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Original Research Article

Association of the serum-free T3 and T4 hormones in severe traumatic injury

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ABSTRACT

Background: The main objective of the current study to investigate that the association of serum-free t3 and t4 hormones in the patient with a severe traumatic injury.
Methods: The study was conducted at the trauma center, the department of general surgery, Pt. J.N.M. Medical College and associated Dr. B.R. Ambedkar Memorial Hospital, Raipur, C.G. Total 77 participants were concluded in the present study. The patients with head injuries, chest injury and abdominal injury who sustained their trauma within 24hrs of admission, within the age group of patients are 10-82 years were included. Retrospective observational study design applied to the present study.
Results: The free thyroid hormone (ft3 and ft4) at different time interval at admission, at 24hrs and at 5th day was within normal limit. At admission ft3 mean=1.5 pmol/l (sd=0.18), after 24 hrs and 5th day mean ft3 was 1.47 pmol/l (sd= 0.14). The serum-free t4 mean value at admission, at 24hrs and after 5th day was 0.71 pmol/l (sd=0.52).
Conclusions: The deranged fT4 levels have a significant association with the severity of trauma and the role of hormone level prediction of the trauma victims has important mechanisms which remain an unexplored subject. The prediction of the status ft3 level of the patients paves way for exploring the method through which these could be of clinical use for the patient's management.

Keywords: Free T3, Free T4 Hormone, Severe traumatic injury

INTRODUCTION

Trauma is the fourth leading cause of death in India and accounts for 10.1% of all deaths; furthermore, it is one of the major causes of disability worldwide.[1] As per world health organization report (2004) it is predicted to be the third leading cause of death in the country by 2020.[2]

It is estimated that in India around 5,00,000 deaths result from trauma annually with 80,000 deaths a year from road traffic accidents alone. It is a leading cause of death and disability in the younger age group which results in significant economic losses.

As per WHO SEARO, January, (2001); trauma victims occupy nearly 10-38% of hospital beds in the country.[3] The burden of road traffic injuries alone amount to Rs. 55,000 crores or 3% of GDP through direct and indirect socio-economic losses (India Injury Report, 2005).[4]

In addition to road traffic accidents, burns, occupational injuries (including agriculture-related), suicide and assault injuries are also rated as major injury problem in India. Trauma care systems in India are at a nascent stage of development. Industrialized cities, rural town, and village coexist with a variety of healthcare facilities but

they are almost completely lacking in organized trauma care.

First "National consultation on trauma system development in India" was held in Ahmedabad on 10-11 February 2005. The purpose of the consultation was to review the current status of the trauma care in the country to suggest appropriate strategies for improvement to meet the challenge of increasing trauma.

In India, injuries are the seventh leading cause of mortality and highest numbers of deaths are registered in 15-24 years age group to the extent of 24.6%.[5] As per the official reports of National Crime Records Bureau, the total number of accidental deaths was 2,33,903 during 1997, with an annual injury mortality rate of 25/10,00,000 population per year (National Crime Record Bureau, 1997).[6]

The purpose of the current study to investigate that the association of serum-free t3 and t4 hormones level in a patient with a severe traumatic injury.

METHODS

The retrospective observational study design was used in the present study. The study was conducted at the trauma center, the department of general surgery, Pt. J.N.M. Medical College and associated Dr. B.R. Ambedkar Memorial Hospital, Raipur, C.G. Total 77participants were concluded in the present study.

Inclusion criteria

Inclusion criteria of the present study are head injuries patients, chest injury patients, abdominal injury patients, all patients were sustained trauma within 24hrs of admission, age group of patients is 10-82 years.

Exclusion criteria

The patients were suffering from any concurrent medical illness (on the basis of history pertaining to a relative in patients) was excluded.

Hormone level was measured using the Elisa sandwich method, 10ml of venous blood was withdrawn at the time of admission, 24hrs in admission and 5th day after admission.

Statistical analyses

The purpose of present study descriptive and the chi-square test was used.

RESULTS

The majority of the subject had an abdominal injury (n=32, 41.5%), followed be had a head injury (n=23, 29%) and had chest injury (n=22, 28.57%) (Table 1).

Table 1: Type of injuries.

Type of Injuries	No. of cases	Percentage
Abdominal injuries	32	41.55
Chest injuries	22	22.57
Head injuries	23	29.87

The mean fT3 and Ft4 levels of all the 77 participants were observed to be 1.51 (sd= 0.18) and 0.71 (sd=0.53) respectively (Table 2 and Table 3). After 24 hours of admission, fT3 and fT4 were observed on 74 participants and it shows the mean value of 1.47 (sd=0.14) and 0.73 (sd=042) respectively. After the 5th day of admission 51participants fT3 and the fT4 level were measured, and it revealed that the fT3 mean value to be 1.47 (sd= 0.13) and fT4 mean value 0.79 (sd=0.50) respectively.

Table 2: Free fT3 Thyroid levels at different time intervals.

Time interval	fT3		
	N	mean	Sd
At Admission	77	1.51	0.18
24hrs after admission	74	1.47	0.14
5th day after admission	51	1.47	0.13

Table 3: Free fT4 thyroid hormone levels at different time interval.

Time interval	fT4		
	N	Mean	Sd
At Admission	77	0.77	0.53
24hrs after admission	75	0.73	0.42
5th day after admission	51	0.79	0.50

Table 4 shows that the proportion of the subject with deranged fT3 values among alive and expired subjects was not significantly different (p=0.4255).

Table 4: The fT3 and fT4 thyroid hormone level of the day 0 (n=77).

Levels	Alive (n=75)		Expired (n=2)		χ^2	P-value
	No.	%	No.	%		
fT3						
Deranged	18	24.00	1	50	0.0011	0.4255
Normal	57	76.00	1	50		
fT4						
Deranged	39	52.00	2	100	0.174	0.51
Normal	36	48.00	0			

The percentage of subjects with deranged fT4 values was not significantly higher amongst those who expired (p=0.5170). Three patients have expired within24 hrs of admission, hence at 24hrs interval, the fT3 and fT4

assessment could be done in 72 patients only. In all the patients who expired, both fT3 and fT4 levels were deranged. However, no statistically significant association between fT3 levels and outcome could be seen (p=0.334), for fT4 levels also no any significant association with outcome was observed (p=0.5478) (Table 5).

Table 5: The fT3 and fT4 thyroid hormone level of day 24hrs (n=75).

Levels	Alive (n=72)		Expired (n=3)		χ^2	P-value
	No.	%	No.	%		
fT3						
Deranged	17	23.61	2	66.66	0.93	0.334
Normal	55	76.38	1	33.33		
fT4						
Deranged	46	63.88	3	100	0.464	0.547
Normal	26	36.11	0	0		

The Table 6 reveals that at 5th day, the assessment was done in 51 patients only, as 14 patients have discharged to this period while 12 patients died. The free thyroid hormone (ft3 and ft4) at different time interval at admission, at 24hrs and at 5th day was within normal limit. At admission mean ft3 is 1.5 pmol/l (sd=0.18). The mean total T3 fell rapidly and remain low throughout the period but serum ft3is normal or elevated immediately after trauma or postoperative period after 24 hrs and 5th day mean ft3 was 1.47 pmol/l (sd= 0.14). The serum-free t4 mean value at admission, at 24hrs and after 5th day was 0.71 pmol/l (sd=0.52). This value is within normal limit. Serum ft4 level is reduced in euthyroid sick patients according to the severity of trauma.

Table 6: The fT3 and fT4 thyroid hormone level of 5th day (n=58).

Levels	Alive (n=51)		Expired (n=12)		χ^2	P-value
	No.	%	No.	%		
fT3						
Deranged	16	31.37	5	41.66	0.68	0.6726
Normal	35	68.62	7	58.33		
fT4						
Deranged	27	52.94	9	75.00	0.98	0.627
Normal	24	47.05	3	25.00		

DISCUSSION

Trauma is the leading cause of death worldwide. Our present study findings reveal that abdominal injury, head injury and chest injury were the most common traumatic injury encountered in a trauma center. Mortality was not significantly different among subjects with deranged fT3, fT4 values and with normal T3, fT4 values. Though the total T3 fell rapidly and remain low throughout the period, serum ft3 remained normal or elevated immediately after trauma or postoperative period. An increase in serum ft3 is mainly due to decreased activity of type 1 iodothyronine 5' monodeiodinase-5'activity in tissue.[7] Serum ft4 level is reduced in euthyroid sick patients according to the severity of trauma. In acute and short-term trauma there is no fall in serum ft4 levels, low serum ft4 level is correlated with poor prognoses.[8] In another study, the serum-free t4 index is frequent low in these patients.[7,9-11] The low level of free t4 is due to the presence of an inhibitor of serum binding protein of thyroid hormone in the circulation.[12-15]

CONCLUSION

On the basis of the observation of the present study and their analyses, the conclusion made that the deranged fT4 levels have a significant association with the severity of trauma. Free T3 level findings in the present study suggested that the role of hormone level prediction of the trauma victims has important mechanisms which remain an unexplored subject. Still, from a medical point of view, the prediction of the status ft3 level of the patients paves way for exploring the method through which these could be of clinical use for the patient's management.

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