 subjects aged between 16 and 93 (mean±SD: 55.13±22.68). The GCS score varied between 3 and 15 (13.18±2.89). 20 subjects (9.3%) had between 1 and 6 years of education, 133 (62.15%) had between 7 and 13 years of education and 61 subjects (28.50%) had more than 14 years of education. Overall, 60 patients (28.0%) had a history of substance abuse and 19 patients (8.9%) had psychiatric antecedents. With regards to the Marshall Classification of the cohort, 8.8% ,62.62%, 16.36%, 7.48%, 3.74% of scans were in the first to fifth category respectively with the majority of patients included in the second category, Finally only two patients (0.93%) were included in the last category.

The MoCA scores

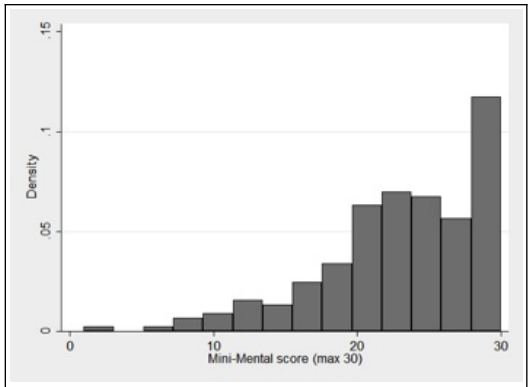
varied between 3 and 30 (18.03± 6.57) (Figure 1) .Using the suggested cutoff score of 26, 189 subjects (88.3%) had suboptimal cognition.



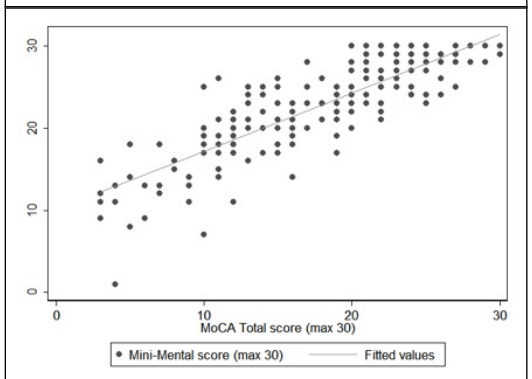
Distribution of the MoCA total score

The MMSE scores

varied between 3 and 30 (22.89±5.47) (Figure 2) .It should be point out that about 12% of the sample had the maximum score of 30. Using the suggested cutoff score of 26, 107 subjects (50.0%) had suboptimal cognition.



Distribution of the MMSE total score



Scatterplot of the MoCA total score and the MMSE total score

Prediction of outcome as measured with DRS

The MoCA and the MMSE total score were correlated ($r = 0.852$, $p < 0.001$) (Figure 3) .Using the suggested cut-off scores, all the subjects classified as having suboptimal cognition by the MMSE were also classified as such by the MoCA but the MoCA also classified an additional 82 subjects as having suboptimal cognition.

MoCA Vs MMSE as a better predictor of the DRS score

In order to determine which of the two tests (MoCA or MMSE) was a better predictor of the DRS score at discharge, 3 regression models were fitted, one without the MoCA, one without the MMSE and one with neither to compare the R2.

The model without the MMSE had a R2 of 53.7% and the model without the MoCA had a R2 of 55.0%. The models without the MMSE and the MoCA had a R2 of 24.9%. This indicates firstly that the the MoCA and the MMSE scores were significant predictors of the DRS score at discharge and secondly that the MMSE and MoCA scores were correlated because removing one or the other from the original model only reduced the R2 by a small percentage. The results also show a slightly better ability of the MMSE to predict outcome because of the small difference in the R2 but this is not statistically significant.

Conclusion

The MoCA is not a better predictor of outcome as assessed with the DRS than the MMSE. Perhaps it would be the case at a later time in the recovery process that is after the acute stage when cognitive deficits of patients with TBI are more subtle. Further studies on the MoCA are therefore needed in the later stages of recovery post TBI.

References

1. Nasreddine ZS, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriatr Soc.2005.

2. Folstein, M.F., et al. (1975). Mini-Mental State: a practical method for grading the cognitive state of patients for the clinicians. J of Psychiatric Res, 12, 189-198.

3. Zwecker M, et al. Mini-Mental State Examination, cognitive FIM instrument, and the Loewenstein Occupational Therapy Cognitive Assessment: relation to functional outcome of stroke patients. Arch Phys Med Rehabil 2002.

4. Rappaport M, et al.: Disability rating scale for severe head trauma: coma to community. Arch Phys Med Rehabil 1982.

5. Leblanc J, de Guise E, Gosselin N, Feyz M. Comparison of functional outcome following acute care in young, middle-aged and elderly patients with traumatic brain injury. Brain Inj 2006; 20: 779-790.

6. Marshall LF, Marshall SB, Klauber MR et al. A new classification of head injury based on computerized tomography. J Neurosurg. 1991; 75: S14-S20.