



ASSESSMENT OF THYROID HORMON IN CASE OF HEAD INJURY AND ITS CLINICOPATHOLOGICAL CORRELATION

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ABSTRACT Traumatic brain injury (TBI) is an important cause of death and disability in young adults. Lack in definite results about the change in thyroid hormones levels after traumatic brain injury & its relation with severity of traumatic brain damaged patients. No data about their effect on mortality of traumatic brain damaged patients and many controversies in this field motivate us to do this large study. Our aim is to evaluate the pattern of thyroid hormonal level changes after traumatic brain injury and its correlation with prognosis.

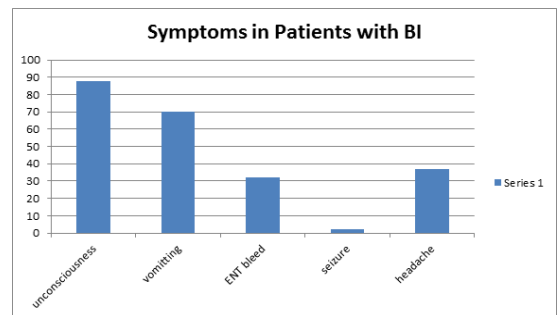
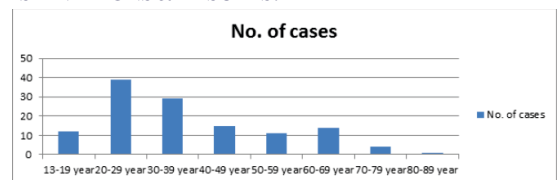
KEYWORDS : Traumatic brain injury (TBI), Brain Injury(BI), TSH, T4, T3

INTRODUCTION:

Traumatic brain injury (TBI) is an important cause of death and disability in young adults and may lead to physical disabilities and long term cognitive, behavioural psychological and social defects. Substantial changes in serum levels of thyroid hormones have been described following many non-thyroidal illnesses, in particular after major surgery, burns, most critical illness and drug therapy. Decreased levels of T3 and free T3 associated with increase in reserve T3 and normal TSH levels have been observed in such conditions. This pattern is suggestive of a decrease in thyroid function of hypothalamic or pituitary origin as TSH levels remain normal despite low thyroid hormone levels. In addition, low T4 levels are usually present in critically ill patients and a relation between T4 levels and both severity and outcome has been observed in intensive care medical patients. Low T3 and low T4 syndrome is present after severe trauma in patients of head injury. The aims and objectives of our study is to determine the changes of thyroid hormones levels in traumatic brain injury patients and to assess the role of change in levels of thyroid hormones as prognostic indicator in traumatic brain injury patients.

Glasgow Coma Scale Scoring has been done regularly. CT scan of head of the patients were done as early as possible and repeated as and when required. Thyroid hormone levels were assessed and compared on 1st and 5th day of admission. All hormone levels were assessed by using ELISA sandwich method. Outcome was noted in terms of survival and expiry.

OBSERVATIONS & RESULTS:



MATERIAL & METHODS:

This study was a Prospective Cohort study, conducted in The Department Of Surgery, Govt.Gandhi Medical College & Hamidia Hospital Bhopal of patient of traumatic brain injury(TBI) during December 2013 to December 2014. 100 patients of more than 14 year of age had traumatic brain injury admitted within 24 hours of head injury were included in the study. Patient who had palpable thyroid nodule, history of thyroid illness, head injury with burn and patient on anti-thyroid drugs with head injury were excluded from the study.

TABLE 01:

GCS AND CHANGES IN THYROID HORMONES LEVEL IN SURVIVED CASES(n=88) & EXPIRED CASES (n=12)

GCS	SURVIVED CASES								EXPIRED CASES					
	Total survived cases (n=88)		Cases with decreased T4		Cases with decreased T3		Cases with decreased TSH		No of cases with decreased T4		No of cases with decreased T3		No of cases with decreased TSH	
	No	%	No	%	No	%	(n=12)	No	%	No	%	No	%	
Severe	11	7	63.64	1	9.09	1	9.09	9	8	88.89	2	22.22	1	11.11
Moderate	32	9	28.13	1	3.13	0	0.00	3	2	66.67	1	33.33	0	0
Mild	45	7	15.56	0	0.00	1	2.22	0	0	0	0	0	0	0
Total	88	23	107.3	2	12	2	11	12	10	155.6	3	55.6	1	11.11

TABLE 02:

Changes (decreased) In T4 Level Among Survived Cases (n=88) & Expired Cases (n=12)

GCS	SURVIVED CASES			EXPIRED CASES		
	Total survived cases (n=88)	No of cases with decreased T4	% of cases with decreased T4	Total expired cases (n=12)	No of cases with decreased T4	%
SEVERE	11	7	63.64	9	8	88.89

MODERATE	32	9	28.13	3	2	66.67
MILD	45	7	15.56	0	0	0
TOTAL	88	23	107.33	12	10	155.56

TABLE NO 3:

Decrease In Thyroid Hormone Level In Number Of Survived Cases (n=88) & Expired Cases(n=12)

DECREASED HORMONE LEVEL	SURVIVED CASES		EXPIRED CASES	
	No of survived cases(n=88)	%	Total expired cases(n=12)	%

T4	49	55.68	8	66.67
T3	30	34.09	3	25.00
TSH	9	10.23	1	8.33
TOTAL	88	100	12	100

TABLE 04:
Gcs & T3 Level In Survived Cases(n=88) & Expired Cases (n=12) (n=12)

GCS	SURVIVED CASES			EXPIRED CASES		
	Total survived cases (n=88)	No of cases with decreased T3	%	Total expired cases (n=12)	No of cases with decreased T3	%
SEVERE	11	1	9.09	9	2	22.22
MODERATE	32	1	3.13	3	1	33.33

Table No 06

Comparison Of Gcs And Changes In Thyroid Hormones Level In Survived Cases (n=88) & Expired Cases (n=12)

GCS	SURVIVED CASES								EXPIRED CASES							
	Total survived case		Cases with decreased T4		Cases with decreased T3		Cases with decreased TSH		Total expired cases		No of cases with decreased T4		Cases with decreased T3		Cases with decreased TSH	
	n=88	No	%	No	%	No	%	No	%	n=12	No	%	No	%	No	%
SEVERE	11	7	63.64	1	9.09	1	9.09	9	9	8	88.89	2	22.22	1	1.11	
MODERATE	32	9	28.13	1	3.13	0	0.00	3	2	66.67	1	33.33	0	0	0	
MILD	45	7	15.56	0	0.00	1	2.22	0	0	0.00	0	0	0	0	0	
TOTAL	88	23	107.32	2	12	2	11	12	10	156	3	55.6	1	11.1		

Table:07
Changes In Thyroid Hormone Levels At Different Time Intervals After Injury

THYROID HORMONES	AT ADMISSION			ON 5 TH DAY		
	N=100	Mean	%	n=88	Mean	%
T4(microGm/dL)	57	44.1	57	49	43.5	55.68
T3(nG/dL)	33	9.4	33	30	3.4	34.09
TSH(mIU/L)	10	3.76	10	9	3.54	10.23
TOTAL	100	57.26	100	88	50.44	100

DISCUSSION & RESULT:

The incidence of head injury was more in male patients .The male to female ratio being 3:1 showing Male predominance. In the study done by M Swarnakar , P Singh, S Dwivedi, it was found that ratio of male to female in their study was 3:9:1. There were more patients in age group of 20-40 years(80.1%) who sustain head injury among the patients included in our study of 13-60 yrs & 7.69% cases are >50 yrs. The study of M Swarnakarm , P Singh, S Dwivedi evident that most of the injuries were seen in 11-40 year age group(64.06%) of which in third decade suffered the maximum injuries(26.53%),cases>50 years contributed only 10.05% of total admission . In study of Jha S, Yadav BM, et al the age of the victims varied from 3-84 years. Maximum number of head injury cases occurred in 21-50 yrs age group are 42(54.54%) and >60 yrs (14.3%). These findings are similar to our results. Maximum number of injuries were due to RTA (72.85%) followed by assault(19.21%) then fall from height (7.29%). High incidence of trauma on roadside may be attributed to the following reasons: there are almost no segregation of pedestrian from wheeled traffic, widespread disregard of traffic rules & defective layout of crossroad & speed breakers & there is significant increase in number of vehicles on road. Predominance of RTA as cause of head injury shown in study by A N Jha, Agrawal et al., conclude that most of the cases are due to road traffic accidents , brought to a tertiary care hospital of South delhi of followed by fall & assault. In the study done by M Swarnakar et al had the similar results. Among the various injuries RTA was the commonest cause of injury (46.85%) followed by assault (27.42%) & fall (21.14%). In our study cases of RTA were maximum followed by assault & fall.

In our study out of 100 patients, 88 patient survived and 12 patients were expired. In survived cases the incidence of decrease in level of T4 was 63.6% with severe head injury. 28% in moderate head injury cases and 15.6 % in mid head injury cases respectively and was significant. We found that Decrease in T4 level with normal TSH in expired cases was 100 % in patients with Severe head injury. With this we conclude that decrease in T4 level with normal TSH was more associated with severe head injury with poor outcome & it shows the malfunction of Hypothalamo-Pituitary Axis. In a study conducted by Babak Malkelpour, Ali Mehrafshan, Forough Saki, 2011 in 72 patients of head injury found decrease in T4 level was more with severe head injury . T4 level of 16 patients (22%) are decreased. From 16 patients

MILD	45	0	0	0	0	0
TOTAL	88	2	12.22	12	3	55.6

Table No 05:
Gcs & Decreased Tsh Level In Survived Cases(n=88) & Expired Cases (n=12)

GCS	SURVIVED CASES			EXPIRED CASES		
	Total survived cases (n=88)	No of cases with decreased TSH	%	Total expired cases (n=12)	No of cases with decreased TSH	%
SEVERE	11	1	9.09	9	1	12.5
MODERATE	32	0	0	3	0	0
MILD	45	1	2.22	0	0	0
TOTAL	88	2	11.31	12	1	12.5

with reduced T4 , 6 patients expired(37.5%). It means that T4 reduction influence on patients mortality(P=0.038). It also means that primary GCS score of patients has a correlation with serum T4 on first day 1 of admission. Following brain injury a secondary hypothyroidism happens due to pituitary dysfunction , serum level of T4 on the first day of admission correlate with primary GCS score which is an indicator of severity of brain injury. In addition mortality rates of severely brain injured patients have a high correlation with low serum level of T4. Rudmon et al and Fliescher et al observed decreased level of T4 in severely comatose patients. The decrease in serum T4 level can be attributed to both the reduction thyroid hormone secretion and to the presence of inhibitors of thyroid hormone bindings. Thyroid hormone levels can be considered as a prognostic indicator and these levels could be clinical use for patient management . Although the mechanism remains an unexplored and multidisciplinary approach to resolve this issue is required.In our study decrease in T3 level in survived head injury cases was not significant(9.09%) with severe head injury & 3.13% with moderate head injury cases but decrease in T3 in expired cases was significant i.e.25% in cases with severe head injury. The levels of T3 & T4 is usually associated with high TSH but this phenomenon was not seen in our study most probably due to hypothalamic-pituitary-thyroid axis damage. In a study conducted by F.Tanriverdi et al (2007) paris on 104 patients, 43.3% had low T3 syndrome in cases of severe head injury which may be partly due to decreased T4 conversion to T3 &/or increased thyroid hormone turn over. Hiader et al observed in their study normal T3 level and T3 resin uptake were observed after 4th day post head injury, who concluded that secretion of thyroid hormone is uninfluenced by head injury. Chilario et al showed that T3 decrease significantly after brain injury.

In our study decrease in TSH level in survived and expired cases not significant . In patient with decrease T4 level, TSH was not found raised ,so this inappropriate TSH level was abnormal. F Tendriverdi et al and Mazaux et al in their study showed that TSH deficiency was defined by low serum T4 without appropriate elevation in serum TSH. B.Malkepur et al (2011) found that, severely traumatized head injury patient develop a low T3, low T4 & inappropriately low TSH level due to a varying degree of hypothalamic-pituitary-thyroid axis dysfunction & secondary hypothyroidism due to hypothalamic damage in head trauma. In our study the level of T4 and T3 on the first day admission effect on the severity of brain damage that was evaluated with GCS score of the patients. But the level of TSH did not correlate with the severity of head injury. Also, our study showed that serum level of T4 in the first day admission of severely brain injured patients correlate with the mortality of them . However , level of TSH did not affect on the patient's mortality. The finding in the present study suggest the role of hormone levels in prediction of outcome amongst brain trauma victims may be important thyroid hormone levels can be considered as a prognostic indicator and these levels could be of clinical use for patient management. Although the mechanism remains an un explored matter and a multidisciplinary approach to resolve this issue is required.

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