



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 10, pp. 20599-20601, October, 2017

**International Journal of
Recent Scientific
Research**

DOI: 10.24327/IJRSR

Research Article

ANALYSIS OF ACUTE ISCHAEMIC STROKE WITH REFERENCE TO ABNORMAL THYROID HORMONE

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DOI: <http://dx.doi.org/10.24327/ijrsr.2017.0810.0924>

ARTICLE INFO

Article History:

Received 17th July, 2017
Received in revised form 21st
August, 2017
Accepted 05th September, 2017
Published online 28th October, 2017

Key Words:

Acute ishchemic stroke, thyroid function tests, NIHSS (national Institute of health stroke scale).

ABSTRACT

Back ground: Thyroid function abnormalities are found in acute ischemic stroke which is the Basis of present study. Until now there were only few studies about the thyroid function in stroke. The purpose of the present study was to investigate associations of thyroid hormone status with clinical severity and outcome of acute ischemic stroke by utilizing - NIHSS SCORE and to associate the thyroid hormone status and the anterior/posterior circulation involvement of stroke. **Materials and Methods:** This is a prospective observational study involving 80 patients admitted with acute Ischemic stroke between December 2015 and November 2016 in santhiram general Hospital, nandyal, under departments of medicine and neurology. **Results:** patients with low t3 level had worse neurological prognosis which was statistically Significant ($p=0.001$). A total of 80 patients who met inclusion criteria were included in the present study. Mean age of patients was 64.7years, males outnumbered females (27:13). Low t3 level had significantly high mean and median NIHSS when compared with Patients having normal t3 values ($p=0.02$). Majority of patients ($n=6$) with low t3 Level had posterior circulation stroke which was statistically significant($p=0.007$). **Conclusions:** Thyroid function abnormalities can serve as a marker for assessing Severity and prognosis of acute ischemic stroke which need to be strengthened by Larger controlled studies.

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INTRODUCTION

In acute stroke, several factors such as C-reactive protein (CRP), glucose levels on admission, fibrinogen concentration, erythrocyte sedimentation rate, and leukocyte count have been examined as prognostic factors for stroke outcome and have been found to be associated with the increased morbidity and mortality¹⁻³. Similarly, thyroid hormones also vary in serum of patients with acute stroke. Thus far, there were five studies that have been published to address the importance of serum thyroid hormone levels after acute stroke. Hama *et al.* from Japan reported malnutrition and non - thyroidal illness syndrome after stroke in 2005⁴; another one was by Alevizaki *et al.* who described a low T3 levels is associated with outcome in acute stroke patients from Greece in 2007⁵; the third one was done by yonghuazhang and Michael A.meyer from New York in 2010⁶. The fourth study was done by Akrammohammed al-mahdawi from Iraq, the study was done between 2011-2012¹⁴.the fifth study was done by Salilkumar pal, Tuhinsantra from kolkata, india in 2015¹⁵. Critical illness is often associated with alterations in thyroid hormone concentrations in patients with no previous intrinsic thyroid disease⁷⁻⁹. This is known as non- thyroidal illness syndrome

(NTIS; or euthyroid sick syndrome or “low-T3 syndrome”). The most common hormone pattern in NTIS is a decrease in T3 level with normal levels of thyroxine (T4) and thyroid-stimulating hormone (TSH)^{10, 11}. The alterations in thyroid hormones can be due to sick euthyroid syndrome as cited above or can be due to disturbance in hypothalamo-pituitary-thyroid axis⁶. The objective of this, prospective study is to investigate possible associations of thyroid hormone status with clinical severity using National Institute of Health Stroke Scale (NIHSS) and outcome in patients admitted for acute stroke, and whether there is association between the pituitary axis abnormality and the anterior or posterior circulation involvement.

MATERIALS AND METHODS

This is a prospective observational study involving 40 patients admitted with acute ischemic stroke between December 2014 and November 2016 at Santhiram General Hospital, Nandyal, under departments of General Medicine and Neurology.

Inclusion criteria- 1) Age of the patient above 18 yrs 2) All acute strokes who present within 48 hrs of onset 3) Patients

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without previous thyroid dysfunction. 4) Who give consent for the study.

Exclusion criteria- 1) Patients with hepatic and renal impairment at presentation. 2) Patients with sepsis 3) Transient ischemic attacks. 4) Patients on medication that can alter thyroid function. 5) Age less than 18years. 6) Who do not give consent for the study. 7) Pregnant females. Basic and clinical characteristics including demographic data such as, age, sex, cigarette smoking, concurrent illness, medications, and whether the stroke involve the anterior or posterior circulation from brain imaging were collected and categorized.

We divided all patients into 2 groups with one low-T3 group and other normal-T3 group based on initial thyroid functions. Thyroid function was evaluated by measuring serum total T3, T4, and TSH within 48 hrs of onset of stroke. T3, T4 and TSH were measured by chemiluminescence. Normal range in our laboratory for T3 is 0.8-2 ng/mL; for T4 is 5.56-12.2mcg/dl; for TSH is 0.7-7 μ IU/mL. The severity of stroke was assessed using NIHSS (National institute of health stroke scale). The severity distribution of NIHSS scores on admission was divided into 3 categories, mild: NIHSS < 8; moderate: NIHSS 8-14; severe: \geq 14. Neurological impairment and improvement were assessed using NIHSS at admission and after 1 week respectively. Statistical analysis was performed to compare patients with normal T3 levels and low T3 levels. Independent sample t test (for continuous variables) and chi square test (for categorical variables) and correlative analysis were used to determine the significance. Differences were considered significant at $p < 0.05$. The statistical package for social sciences (spss version 16) was used for analysis.

RESULTS

A total number of 80 patients who met all the above mentioned inclusion criteria were taken into study. It included a total of 54 males and 26 females with a mean age of 64.7years. Out of the total 80 strokes 74 were ischemic and 6 were hemorrhagic. Out of 80 patients 46 are smokers, 10 are alcoholics, 26 are hypertensives, 11 are diabetics, 12 has dyslipidemia and 6 has ischemic heart disease. 20 patients (25%) have low T3 level (0.8 ng/ml) while 60 patients(75%) have normal T3 levels. There was no significant difference between the low t3 and normal t3 group in the above traits. Patients with low T3 levels have significantly high mean and median NIHS score compared to those with normal T3 values (p value 0.02).

Table 1

LEVELS OF T3	Median	Nihs Score			
		N	Mean	Std deviation	% of total N
LOW T3(<0.8ng/ml)	14.00	20	16.30	9.190	25.0%
NORMAL T3(>0.8ng/ml)	8.00	60	9.03	4.390	75.0%
Total	9.00	80	10.85	6.632	100%

Table 2

LEVELS OF T3		Distribution of nihs score			Total
		Mild(<8)	Moderate(9-14)	Severe(>14)	
LOW T3(<0.8ng/ml)	Count	2	6	12	20
	% within levels of T3	10.0%	30.0%	60.0%	
NORMAL T3(>0.8ng/ml)	Count	28	24	8	60
	% within levels of T3	46.7%	40.0%	13.3%	
Total	Count	30	30	20	80
	% within levels of T3	37.5%	37.5%	25.0%	

The distribution pattern showed that much higher portion of patients in low T3 group belonged to moderate to severe Category (NIHSS 8-14 or >14) while majority of patients in normal T3 group fell into mild category.

There is significant difference between the normal T3 group and low T3 group in terms of territory of stroke.

Majority of the patients in low T3 group belong to posterior circulation stroke.(p value 0.007)

There was a significant negative correlation between T3 levels and NIHS scores, which implies that after acute stroke the lower the T3 values are worse is the neurological impairment.(P value 0.001)

Two patients had low T4 out of which one patient had severe form of euthyroid sick syndrome with all the three hormones being low. The other patient showed improvement during hospital stay and was discharged. The patient with severe form of euthyroid sick syndrome had a NIHSS score of 34. He was in persistent vegetative state and was discharged at request.

DISCUSSION

This short term prospective study showed the association of low t3 with severity of stroke and its outcome. This is the second study which used NIHS scale to assess the stroke severity and prognosis the other being was done by Yonghua Zhang and Michael A. Meyer. The previous study was retrospective study done from the data available from kaleida health infoclique electronic record system where as the present study was a prospective study on the patients who were admitted in the hospital.

The present study included hemorrhagic strokes while the above mentioned study was only done on ischemic stroke. The above mentioned study showed significantly high NIHS score in patients in low t3 group and also worse prognosis in low t3 group. The present study showed a significantly high NIHS in low t3 group, but failed to show significant difference in outcome between low t3 and normal t3 group. This difference of finding can be explained by the time of reassessment.

In the present study patients were reassessed after 1 week whereas in the previous study data was obtained from the first clinical follow up i.e after 2-4 weeks. The previous study concluded that alteration in t3 levels did not relate to the region of stroke, suggesting that alteration of thyroid hormones is more related to metabolism rather than blood supply.

In contrast the present study showed a significant difference in the territory of stroke in the low t3 and normal t3 group, in that most of the patients with low t3 are in posterior circulation stroke group. There was no scientific explanation for this observation, but it may suggest the role of involvement of hypothalamic pituitary thyroid axis.

Levels of T3 with Territory of Stroke **Table 3**

LEVELS OF T3		Count	Territory of Stroke		Total
			Anterior circulation	Posterior circulation	
LOW T3(<0.8ng/ml)	Count	8	8	12	20
	% within levels of T3	40.0%	40.0%	60.0%	100.0%
NORMAL T3(>0.8ng/ml)	Count	52	52	8	60
	% within levels of T3	86.7%	86.7%	13.3%	100.0%
Total	Count	60	60	20	80
	% within levels of T3	75.0%	75.0%	25.0%	100.0%

Change in Nihss Score After 1 Week **Table 5**

LEVELS OF T3	N	% of total N	Median	Mean	Std deviation
LOW T3(<0.8ng/ml)	20	25.0%	4.00	4.00	2.108
NORMAL T3(>0.8ng/ml)	60	75.0%	5.00	4.93	2.572
Total	80	100%	5.00	4.70	2.472

It has been generally accepted that low T3 accompanying severe illness is considered as an adoptive response to stress to spare energy^{5,12}. Whether or not to treat with thyroxin replacement is controversial¹⁰, while true hypothyroidism has been interestingly reported, that a preexisting condition may actually be protective in acute stroke¹².

There were no conclusive studies whether treatment of low T3 is beneficial in stroke patients. There were contradictory studies regarding the same issue. Some studies reported advantage of brain “being preconditioned” with hypothyroidism when a stroke occurs¹², whereas one animal study showed a neuroprotective effects defined by reduction of infarct size and improvement of neurological deficit with administration of T3¹³. Further studies were required to conclude this aspect.

CONCLUSIONS

Patients of acute ischemic stroke who present with severe neurological impairment tend to have low t3 levels in their blood. Alteration in t3 levels appeared to be related to the territory of stroke. Patients with posterior circulation stroke tend to have low t3 values. Neurological improvement is better in patients with normal t3 levels compared to patients with low t3 levels, but was not statistically significant in this study.

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