

# Study of carotid intimal thickness in ischemic stroke and coronary artery disease

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## Abstract

**Introduction:** Intima medial thickness of common carotid arteries can be used to measure generalized atherosclerosis and also surrogate marker of coronary artery disease and ischemic stroke. It is extensively used to examine the carotid IMT and to evaluate the regression of atherosclerosis lesion in interventional studies. **Material and methods:** It was a cross sectional study conducted in the department of Medicine of a tertiary care centre, Indore, India. Carotid ultrasonography examinations were performed with the use of Shimadzu (SDU 2200) & Toshiba just vision-400 sonography machine equipped with a 7.5 to 10 MHz linear-array transducer. With the subject in the supine position and the neck in slight hyperextension the common carotid artery, carotid bulb, and the extra-cranial part of internal carotid artery was identified on both sides and IMT was measured as the distance between the luminal intimal interface and the medial adventitial interface. **Results:**  $P < .001$  which is highly significant i.e. increased IMT is strong risk factor for Ischemic stroke and CAD in all the age groups.  $P < .001$  which is highly significant i.e. increased IMT is strong risk factor for both ischemic stroke and Coronary artery disease. When carotid intimal thickness between patients of ischemic heart disease and coronary artery disease is compared, we observed a  $P$  value  $> .05$ , which is not significant, i.e. there is no much difference of IMT in ischemic stroke and Coronary artery disease. **Conclusion:** Parkinson's disease and Parkinson plus syndrome is a group of sporadic, neurodegenerative diseases of the central nervous system. There are only a few reports about the frequency of neuropsychiatric symptoms in patients with Parkinson disease from India and no such Indian report in patients with Parkinson plus syndrome

**Keywords:** Myocardial infarction, Coronary artery disease, Ischemic stroke, Carotid Media intima thickness.

## Introduction

The burden of coronary artery disease (CAD) continues to rise globally, as developing nations, including India, are adopting to lifestyle changes with predisposition to cardiovascular diseases (CVD)[1]. Measurement of carotid IMT is being increasingly used as a non-invasive marker of atherosclerosis. The Intima plus medial thickness was measured as the distance from the leading edge of the first echogenic line to the second echogenic line. Intima medial thickness of common carotid arteries can be used to measure generalized atherosclerosis and also surrogate marker of coronary artery disease and ischemic stroke. It is extensively used to examine the carotid IMT and to evaluate the regression

of atherosclerosis lesion in interventional studies [2-6]. Homa and colleagues found that the normal intima-media thickness in the common carotid artery, as measured in areas void of plaque, increases linearly with age from a mean of 0.48 at age 40 yr to 1.02 at age 100 yr follows the formula  $(0.009 \times \text{age}) + 0.116$ . In addition to age related change, the intima-media thickness also increases in response to early plaque formation, and this measurement is used, therefore, as a marker for cardiovascular risk in a variety of clinical settings.

A number of studies have quantified the association of IMT of the extra cranial carotid arteries and coronary atherosclerosis. In addition, studies have shown that factors that reduce the risk of coronary artery disease

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(CAD) can influence the progression rates of carotid atherosclerosis as measured by B-mode ultrasound.

With this background we consider the measurement of IMT of common carotid artery by using high resolution B-mode color Doppler imaging as a measure of atherosclerosis in patients of ischemic stroke and coronary artery disease against controls for early detection of development of atherosclerosis in these patients.

## Material and Methods

Present cross sectional study was conducted in the department of Medicine of a tertiary care centre, Indore, India. The institutional ethics committee permission was sought. **Inclusion Criteria were:** (1) All the patient of acute ischemic stroke. 2. Acute myocardial infarction. 3. Age greater than 30 years. And **Exclusion Criteria were:** (1) Hemorrhagic stroke. 2. Heart disease other than acute MI i.e. RHD, DCM etc. The patients fulfilling the inclusion and exclusion criteria and

## Results

In our study, below 40 yrs there were 18 patients, between 41 to 50 yrs there were 30 patients, between 51 to 60 yrs there were 26 patients and above 60 yrs there were 30 patients. Below 40 yrs there were 10 controls, between 41 to 50 yrs there were 11 controls, between 51 to 60 yrs there were 16 controls and above 60 yrs there were 13 controls. Distribution of cases and controls according to the age is given in **table no. 1**.

**Table- 1: Distribution of cases and controls according to the age.**

Age group	Cases (%)	Controls (%)
≤ 40yrs	18(17.3)	10(20)
41-50 yrs	30(28.8)	11(22)
51-60yrs	26(25)	16(32)
>60yrs	30(28.8)	13(26)
<b>Total</b>	<b>104(100)</b>	<b>50(100)</b>

**Table- 2: Comparison of mean IMT in cases and controls of different age group.**

Age group in yrs.	Intimal medial thickness in mm in cases mean	Intimal medial thickness in mm in cases SD	Intimal medial thickness in mm in control mean	Intimal medial thickness in mm in control SD	P value
≤40	0.690	0.056	0.403	0.961	P < .001
41- 50	0.791	0.076	0.595	0.108	P < .001
51- 60	0.839	0.068	0.632	0.111	P < .001
> 60	1.017	0.158	0.825	0.102	P < .001

P < .001 which is highly significant i.e. increased IMT is strong risk factor for Ischemic stroke and CAD

consenting to participate were included in the study. So finally, a total of 104 cases of CAD and Ischemic stroke were included and they were compared with 50 controls without the disease in study.

**Procedure:** All carotid ultrasonography examinations were performed with the use of shimad Zu (SDU 2200) & Toshiba just vision-400 sonography machine equipped with a 7.5 to 10 MHz linear-array transducer. With the subject in the supine position and the neck in slight hyperextension the common carotid artery, carotid bulb, and the extra-cranial part of internal carotid artery was identified of both side and IMT was measured as the distance between the luminal Intimal interface and the medial adventitial interface.

Severity of carotid atherosclerosis was evaluated by the mean 1:1ax-IMT, which is the mean of maximal wall thickness at 6 carotid segments (near and far wall of the left and right common carotid artery, carotid bifurcation and internal carotid artery).

**Table-3: Comparison of mean IMT in patients of Ischemic stroke, Coronary artery disease (CAD) and controls**

	N	Mean IMT (in mm)	SD	P value
Control	50	0.626	0.176	
Ischemic stroke	52	0.862	0.162	P < .001
Coronary artery disease	52	0.835	0.147	P < .001

P < .001 which is highly significant i.e. increased IMT is strong risk factor for both ischemic stroke and Coronary artery disease.

**Table-4: Comparison of mean IMT in patients of Ischemic stroke and Coronary artery disease**

	n	Mean IMT (in mm)	SD	P value
Ischemic stroke	52	0.862	0.162	P > .05
Coronary artery disease	52	0.835	0.147	

P > .05 which is not significant i.e. there is no much difference of IMT in ischemic Stroke and Coronary artery disease.

## Discussion

In our study, we have taken 104 cases out of it 52 patients are of ischemic stroke, 52 are of acute MI and 50 are control we have measured the intima medial thickness of common carotid artery of all cases and control.

In our study, we found that carotid IMT is significantly increased in cases ( $0.851\text{mm} \pm 0.155$ ) as compared to control ( $0.626\text{mm} \pm 0.176$ ) and carotid IMT is significantly increased in patients of acute MI ( $0.835\text{mm} \pm 0.147$ ) as compared to control ( $0.626\text{mm} \pm 0.176$ ).

Similar result was observed in a study, conducted by G. Geroulakos, D. J. O'Gorman and collogue [7] they found the IMT of the common carotid artery for the controls was  $0.71 \pm 0.16$  mm and for the patients  $0.91 \pm 0.18$  mm (P<0.005).

Similar result was observed in a study, conducted by A Kablak-Ziembicka et. al. [9], they found similar results. They determined significant correlation between mean IMT and advancing CAD (p < 0.0001).

The SMART study done by Joke M. Dijk et al [10] on consecutive 2374 patients with manifest arterial disease enrolled in the cohort study SMART (Second Manifestations of ARterial disease), a cohort study among patients with manifest arterial disease or cardiovascular risk factors. The increase common CIMT is associated with the occurrence of new vascular events, mostly for ischaemic stroke and CAD, in patients with manifest arterial disease.

In our study, we found out that in 52 patients of ischemic stroke the mean carotid IMT was  $0.862 \text{ mm} \pm 0.162$  which is significantly high in comparison to control in whom, the carotid IMT was  $0.626 \text{ mm} \pm 0.176$ . Thus increased carotid IMT is associated with increase in risk of ischemic stroke.

Jie J. Cao, MD, MPH et.al. [3], demonstrated similar findings that increased carotid artery intima-media thickness (IMT) is associated with the occurrence of stroke. They found association of stroke was significantly different depending on IMT (P<0.02), with no association of stroke among those in the lowest IMT levels and a significant association among those with higher levels of IMT.

Daniel H. O'Leary, M.D.et.al. [11], found that increase in the thickness of the intima and media of the carotid artery, as measured noninvasively by ultrasonography, are directly associated with an increased risk of ischemic stroke in older adults without a history of cardiovascular disease.

In our study, we also compared carotid IMT in patients of ischemic stroke and acute MI. We found that the 52 patients of ischemic stroke the mean carotid IMT was  $0.862 \text{ mm} \pm 0.162$  which is slightly high from carotid IMT of patients of acute MI  $0.835 \text{ mm} \pm 0.147$  which is not significant p >0.05. Thus in our present study we have found that the increased carotid intima media thickness is strongly related with increased incidence of ischemic stroke and coronary artery disease.

## Conclusion

Atherosclerosis is a generalized phenomenon involving all the arteries of body and it can lead to complication like cerebrovascular, coronary artery disease, and peripheral vascular disease. Atherosclerosis is multi-factorial. In this study we have found significant association of increased carotid IMT with ischemic stroke and coronary artery disease. In this study we have found significant association of increased carotid IMT with ischemic stroke and coronary artery disease. Early intervention can lead to the prevention of complication like ischemic stroke, coronary artery disease and peripheral vascular disease.

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