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COMPARISION BETWEEN GLASGOW COMA SCALE & MADRAS HEAD INJURY PROGNOSTIC SCALE IN PREDICTING OUTCOME AFTER TRAUMATIC BRAIN INJURY

Neurosurgery

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ABSTRACT

Background: Traumatic brain injuries (TBI) are a major cause of morbidity and mortality around the world. Predicting outcome after TBI helps in triaging patients, making clinical decisions and using resources effectively. Any ideal prediction score or model should be easy to apply, with high sensitivity and specificity rates irrespective of the management protocol, its time and place of application. **Objective:** To Compare the performance of Madras Head Injury Prognostic Scale (MHIPS) and Glasgow Coma Scale (GCS)in predicting outcome after TBI. **Methods:** In this prospective study we evaluated 188 patients with TBI who were admitted in Trauma ward of Rajiv Gandhi Government General Hospital, Chennai. All patients were scored with GCS and MHIPS at 6, 24 and 72 hours after admission. Based on Glasgow Outcome Score patients were categorized into 3 outcome groups. We compared the correlation between the two scores. **Results:** Overall mortality observed in our study was 22.4%. 78.2% patients were managed conservatively. RTA (72.3%) was the predominant mode of injury followed by Falls (15.4%). There is excellent positive correlation between GCS and MHIPS at all times. In all the cases, the p-values calculated were <0.001, showing that correlation is not due to chance but of statistical significance. **Conclusion:** MHIPS remains comparable to GCS for predicting in-hospital mortality. Good correlation was observed between two scores.

KEYWORDS

MHIPS, GCS, Trauma, Mortality, Head Injury

INTRODUCTION:

Traumatic brain injuries (TBI) are a major cause of morbidity and mortality around the world. In India more than 175000 deaths occur due to road traffic accidents and another 1 million people require rehabilitation.[1] The incidence of TBI varies from 67 to 317 per 100000 individuals and mortality rates range from around 4-8% for moderate injury to approximately 50% with severe head injury.[2]

Predicting outcome after TBI helps in triaging patients, making clinical decisions and using resources effectively. It also helps in starting rehabilitation early and in communicating prognostic information with families of the patients.

Any ideal prediction score or model should be easy to apply, with high sensitivity and specificity rates irrespective of the management protocol, its time and place of application. Many prospective and retrospective studies have been done to derive a baseline predictive model for patients in the intensive care unit in general or specific to traumatic brain injury.[3]

Background:

Subjective estimates of prognosis based solely on clinicians personal experience vary widely. It is far less accurate than evidence based prognosis. Historically COMA scales originated in neurosurgical ICUs. In 1966 Ommaya, Neurosurgeon from National Institute of Neurological diseases and blindness, Maryland, USA published the earliest literature describing COMA score/scale. The so called "Vital Sign Card" or "Ommaya coma scale" had 41 points.[8] In 1974, Teasdale and Jennet, Institute of neurologic sciences Glasgow, UK published "Assessment of coma and impaired consciousness: a practical scale" in Lancet. They named it COMA index or GCS (Glasgow Coma Scale). In 1976, they revised to include withdrawal to pain in motor response. GCS was rapidly adopted by physicians all over the world. GCS sum score became marker for prognosis.[4] GCS became gold standard against which other scales are compared. In 2005, Full Outline of Unresponsiveness (FOUR) score, a landmark scoring system was published by Wijdicks et al in Annals of Neurology.[5]

AIM & OBJECTIVE:

In this study we compared the performance of one such scale- Madras Head Injury Prognostic Scale (MHIPS) with GCS and we examined the correlation between GCS and MHIPS in predicting outcome after traumatic brain injury.

MATERIALS AND METHODS:

This was a prospective study conducted at Institute of neurosurgery, Madras medical college from August 2018 to October 2018. 200 patients admitted in Trauma ward of Rajiv Gandhi Government General Hospital/Madras Medical College were enrolled in the study. Patients more than 12 years of age with Traumatic Brain Injury whose radiological evaluation was done within 6 hours of admission were included in the study. Heavily sedated patients and those patients receiving neuromuscular blockers were excluded from the study as neurological evaluation cannot be done reliably. Hemodynamically unstable patients who could not be shifted for radiological evaluation were also excluded. On admission, patient's detailed history was noted. Data was collected using structured proforma after obtaining consent from immediate relatives. Patients were managed according to ATLS protocol initially followed by definitive evaluation and management by Neurosurgery department. GCS and MHIPS scores were noted at 6 hours, after 24 hours and after 72 hours. Enrolled patients were followed up till discharge/ in-hospital death. Among the enrolled patients, 5 died before 72 hours, 7 patients lost follow up (discharged AMA, Absconded), leaving **188 patients** for analysis.

Outcome at the time of discharge was noted as per Glasgow Outcome Scale (GOS).[7] Depending on GOS, patients were classified into 3 outcome groups: GOOD (GOS 5&4), POOR (GOS 3&2) and DEATH.

TABLE-1 : GLASGOW OUTCOME SCORE

OUTCOME	GOS	
GOOD	5	Good recovery ("mild to no residual deficits")
	4	Moderate disability ("independent but disabled")
POOR	3	Severe disability ("conscious but dependent")
	2	Vegetative state ("alive but unconscious")
DEATH	1	Dead

Madras Head Injury Prognostic Score (MHIPS) is a simple, objective bedside scoring system based on 6 major prognostic factors. It was published in 2008 by Ramesh VG et al.[6] "A new scale for prognostication in head injury" in Journal of Clinical Neurosciences. MHIPS scores range from 6 to 18. Each patient was assigned predicted prognosis using MHIPS as follows: Death- MHIPS ≤12, Poor Outcome- MHIPS 13-14, Good Outcome- MHIPS 15 and above.

TABLE-2: MADRAS HEAD INJURY PROGNOSTIC SCALE

PROGNOSTIC FACTOR	SUBGROUP	SCORE
AGE	>45	1
	15 - 45	2
	<15	3
BEST MOTOR RESPONSE (GCS)	1-2	1
	3-4	2

PUPILLARY LIGHT RESPONSE	Absent	1
	Impaired	2
	Normal	3
OCULOCEPHALIC RESPONSE	Absent	1
	Impaired	2
	Normal	3
CT BRAIN	Absent cisterns/ Midline Shift>5mm/Lesion >3cm	1
	Partially effaced cisterns/ MLS<5mm/ Lesion<3cm	2
	Normal cisterns / No MLS / No lesions	3
SYSTEMIC INJURIES	Thoracic/Abdominal visceral / >2 long bone#	1
	1 or 2 long bone fractures	2
	No systemic or long bone injuries	3
MAX = 18		

Drawbacks of MHIPS include the fact that it cannot be scored at the time of admission unlike GCS and FOUR scores. It also requires qualified medical personnel for scoring being difficult for paramedics and even nurses. MHIPS cannot be used in peripheral hospitals without CT scan facilities.

Criticism for GCS was that the score was skewed towards motor part. Verbal component becomes unusable in intubated patients and patients who are dysphasic. GCS may not detect subtle changes in neurological examination. Abnormal brainstem reflexes and changes in breathing pattern which reflect severity of trauma were not included.

Lower GCS scores were associated with worse outcomes. There is no threshold value below which GCS predicts death. In this study we used GCS <7 as cutoff point for comparison with MHIPS in predicting mortality.

RESULTS AND DISCUSSION:

Statistical analysis was done using IBM SPSS ver17.0. Descriptive statistics were performed to describe study sample and distribution of data. Pearson's correlation coefficient was used to identify relationships between GCS and MHIPS at 6, 24 and 72 hours. Spearman rho correlation and Kendall's tau b were also calculated to determine construct validity. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of GCS and MHIPS in predicting mortality were calculated.

About 83%(n=156) of the patients were male and 17%(n=32) were female. Road traffic accidents (RTA) was the predominant mode of injury (72.3%) followed by Falls (15.4%) and assault (4.3%). 21.8% (n=41) patients were operated and the rest 78.2% were managed conservatively.

TABLE-3: Descriptive statistics of the patients

VARIABLE		FREQUENCY	PERCENTAGE
SEX	MALE	156	83%
	FEMALE	32	17%
MOI	RTA	136	72.3%
	FALL	29	15.4%
	ASSAULT	8	4.3%
	OTHERS	15	8%
MANAGE-MENT	CONSER VATIVE	147	78.2%
	OPERATED	41	21.8%
OUTCOME	GOOD	132	70.2%
	POOR	14	7.4%
	DEATH	42	22.4%

Overall mortality observed in our study was 22.4%. Mortality was comparable to 21% in Wijdicks et al[5] study and comparatively more than study by Sadaka et al[9] (7.8%). Higher mortality in our study may be due to inclusion of emergency postoperative neurosurgical cases. Mean GCS score was around 11 while the mean MHIPS score was around 15.

TABLE-4: Mean and SD

SCORE	MEAN	STANDARD DEVIATION
GCS at 6hrs	11.31	4.104
GCS at 24 hrs	11.63	4.157
GCS at 72 hrs	11.97	4.393
MHIPS at 6 hrs	14.97	1.982
MHIPS at 24 hrs	14.99	2.189
MHIPS at 72 hrs	15	2.399

Table-5: Correlation between GCS and MHIPS

	Pearsen correlation	Spearman's rho	Kendall's tau_b	P-value
GCS and MHIPS at 6hrs	0.823	.773	.659	<0.001
GCS and MHIPS at 24hrs	0.855	.759	.659	<0.001
GCS and MHIPS at 72hrs	0.888	.767	.676	<0.001

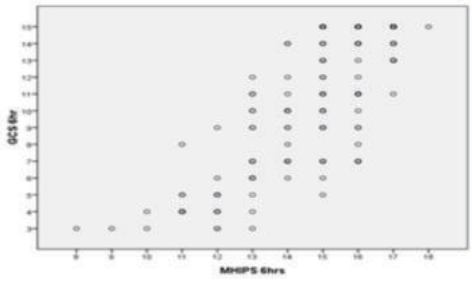

Figure 1: Correlation between GCS and MHIPS at 6 hours

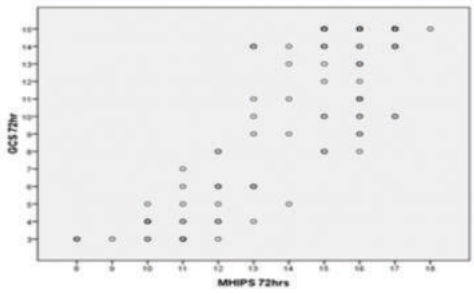

Figure 2: Correlation between GCS and MHIPS at 72 hours

Pearson correlation coefficient between GCS and MHIPS were 0.823, 0.855, 0.888 at 6, 24 and 72 hours respectively. As derived from the graph, there is excellent positive correlation between GCS and MHIPS at all times. In all the cases, the p-values calculated were <0.001, showing that correlation is not due to chance but of statistical significance. Results echo findings from similar study – Reza Yazdani et al, Iran.[10]

Mortality of the patients were significantly high when GCS was less than 7 and MHIPS less than 13. Specificity, Positive predictive values, Negative predictive values and accuracy were similar between GCS and MHIPS. Both GCS and MHIPS have comparable results in predicting In-Hospital mortality at 72 hours. GCS has better Sensitivity at 6 hours.

Limitations:

This was a single institution study which limits generalizability of the findings. Outcome was scored at the time of discharge. Both functional and cognitive status may continue to improve well beyond this time. Long term follow up is needed. 35% of study population were alert patients. A study of larger group of comatose patients would be desirable.

CONCLUSION:

An ideal coma scale should be reliable, valid, easy to use, easy to remember and predictive of relevant outcome. Even after 40 years since its introduction, GCS still remains the cornerstone of initial traumatic brain injury evaluation. MHIPS remains comparable to GCS for predicting in-hospital mortality. Good correlation was observed between two scores. Additional research involving evaluation of post discharge functional and cognitive status may highlight further benefits of MHIPS.

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