CORRELATION BETWEEN GLASGOW COMA SCORE, CT OPTIC NERVE SHEATH DIAMETER AND ROTTERDAM CT SCORE IN TRAUMATIC BRAIN INJURY

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INTRODUCTION

- Traumatic brain injury (TBI) is a major public health problem worldwide and is usually complicated by increased intracranial pressure (ICP). Its management aims to prevent the occurrence of or to reduce an already raised ICP. Thus, timely detection of an elevated ICP is of an utmost importance since, undetected and unmanaged, it can be fatal.
- The severity of a TBI can be determined clinically by the Glasgow Coma Scale or via neuro-imaging modalities. When indicated, CT brain is the first line imaging study performed in an acute TBI context and allows for assessment of structural damage and detection of hematomas. The Rotterdam CT Score (RCTS) is a classification system of TBI based on some CT findings and predicts the outcome of TBI patients.
- The optic nerve sheath diameter (ONSD) measurement by imaging modalities, such as US or CT, has been considered as an alternative to the invasive ICP monitoring methods and it can predict as well the outcome in TBI.

AIM OF THE WORK

This study aims to correlate between the Glasgow Coma Score, the CT ONSD and the Rotterdam CT score in TBI patients.

SUBJECTS AND METHODS

- This cross-sectional study was conducted from October 2020 to July 2021. It was carried on at the Main Hospital's Emergency Department of the Faculty of Medicine, Alexandria University. It included 184 subjects with 150 traumatic brain injured patients and 34 controls. The patients were at least 18 year-old, presenting an acute, moderate (GCS: 9 - 12) to severe (GCS =< 8) TBI and referred for a non-contrast brain CT. The controls, with matched age and sex, consulted for a non-traumatic reason and presented no intracranial abnormality.
- RCTS (score 1 to score 6) was assessed and ONSD was measured bilaterally in the axial plan, using a CT abdomen window, at a distance of 3 mm behind the eyeball.
- Statistical tests were perfomed for comparison and correlation between different variables, and to determine the cutoff of the ONSD.

RESULTS

- The range of the ONSD in our control group varied from 4.25 to 6.92 mm with a mean of 5.5 ± 0.64 mm whilst our patients group had a higher ONSD with values ranging from 4.57 to 9.4 mm and a mean of 6.96 ± 1.1 mm.
- The cutoff value of ONSD to predict the severity of TBI according to critical Rotterdam CT score (score 4 and above) was 6.3 mm with a sensitivity of 91%, specificity of 44%, positive predictive value of 50%, negative predictive value of 89%.
- The correlation between mean ONSD, GCS and RTCS was established by using the Spearman's Rho test. It showed a positive correlation coefficient value of 0.396 and a p-value <0.0001 between the ONSD and RCTS, indicating increase in ONSD value corresponds to an increase in RCTS score. Regarding the correlation between ONSD and GCS, a negative correlation was found with a value of -0.376 with a p-value <0.0001, suggesting increase in ONSD value relates to a decrease in GCS values.

Table 1: Comparison between the two studied groups

	Cases(n = 150)	Control(n = 34)	p
Age Mean ±SD (Min-Max)	 39.1±17.1 (18-87)	 39.1±13.4 (18-65)	P=.968
Sex Male Female	 119(79.3) 31(20.7)	 22(64.7) 12(35.3)	P=.069
GCS Median (Min-Max)	 11 (4-12)	 15 (15-15)	P<.001*
ONSD Left axial Mean ±SD	6.9±1.2	5.4±0.7	P<.001*
ONSD Right axial Mean ±SD	7.0±1.1	5.5±0.6	P<.001*
Mean ONSD ±SD (Min-Max)	6.96±1.1 (4.57 – 9.4)	5.5±0.6 (4.25 – 6.92)	P<.001*

Table 2: Correlation between ONSD, GCS and RCTS

	Mean ONSD	
	r_s	p
GCS	-0.367**	0.0001
RCTS	0.396**	0.0001

**. Correlation is significant at the 0.01 level (2-tailed)

rs: Spearman coefficient

By Spearman correlation test

CONCLUSION

Increased intracranial pressure following a TBI can be indirectly evidenced by an increased ONSD, which has been demonstrated to correlate with higher Rotterdam CT score and severe GCS. Making ONSD an alternative noninvasive method of assessing raised ICP in a setting where External Ventricular Device, the gold standard in intracranial hypertension detection and monitoring, is unavailable or contraindicated.