Association of Serum Homocysteine Levels in Stroke Patient With Ct Scan Findings

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ABSTRACT *Introduction :* The burden of stroke comprises largely of the elderly population. However, there remains a small but significant subset of younger patients with ischemic stroke, in whom conventional vascular risk factors play a smaller role. Hyperhomocysteinemia causes increased arterial blood pressure thereby increasing the risk of cerebrovascular accidents. Neuroimaging plays a vital role in the workup of acute stroke by providing information essential to accurately triage patients, expedite clinical decision making with regards to treatment, and improve outcomes in patients presenting with acute stroke. So the aim of the study is to study serum homocysteine levels to assess it's role as a risk factor for stroke with CT scan finding.

Materials and Methods : 40 patients of cerebrovascular accidents admitted . The study was carried out in patients admitted with focal neurological deficit Serum homocysteine was estimated by enzymatic photometry method. CT scan was done for each patient. Results : It was found that the serum homocysteine levels were slightly higher in patients with recurrent stroke than new cases of stroke, Mean serum homocysteine levels were higher in patients with infarct than in patients with normal CT finding Mean serum homocysteine levels were higher in patients with hemorrhage than in patients with normal CT finding. Mean serum homocysteine levels were higher in patients with hemorrhage and infarct taken together than in patients with normal CT finding.Conclusion: CT allows time-critical decision-making in stroke patients, informing decisions on thrombolytic therapy with tPA, which has a narrow therapeutic index.People at risk for cerebrovascular diseases such as hypertension, smoking and sedentary lifestyle should be screened for hyperhomocysteinemia. In conclusion the present study revealed that hyperhomocysteinemia appears to be an important risk factor for cerebrovascular accidents.

Introduction

Stroke is a common worldwide health problem. It is one of the major cause of morbidity, mortality and disability in developed as well as developing countries after coronary artery disease[1]. Mortality due to stroke rises rapidly with age. The burden of stroke comprises largely of the elderly population. However, there remains a small but significant subset of younger patients with ischemic stroke, in whom conventional vascular risk factors play a smaller role.

The definition of stroke is clinical, and laboratory studies including brain imaging are used to support the diagnosis.The diagnosis of stroke (versus not stroke) is still a matter of clinical skill often without the help of many, or any, confirmatory investigations. However this does have the advantage that the diagnosis is independent of the availability and quality of rapidly changing technology (such as CT scanners),which is often not available at all in developing countries, or even universally available in developed countries [1,2,3]

Neurologic symptoms manifest within seconds because neurons lack glycogen, so energy failure is rapid. If the cessation of blood flow lasts more than a few minutes, infarction or death of brain tissue results.

The standard definition of Transient Ischemic Attack (TIA) requires that all neurologic signs and symptoms resolve within 24 hours regardless of whether there is imaging evidence of new permanent injury; stroke has occurred if the neurologic signs and symptoms lasts for >24 hours[4,5].

Many studies indicate a plethora of conventional risk factors for stroke. Nevertheless, cerebrovascular events do occur sometimes in the individuals without any of the previously mentioned risk factors. As a consequence, it is very likely that other risk factors exist. Hyperhomocysteinemia, defined as an elevated plasma total homocysteine concentration (>10 μM), is one such modifiable risk factor[5].Some studies have shown that elevated serum homocysteine is an independent risk factor for stroke[6-8].

Hyperhomocysteinemia causes increased arterial blood pressure thereby increasing the risk of cerebrovascular accidents. Elevated plasma homocysteine has also been shown to induce oxidative injury to vascular endothelial cells and cause impairment of the endothelial production of nitric oxide, a strong vascular relaxing factor.

Plasma homocysteine levels are strongly influenced by diet, as well as by genetic factors. The dietary components with the greatest effects are folic acid and vitamins B_6 and B_{12}. Folic acid and other B vitamins help break down homocysteine in the body.

The reason for the decline in the incidence of major stroke in recent years are unclear, may be due to the treatment of risk factors such as hypertension and elevated cholesterol. It has been estimated that full implementation of currently available preventive strategy could reduce stroke incidence by as much as 50 - 80 %.

Neuroimaging plays a vital role in the workup of acute stroke by providing information essential to accurately triage patients, expedite clinical decision making with regards to treatment, and improve outcomes in patients presenting with acute stroke.[8,9,10]

So the aim of the study is to study serum homocysteine levels in to assess it's role as a risk factor for stroke with CT scan finding .

Materials and Methods

All patients of cerebrovascular accidents admitted to Sree Balaji Medical College and Hospital, Chrompet over a period of 2 years.

Prior to admission to the study, a detailed history was taken and a thorough physical examination was performed so as to fulfil the inclusion and exclusion criteria laid down in the study protocol. The ethical committee of the college cleared the study.

Serum homocysteine was estimated by enzymatic photometry method. Enzymatic photometry is a technique used for estimation of the concentration of a substance by exploiting the property of absorption of light of a particular wavelength. To be more precise, photometry is used to determine the concentration of a light-absorbing compound present in a solution. 4 ml blood was collected from the patient and serum was separated immediately for the analysis.

Observations and Results

In this study of 40 patients presenting with neurological deficits due to cerebrovascular accidents, 24 male patients and 16 female patients were studied.In the present study, it was observed that according to age and sex wise distribution of patients male patients were of younger age as compared to female patients. It was observed that Mean serum homocysteine levels were higher in male patients than females. However the difference was statistically not significant ($p > 0.05$). Mean serum homocysteine levels were higher in smokers than non-smokers. The difference was not statistically significant ($p < 0.05$).

Table 1 : Independent samples T-Test to compare mean S. Homocysteine (µmol/L) level between known case of stroke and Normal.

	Stroke	N	Mean	Std. Dev
S. HOMOCYST-EINE LEVELS (µmol/L)	No	30	27.46	15.688
	Yes	10	22.76	10.521

Though the serum homocysteine levels were slightly higher in patients with recurrent stroke than new cases of stroke, the difference was statistically not significant ($p > 0.05$).

Table 2: Comparison between mean S. Homocysteine (µmol/L) level and CT scan results

CT scan	N	Mean	Std. Dev
Normal	4	13.96	3.785
Infarct	34	26.93	14.383
Haemorrhagic	2	39.99	20.789
Total	40	26.28	14.588

Mean serum homocysteine levels were higher in patients with infarct than in patients with normal CT finding

Mean serum homocysteine levels were higher in patients with hemorrhage than in patients with normal CT finding.

Mean serum homocysteine levels were higher in patients with hemorrhage and infarct taken together than in patients with normal CT finding.

Discussion

In this study of 40 patients, 17 patients were less than 60 years and 23 patients were more than 60 years of age. It was also observed that patients less than 60 years had a mean homocysteine of where as those more than 60 years had a mean homocysteine level of However, the difference was statistically not significant ($p > 0.05$).

However, according to findings some studies [11,12,13] increase in the serum homocysteine levels were observed with increasing age.

Our study consisted of 34 (85%) patients with sedentary lifestyle and 6 (15%) patients with active lifestyle. Mean serum homocysteine levels were higher in sedentary lifestyle (28.46) than active lifestyle (13.98). The difference was statistically highly significant($p < 0.01$). Perry IJ suggested association between hyperhomocysteinemia and established vascular risk likely to reflect lifestyle factor[15].

In our study, only 3 (7.5%) patients were on vegetarian diet and 37 (92.5%) patients were on mixed diet. Mean and Standard deviation of serum homocysteine levels were 34 and 20.522 in vegetarians and 25.66 and 14.205 in patients on mixed diet. However, the difference was statistically not significant ($p > 0.05$).

The associations between hyperhomocysteinaemia and established vascular risk factors are likely to reflect, at least in part, links with common underlying dietary and lifestyle factors, in particular, a diet high in saturated fat with inadequate folate intake from fruit and vegetables.

In our study, 34 (85%) patients were having infarct, 2 (5%) patients were having hemorrhage and 4 (10%) patients were having normal CT finding. Mean homocysteine levels were higher with infarct (26.93) and hemorrhage (39.99) than in patients with normal CT finding (13.96). The difference was statistically significant with both infarct ($p < 0.01$) and hemorrhage ($p < 0.05$).

Various study concluded that hyperhomocysteinemia as an important risk factor for ischemic stroke ,also said that small but insignificant association between elevated homocysteine and risk of ischemic stroke [14,15]. Brattstrom et al findings suggested hyperhomocysteinemia might be a risk factor for atherosclerotic cerebrovascular accidents. One study observed no association between hyperhomocysteinemia and cerebrovascular accidents [16].

Boushey and colleagues have reported on a meta-analysis of many observational studies relating total homocysteine concentrations to atherosclerotic vascular disease, of which 11 studies addressed the association between homocysteine and risk of stroke [17], 9 case-control studies provided support for the hypothesis that homocysteine is an independent risk factor for stroke while 2 prospective studies did not support the study[18,19,20].

Our study of serum homocysteine levels in cerebrovascular accidents is a cross sectional study. The present study was performed to determine serum homocysteine levels in cerebrovascular accidents. The aim and objective was to study serum homocysteine levels as risk factor for cerebrovascular accident.

All the patients were subjected to thorough history, clinical examination and investigations including fasting lipid profile, CT scan brain and serum homocysteine. Our main observation was that serum homocysteine levels were elevated in cerebrovascular accident patients significantly,

both in cases of infarct and hemorrhage. Further serum homocysteine levels were higher in patients with sedentary lifestyle, hypertension and smoking. Serum homocysteine did not show any relation with age, sex, diabetes mellitus and stroke recurrence.

Rapid and accurate diagnosis is crucial since the only drug currently approved by the FDA for treatment of acute ischemic stroke is intravenous tissue plasminogen activator (tPA) administered within 3 hours of stroke onset. CT allows time-critical decision-making in stroke patients, informing decisions on thrombolytic therapy with tPA, [21,22]which has a narrow therapeutic index

People at risk for cerebrovascular diseases such as hypertension, smoking and sedentary lifestyle should be screened for hyperhomocysteinemia. In conclusion the present study revealed that hyperhomocysteinemia appears to be an important risk factor for cerebrovascular accidents. It is therefore important to use serum homocysteine level as an important tool to investigate all cases of cerebrovascular accidents and also in those who are at risk of developing stroke.

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