CORRELATION OF SERUM CORTISOL LEVEL WITH THE PROGNOSIS OF STROKE: A CROSS SECTIONAL STUDY

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Abstract

Introduction: Cortisol is a hormone of immense importance in the hypothalamo-pituitary-adrenal axis & it has got paramount effects on the metabolism of lipid, glucose & protein. With reference to stroke, a stress response implies rise in the levels of catecholamines & cortisol during the 1st week after the acute episode. Such kind of response is evident in infarction of cerebrum & bleeding in the cerebral cortex. There is ample amount of evidence from past studies that raised levels of serum cortisol levels are associated with volume of ischemic lesion.

Patients and methods: Subjects included were patients who were admitted in the hospital within six hours after the stroke episode. Every patient was monitored for Scandinavian Stroke Scale (SSS) after the admission. This test was conducted per two hours in first twenty four hours, then per four hours in the next 48 hours & then every day up-to seventh day. Blood samples were extracted for the estimation of serum cortisol. Time duration of 01:00 AM to 07:00 AM was excluded for sample extraction.

Results: Serum cortisol level was significantly higher in subjects with insular involvement (635 nmol/l) as compared to patients without insular involvement.

Conclusion: It's quite clear from our study that raised cortisol levels are highly associated with bad outcome & poor response in patients with stroke.

Keywords: Serum Cortisol, hypothalamo-pituitary-adrenal axis, Stroke.

Introduction

Cortisol plays a crucial role in the maintenance of hypothalamopituitaryadrenal axis & it has got drastic effects on metabolism of lipid, glucose & protein^{1,2}. A typical stress response includes raised levels of catecholamines & cortisol during the first week after stroke. In cases of sudden activation of this axis there is drastic raised in levels of cortisol. Such response leads to migration of glucose from liver & adipose tissue. Many researchers have also observed that there is direct proportion between magnitude of illness and loss of diurnal variation in cortisol^{3,4,5}. As the age advances there is malregulation of hypothalamopituitaryadrenal axis. As the post stroke duration advances, there is release of cytokines after the damage to neurons. Also such kind of damage destroys of hypothalamopituitaryadrenal inhibitory areas^{6,7}.

Also cortisol has positive correlation with the WBC count, fibrinogen & rest of the markers which are responsible for inflammatory response. In cases of ischemic stroke, there is fluctuation in the serum cortisol levels & there is long list of studies that are associated with increase in ischaemic lesion volume and in turn the same is associated with raise in the mortality rates^{8,9,10}. Along with that there is a strong

evidence that such raised levels are extremely neurotoxic & such cases harbor a smaller size of hippocampus. Some studies are suggestive of raise in the levels of stress hormones is associated with less favorable outcome^{11,12}. Raise in the circulation of catecholamines is also seen in association with insular damage & in turn with associated stroke¹³.

Aims & objectives: Our research is directed to find the association between raised cortisol level & the severity of stroke.

Patients and Methods:

In our study, total 68 patients were taken into consideration & their informed consent was taken. They were such cases who were admitted within six hours in hospital after the onset of episode of stroke. Patients who were below 18 years or having any other kind of life threatening illness & in case of pregnant patients. Vital statistics of such cases were strictly monitored. All subjects were monitored for Scandinavian Stroke Scale (SSS). During the follow-up, after three months, SSS, BP & heart rate were assessed. Diagnosis of cerebral infarction & intracerebral hemorrhage were confirmed on the basis of clinical findings & CT scan. Atrial fibrillation was analysed by ECG on admission or by continuous ECG monitor. Also

along with these, a follow-up CT scan was performed after 8 days. Routine haematology scan was done and along with them, serum cortisol was estimated. Time duration of 01:00 AM to 07:00 AM was excluded. So finally, a total of 64 subjects were included in our study after taking into consideration of all the exclusion criterias. The obtained results were analysed by Statistical Package for Social Sciences (SPSS) software.

Results:

A total of 64 patients were included for final analysis.

Table 1: Characteristics of the study subjects.

N=64	value
Age (mean $\pm$ SD)	72.2 $\pm$ 12.32
Male (%)	34 (53.1%)
Female (%)	30 (46.9%)
SSS (mean / range)	36 (21-47)
History of hypertension (%)	38 (59.4%)
History of stroke (%)	12 (18.8%)
Diabetes mellitus (%)	24 (37.5%)
Atrial fibrillation (%)	11(17.2%)

Table 1 shows that the mean age was observed in the current study was 72.2 $\pm$ 12.32 years. There were 34 (53.1%) males and 30(46.9%) females. SSS was observed to be 36 (21-47) on admission. History of hypertension, History of stroke, Diabetes mellitus and Atrial fibrillation was observed in 38(59.4%), 12(18.8%), 24(37.5%) and 11(17.2%) respectively.

Table 2: Cortisol levels in study subjects

Category	Cortisol levels	Number of subjects
patients who died within 7 days of stroke onset	1379.2 $\pm$ 246.2	4
Patients who survived 7 days	654.3 $\pm$ 143.6	60

S-cortisol level was higher in patients with insular involvement, 635 nmol/l, in comparison to patients without insular involvement, 589 nmol/l. This result was not statistically significant.

Discussion:

In our study, we found out that there is high degree of relationship between the body temperature & blood sugar level with the intensity of stroke. When we separately consider the parameter of temperature, as the body temperature rises, the level of cortisol also rises. In our study we also found out that whenever there is insular involvement, there are higher chances of getting more cortisol response. Our studies also showed that the presence of neurological signs is directly proportion to the cortisol level & also the severity of stroke. Similar results were found in studies from the past¹⁴⁻¹⁸. They also found that cortisol was independently associated with morbidity

after the episode of stroke & also with poor functional outcome which is in agreement with our study. Our study also found out the positive correlation between the raised blood pressure & cortisol level¹⁹⁻²¹. Few of the past studies also noted that sustained higher level of cortisol which is directly associated with the length of duration of hospitalization and stay in the intensive care unit²²⁻²⁵.

Conclusion:

After analysis of all the findings of the 64 study subjects, we came to our final conclusion that as the level of serum cortisol is on higher side, there is poor response from the patients and in turn the morbidity & mortality of the patients. Also we conclude that in case of acute stroke response, adrenocorticoid stress response is extremely harmful. We suggest that such kind of studies with large number of study subjects will be extremely helpful for further evaluation.

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