International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 488-492 www.ijdmsrjournal.com ISSN: 2582-6018

Optic Nerve Sheath Diameter and Its Correlation with Ct Severity Scores in Traumatic Brain Injury.

Dr. Emil Benny, Dr. Praveen Kumar John, Dr. Adithiya Krishna Kumar
Postgraduate, A J Institute Of Medical Science And Research Centre, Kuntikana, Mangalore, Karnataka
Professor, A J Institute Of Medical Science And Research Centre, Kuntikana, Mangalore, Karnataka
Intern, A J Institute Of Medical Science And Research Centre, Kuntikana, Mangalore, Karnataka

Submitted: 20-10-2024 Accepted: 30-10-2024

I. INTRODUCTION

- In the developing nations, traumatic brain injury is one of the leading causes of morbidity and mortality.
- Road traffic accidents (RTA) being the leading cause accounting for about 60% of the cases followed by falls and violence.
- Evaluation of intracranial pressure is pivotal in the management of the traumatic brain injury (TBI) as it can be potentially fatal in the event of non-timely intervention.
- Optic nerve sheath diameter (ONSD), Optic nerve sheath diameter / Eyeball transverse diameter ratio (ONSD / ETD ratio), Rotterdam CT score and Helsinki CT score being independent predictors of outcome in patients with traumatic brain injury, are being used as triage tool for predicting the severity of injury.
- ONSD and ONSD / ETD ratio has lately become a substitute for non-invasive measurement and monitoring of the intracranial pressure (ICP).
- Rotterdam CT score and Helsinki CT score are being widely used for evaluation of the patient.
- The ONSD, ONSD / ETD ratio, Rotterdam and Helsinki CT scores can be used as preliminary triage tools for prediction of the intracranial pressure and severity of the TBI on the initial CT imaging.

AIMS AND OBJECTIVE

To correlate the relationship of optic nerve sheath diameter and optic nerve sheath diameter/eyeball transverse diameter with Rotterdam and Helsinki computed tomography scoring systems in traumatic brain injury.

II. MATERIALS AND METHODS

- Study design: Hospital based prospective and retrospective study.
- Sample size: 100
- Source of data: Patients above 18 years of age who undergo non contrast CT Brain within 24 hours of traumatic brain injury.
- The exclusion criteria were pre existing intra cranial space occupying lesion, significant prior brain injury, prior orbital, ocular or optic nerve disease or surgery that influences the reliability of optic nerve sheath or ocular diameter measurements.
- Analysis: The parameters ONSD, ONSD / ETD ratio calculated on the initial CT were correlated with the Rotterdam and Helsinki CT severity scores. Pearson correlation was done to find the correlation between the variables.

- **Rotterdam CT Score**
- **Basal Cisterns**
- Normal - 0; Compressed -1; Obliterated - 2.

- **Midline shift**
- No shift or less than 5 mm -0; Shift more than 5 mm – 1.

- **Epidural mass lesion**
- Present - 0; Absent – 1.

- **Intraventricular blood or TSAH**
- Absent - 0; Present – 1.

Total Score - Sum + 1 **(Range 1-6)**

- **Helsinki CT Score**
- **Mass lesion type**
- Subdural hematoma - 2; Intracerebral hematoma – 2; Epidural hematoma - (-3).

- **Mass lesion size**
- Hematoma volume > 25cm (- 2).

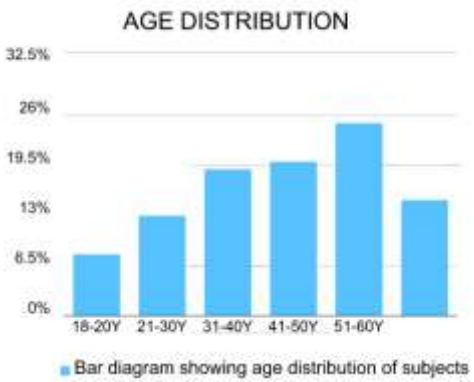
- **Intraventricular hemorrhage:** Present – 3.
- **Basal cisterns**
- Normal - 0; Compressed -1; Obliterated - 5.

International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 488-492 www.ijdmsrjournal.com ISSN: 2582-6018

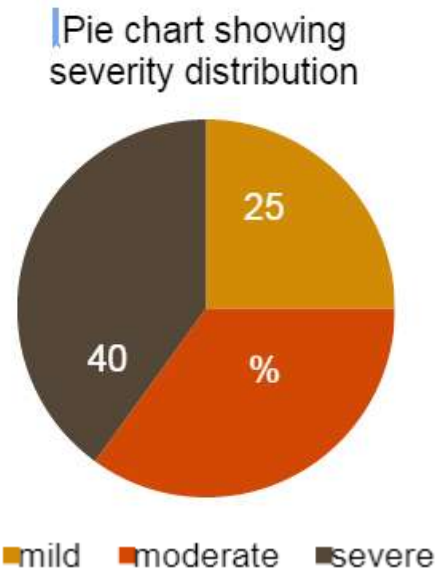
- **Total Score - Sum** (Range: -3 to 14).

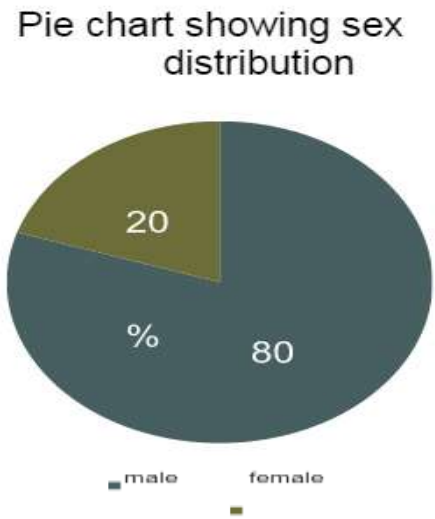
- The ONSD (measured 3 mm behind the eyeball) and Eyeball transverse diameter were calculated.
- Rotterdam and Helsinki CT scores were assessed.
- ONSD and ONSD / ETD ratio were correlated with the Rotterdam and Helsinki CT scores

III. RESULTS

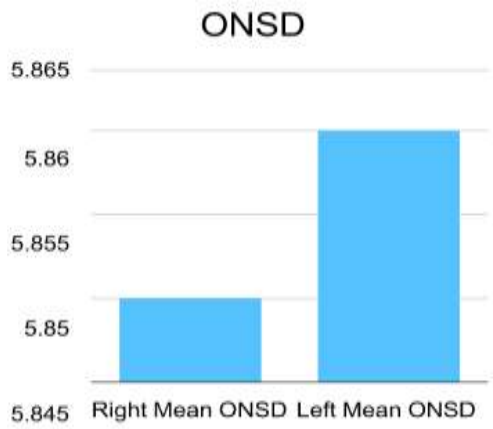


Pie chart showing severity distribution

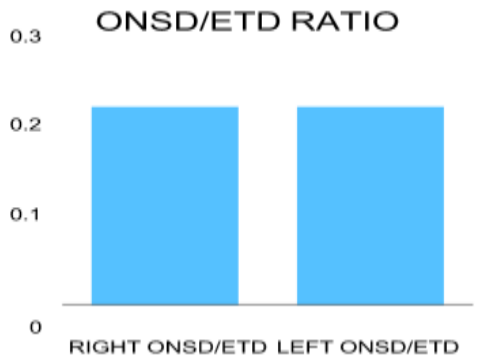




Majority of the subjects were males and belonged to the age group of 20 to 60 years. Mean age of subjects was 38.97 ± 12.76 years with road traffic accidents being the commonest cause.



Bar diagram showing Mean ONSD on Right and Left side.



Bar diagram showing Mean ONSD/ETD ratio on Right and Left side.

International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 488-492 www.ijdmsrjournal.com ISSN: 2582-6018

Correlation between ONSD and ONSD/ETD ratio with RCTS and Helsinki CT scores

		ONSD/ETD Ratio
ONSD/ETD Ratio	Pearson Correlation (r)	1
	P value	
	N	100
RCTS Score	Pearson Correlation (r)	0.790
	P value	<0.001
	N	100
Helsinki CT Score	Pearson Correlation (r)	0.882
	P value	<0.001
	N	100

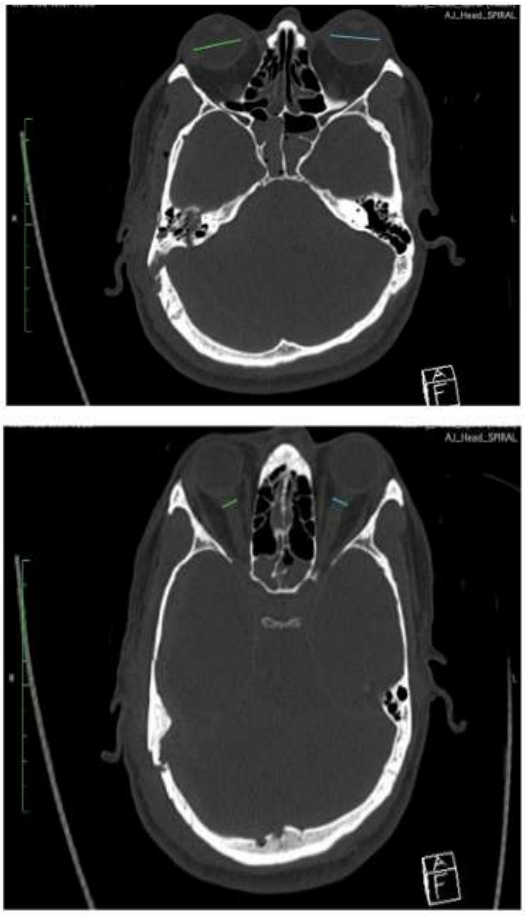
		Mean ONSD
Mean ONSD	Pearson Correlation (r)	1
	P value	
	N	100
RCTS Score	Pearson Correlation (r)	0.772
	P value	<0.001
	N	100
Helsinki CT Score	Pearson Correlation (r)	0.888
	P value	<0.001
	N	100

There was positive correlation between the ONSD, ONSD/ETD ratio with Rotterdam and Helsinki Ct severity scores with a P value<0.01.

IV. DISCUSSION

- The ONSD, ONSD / ETD ratio, Rotterdam and Helsinki CT severity scores were independent parameters to predict outcome in cases of traumatic brain injury.
- In this regard, we aimed to evaluate the correlation between the ONSD, ONSD / ETD ratio in initial CT with the Rotterdam and Helsinki CT severity scores.
- CT is the preferred imaging modality in case of head injury and is available in most of the centres.
- On the initial CT done following traumatic brain injury the ONSD, ONSD / ETD ratio, Rotterdam and Helsinki CT severity scores were calculated.
- ONSD is an alternative indirect way of measuring ICP. To Negate the discrepancy and age related variation of ONSD, ONSD / ETD ratio was calculated.
- The Rotterdam and Helsinki CT severity scores were calculated in accordance assigning numbers to its components.
- In this study which included 100 subjects, 80 were males and 20 females.
- Road traffic accidents (RTA) being the leading cause accounting for about 60% of the cases.
- It was found that ONSD, ONSD / ETD ratio showed a positive correlation with the Rotterdam and Helsinki CT severity scores with significant P value.
- The mean ONSD and ONSD / ETD ratio was 5.85 and 0.212 respectively.

REPRESENTATIVE CASE 1



International Journal Dental and Medical Sciences Research
Volume 6, Issue 5, Sep - Oct 2024 pp 488-492 www.ijdmsrjournal.com ISSN: 2582-6018

- Right and Left ONSD - 6.4 mm and 6.3 mm
- Right and left ETD - 23.2 mm and 22.3 mm.
- ONSD / ETD ratio (Right and left) - 0.27.
- Rotterdam CT severity score – 6
- Helsinki CT severity score – 14

REPRESENTATIVE CASE 2

Right and Left ONSD - 6.1 mm and 6.3mm

- Right and left ETD - 23mm and 22.7mm.
- ONSD / ETD ratio (Right and left) - 0.26.
- Rotterdam CT severity score - 6
- Helsinki CT severity score – 12

V. CONCLUSION

- Optic nerve sheath diameter and Optic nerve sheath diameter / Eyeball transverse diameter ratio should be documented in each report of the initial CT scan of traumatic brain injury cases which may be an important radiological tool in the assessment of the severity of the traumatic brain injury and in prediction of the intracranial pressure.

- These non-invasive parameters on initial CT may aid in appropriate timely interventions and help reduce the mortality associated with the raised intracranial pressure.

REFERENCES

[1]. Das SK, Shetty SP, Sen KK. A Novel Triage Tool ; Optic Nerve Sheath diameter in traumatic brain injury and its correlation to Rotterdam computed tomography (CT) scoring. Pol j Radiol. 2017; 82:240-243.

[2]. Legrand A, Jeanjean P, Delanghe F, Peltier J, Lecat B, Dupon H. Estimation of optic nerve sheath diameter on an initial brain computed tomography scan can contribute prognostic information in traumatic brain injury patients. Critical care. 2013;17(2):R61

[3]. Thelin EP, Nelson DW, Vehviläinen J, et al. Evaluation of novel computerised tomography scoring systems in human traumatic brain injury: An observational, multicenter study. PLoS Med 2017; 14(8):e1002368.

[4]. Vaiman M, Signal T, Kimiagar I, Bekerman I. Intracranial pressure assessment in traumatic head injury with haemorrhage via optic nerve sheath diameter. J neurotrauma. 2016 Dec 1;33(23):2147-2153.

[5]. Du J, Deng Y, Li H, Qiao S, Yu M, Xu Q, Wang C. Ratio of optic nerve sheath diameter to eyeball transverse diameter by ultrasound can predict intracranial hypertension in traumatic brain injury patients. 2020 Apr; 32(2):478-485.