

ASSESSMENT OF CAROTID INTIMAL MEDIAL THICKNESS (CIMT) IN YOUNG PATIENTS WITH ISCHEMIC STROKE: A CASE CONTROL STUDY

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Abstract

Background: Incidence of ischemic stroke in younger patients is increasing leading to higher morbidity and mortality. Data on carotid intimal medial thickness (CIMT) as atherosclerotic marker in young ischemic stroke patients are scarce.

Aims and Objective: To evaluate bilateral CIMT thickness and its correlation with various CVD risk factors in young ischemic stroke patients.

Methods: Total 40 patients (15 to 45 age group) and age matched 40 controls were taken. Demographic profile and risk factors were evaluated. All subjects were taken for CIMT assessment by B mode ultrasonography scan in multiangle measurements in the common carotid artery (CCA), carotid bifurcation (BIF) and internal carotid artery (ICA).

Results: 72.5% of patients were in 35- 45 years age group. Stroke incidence was higher in male. Age specific value of CIMT was higher in all cases as compared to age matched controls in all age group. ($p \leq 0.01$) Increasing age, smoking and hypertension were significantly associated with higher bilateral CIMT.

Conclusion: Ischemic stroke young population is associated with increased CIMT. Risk factors burden is contributory in speeding up atherosclerotic process leading to higher CIMT with multiple co morbidities.

Keywords: carotid intimal medial thickness, carotid bifurcation, ischemic stroke

Introduction

Stroke is one of the leading causes of mortality and morbidity worldwide. In the world approximately 20 million people each year suffer from stroke and of these 5 million do not survive. [1] Developing countries account for about 85% of global deaths from stroke [2, 3]. Men are more likely to have a stroke than women; the male/female sex ratio for India is 7:1 [4] more recently it has been estimated that 12% of all strokes occur in those less than 40 years age. It has been seen in carotid intimal medial thickness (CIMT) measured by ultrasound is predictor of atherosclerosis progression and subsequent stroke in older age group. [5, 6, 7] CIMT measurement is noninvasive, safe and reliable tool of prediction of future vascular events. Normally CIMT is 0.48 at the age of 40, keeps on increasing, up to 1 till the age of 100. Relationship between CIMT and ischemic stroke in young population is not well established. [8] Hence present case control study is designed to assess CIMT in ischemic stroke in young patients.

Material and Methods:

The present study was conducted from September 2019 to December 2020 in Indore, Madhya Pradesh. Total 40 patients of young ischemic stroke (age <45 years) and

similar number of controls were taken. Data included demographic profile, prior DM, hypertension, history of smoking, BMI calculation and HbA1c, lipid profile, electrocardiogram and echocardiography was done in all patients and controls.

Inclusion criteria:

- Patients age more than 15 years and ≤ 45 years
- Stroke proven by imaging (CT/MRI)

Exclusion criteria:

- Critically ill patients
- Poor carotid window

Carotid ultrasonography examinations were performed with the use of Toshiba vision 400 sonographic machine equipped with a 7.5 MHz linear-array transducer. IMT was measured as the distance between the luminal intimal interface and the medial adventitial interface. The point of measurement was taken 1 cm proximal to the carotid bulb at the site of maximum thickness, avoiding the plaque area.

Statistical analysis:

All the data analysis was performed using International Business Machines Corporation (IBM) Statistical Package

for the Social Sciences (SPSS) version 20 software. Cross tabulation and frequency distribution were performed to prepare the tables. Age was expressed as mean and standard deviation whereas all the categorical data was expressed as numbers. Chi-square test was used to find out the association between the parameters and intima medial thickness. The p-value of ≤ 0.05 considered as significant.

Result:

Total 40 stroke patients of age ≤ 45 years and similar number of controls were evaluated for CIMT. Out of 45 patients with stroke, 27 were male & 13 were female. Majority of patients were in 35-45 age groups (72.5%). [Table 1]

Risk factor analysis 17.5% patients found to have obesity, 42.5% were smoker, and 17.5% and 7.5% were hypertensive and diabetic respectively. Dyslipidemia was seen in 37.5% of patients. CIMT was assessed in respect to number of risk factors. [Table 2] Linear correlation was noted between CIMT and number of risk factors. Mean CIMT (both right and left CCA) was higher in patients as compared to controls that was statistically significant. [Table 3] When CIMT was compared among different age groups, the cases had a significantly higher value than age-matched controls ($p < 0.05$).

Table 1: Age distribution of young patients with ischemic stroke/control

| Age group (years) | Number of patients | Control |
|-------------------|--------------------|---------|
| 15-25 | 3 | 5 |
| 25-34 | 8 | 13 |
| 35-45 | 29 | 22 |
| Total | 40 | 40 |

Table 2: CIMT in relations to number of risk factors

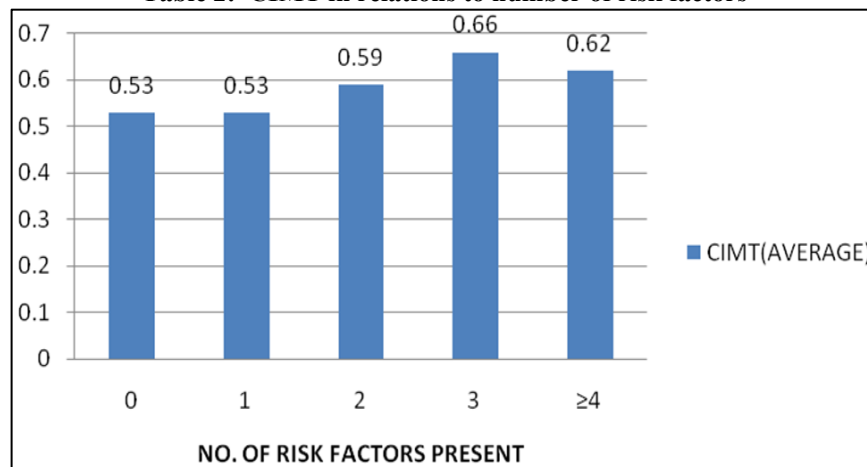
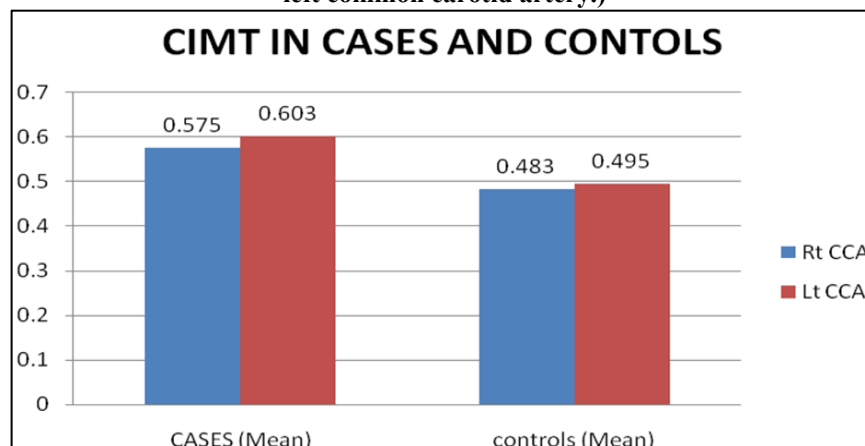


Table 3: Comparison of mean CIMT in cases and controls ($p < 0.05$) (Rt CCA- right common carotid artery, Lt CCA- left common carotid artery.)



Discussion:

CVD risk factor including DM, hypertension, smoking and dyslipidemia are modifiable risk factors. Atherosclerosis plaque modification can be done by controlling these risk factors [9] CIMT is indirect tool for detection of subclinical atherosclerosis, and by assessing both carotids we can improve the prediction of future atherosclerotic events. [10]

In this study we have measured both carotids IMT and was found to be significantly higher among cases (0.575 ± 0.134 mm and 0.603 ± 0.123 mm) as compared to controls (0.483 ± 0.078 mm and 0.495 ± 0.088 mm, $p \leq 0.05$), which persisted among different age groups. Similar findings were noted by Sahoo et al [8], who reported significantly higher mean CIMT (0.782 ± 0.19 mm) than in controls (0.594 ± 0.98 mm; $p < 0.0001$) but study subjects were limited from south India. Mukherjee et al. [11] also reported a significantly higher CIMT values among stroke cases as compared to controls, but the mean values were lower (0.66 vs. 0.32 mm) as compared to Sahoo et al. but similar to present study. However, controls were not matched with the cases in Mukherjee et al. [11]

Higher value of CIMT was observed with multiple risk factors in previous study conducted among Caucasian population. [12] Present study also showed higher CIMT with multiple co morbidities and the difference was statistically significant. Similar findings were noted in Sahoo et al. [8] Study done by Das et al. [13] on Asian Indian stroke cases showed a higher IMT among diabetic stroke patients, but the study had lesser number of cases of ischemic stroke with age-matched controls. Similarly in the present study, the CIMT was significantly higher among hypertensive, smokers, and obese patients. Study from eastern part by Saha et al. [14] observed older age group having a higher value of CIMT among ischemic stroke patients with diabetes as compared to controls, but the difference was not significant. In Norwegian stroke study, it was observed that higher risk factor burden, increased CIMT, family history of premature atherosclerosis was associated with ischemic stroke in young. [15] Present study also found higher risk factors associated with increased CIMT and possibly associated with ischemic stroke.

Risk assessment among stroke patients revealed that higher CIMT, hypertension and smoking habit were the strong positive predictors of future stroke. Present study showed a pattern of risk factor transition on age-wise analysis. Daily smokers have higher risk of ischemic stroke as compared to age- and gender-matched controls. With advancement of age, covariate such as HTN becomes a more important risk factor, while smoking becomes a contributor for the development of stroke. In present study, the presence of ischemic stroke was correlated with age, risk factors, increased IMT of both the carotids.

Present study results extend previous study finding that CIMT is valuable tool for assessment of atherosclerosis and strong predictor of stroke that is applicable in younger patients also.

Limitation:

Study was conducted single center and number of subjects was less. There was no follow up CIMT assessment was done to assess the effect of risk factors modification on atherosclerotic process.

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