Original Research Article

Importance of carotid intimal medial thickness measurement in patients with coronary artery disease

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ABSTRACT

Background: Prevalence of CAD in urban India is about double that of rural India and about 4-fold higher than in United States. Mortality related to CAD is high in Indian Population. Early diagnosis can prevent the CAD related morbidity and mortality. Aims and objectives is to study and compare the CIMT among the patients with CAD and asymptomatic control group.
Methods: Hundred patients with CAD were studied for the CIMT and compared with age and sex matched asymptomatic control subjects in Department of Medicine of G. R. Medical College, Gwalior for one year from 2012 to 2013. Details on history, risk factors and presenting symptoms were recorded for all. High resolution B mode ultrasonography was performed to assess CIMT of carotid arteries.
Results: CAD was more prevalent among males (78%) having mean age of 56.82 ± 8.91 years. Majority of CAD patients had dyslipidemia (42%) followed by hypertension (21%), diabetes (13%) and smoking (17%). Majority of the CAD patients had chest pain (98%) followed by breathlessness (54%) and sweating (12%) as the most common presenting symptom. Mean CIMT was significantly more among the CAD patients (0.76 ± 0.34) as compared to those without it (0.63 ± 0.22) ($p<0.001$).
Conclusions: CIMT was found to be more in CAD as compared to asymptomatic control subjects. CIMT can be an important tool for assessing CAD and atherosclerosis.

Keywords: Coronary artery disease, Dyslipidaemia, Hypertension, Ultra-sonography

INTRODUCTION

Incidence of coronary artery disease (CAD) has increased significantly during the last 30 years as compared to developed Western countries where declining trends are noticed. In India there are approx. 29.8 million individuals with symptomatic CAD.[1,2] Urban population has higher prevalence of CAD as compared to rural parts. However, over the past 40 years, the prevalence of CHD in India has increased 2-3 folds in rural areas, and 5-6 folds in urban areas.

Early detection of CAD is important to decrease the risk of morbidity and mortality. There is a need of a diagnostic tool for early detection in order to have timely intervention.

Assessment of carotid artery intima-media thickness (CIMT) is well-recognized as a surrogate marker of atherosclerosis.[3-6] The National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) stated that CIMT "could be used as an adjunct in CHD risk assessment".[7]

CIMT is one of the methods for the detection of early stages of atherosclerotic disease and has been chosen as a surrogate marker over other non-invasive methods because it is a high-resolution, non-invasive technique

that is readily available, allows visualizing the vessel wall structure with high resolution.[8] In present study authors tried to evaluate the importance of CIMT among the patients with CAD.

METHODS

A prospective cross-sectional study was performed on 140 subjects of either sex having different age groups in Department of Medicine of G.R. Medical College, Gwalior for one year from July 2012 to Aug 2013.

Out of 140 subjects, 100 were the patients having CAD and 40 were the age matched subjects included as control group.

Institutional Ethics Committee approval was obtained before starting the study. A written informed consent was secured from all the subjects after a thorough detailing of the study in their own local language.

Inclusion Criteria

- All patients of coronary artery disease who were admitted in department of medicine were included.

Exclusion Criteria

- Any patients with chronic or acute infection like tuberculosis, pneumonia, skin disease and patients who did not give the written informed consent were excluded from the present study.

After obtaining detailed history, demographic parameters including age and sex, details on the CV risk factors like history of hypertension or diabetes, addiction like tobacco chewing and/or Bidi or cigarette smoking. Baseline clinical examinations including detailed history, General physical examination and systemic examination was carried out in all subjects. Fasting blood samples were collected in the morning for lipid profile, fasting glucose level which was measured using standard enzymatic methods. All the relevant blood investigations were done in Department of biochemistry and pathology of GRMC Gwalior.

High resolution B mode ultrasonography was performed to assess CIMT of carotid arteries. The maximum CIMT of any one side of carotid artery was taken for study.

Statistical analysis

All the data analysis was performed using SPSS ver. 20 software. Frequency distribution and cross tabulation was performed to prepare the tables. Quantitative data was expressed as mean whereas percentage was used to express categorical data. Student t-test was applied to compare the CIMT of cases and controls. ANOVA was applied to compare the variability of CIMT in between different groups among the cases and controls.

RESULTS

Out of 100 CAD patients, majority were males (78%) followed by females (22%). Mean age of patients with CAD was 56.82±8.91 years which ranged from 34 to 64 years. In control Group out of 40 subjects, majority were males (70%) followed by females (30%). Mean age of control group was 54.62±7.22 years which ranged from 44 to 70 years.

Both the groups were compared for the risk factors for CAD and it was found that in CAD groups, majority of the patients had dyslipidaemia (42%) followed by hypertension (21%), diabetes (13%) and smoking (17%), whereas among control group most common risk factor for CAD was dyslipidaemia which was recorded in 29%, hypertension was present in 3%, diabetes was present in 11%, tobacco smoking was reported in 12% and family history of CAD was present in 7% of the subjects of control group.

Most common presenting symptoms in CAD patients were chest pain (98%) followed by breathlessness (54%) and sweating (12%). Among CAD patients, anterior wall MI was seen in majority of the patients (55%), NSTEMI was seen in (2%) and unstable angina in (2%). Majority of the patients with CAD had CIMT between 0.9-1.2.

Table 1: Comparing mean CIMT in both the groups.

Groups	Mean CIMT
CAD	0.76±0.34
Control	0.63±0.22
p Value	<0.0001

DISCUSSION

In addition to the high rate of CHD mortality in the Indian subcontinent, CHD manifests almost 10 year earlier on average in this region compared with the rest of the world, resulting in a substantial number of CHD deaths occurring in the working age group.[9] The occurrence of CAD is getting preponed by almost five years-ten years with passing of every decade since 1970's.[10]

In present study CAD was more prevalent among males having mean age of 56.82±8.91 years which ranged from 34 to 64 years. In Western countries, where CHD is considered a disease of the aged, 23 percent of CHD deaths occur below the age of 70; whereas in India 52 percent of CHD deaths occurring among people under 70 year of age.[1,11] Between 2000 and 2030, about 35% of all CHD deaths in India will occur among those aged 35 to 64, compared with only 12% in United States and 22% in China.[12] As a result, the Indian subcontinent suffers from a tremendous loss of productive working years due to CVD deaths. According to Leeder et al, an estimated 9.2 million productive years of life were lost in India due to CVD in 2000(570% more than the corresponding figure

for the U.S.), with an expected increase to 17.9 million years in 2030.[13] All these figures are alarming and require immediate attention for early diagnosis.

Assessment of carotid artery intima-media thickness (CIMT) is well-recognized as a surrogate marker of atherosclerosis.[3-6] The American Society of Echocardiography's 2008 consensus statement on CIMT defines it as the combined thickness of the intimal and medial layers of the arterial wall of the carotid artery.[14]

Previous published prospective studies on CIMT and CVD risk that included at least 1000 participants and presented odds ratios or relative risks adjusted for CVD risk factors. All those studies demonstrated that CIMT was significantly associated with the risk for myocardial infarction, stroke, CHD death, or a combination of these.[15,16] In present study mean CIMT was significantly more among the CAD patients (0.76±0.34) as compared to those without it (0.63±0.22) (p<0.001) (table 1). In another study by Tewari et al, mean CIMT was 0.84±0.16 mm for those with CAD and 0.65±0.15 mm for those without CAD.[17] Another study by Kasliwal et al, reported similar trends where mean CIMT of patients with CAD was 0.842±0.12 mm and that of control group was 0.657±0.05 mm. This signifies the importance of CIMT estimation and early diagnosis.[18] In a study done by Jadhav et al, higher incidence of CIMT greater than 0.8 mm was observed in 59.2% of the subjects with coronary artery disease as against 40.8% in those without the disease. Multivariate regression analysis revealed CIMT to be associated with coronary artery disease with an odds ratio of 2.40.[19]

CIMT values add additional information beyond traditional risk factors for classifying patients in regard to the likelihood of presence of significant angiographic coronary artery disease.

In a study done by Kasliwal et al, CIMT was measured in 50 patients with angiographically proven significant (≥50%stenosis) left main coronary artery disease and in another 50 age- and sex-matched patients with coronary artery disease without the involvement of the left main coronary artery. Mean CIMT in this study was found to be significantly higher in patients with left main coronary artery disease as compared to those without it (mean CIMT: 0.926 mm compared with 0.789 mm).[20]

Ziembicka et al, investigated the relation between CIMT and the extent of CAD; and whether CIMT is predictive of coronary atherosclerosis. The coexistence of severe extra-cranial atherosclerosis in patients with CAD was also analysed. They found a significant correlation between mean CIMT and advancing CAD. A significant increase in CIMT was observed among patients with one, two, and three vessel CAD. A log normal distribution of CIMT values showed that if mean IMT was over 1.15 mm, patients had a 94% probability of having CAD.[21] This strengthen the findings of present study and

advocate the early diagnosis of atherosclerosis which is an important risk factor for the development of CAD. Geroulakos et al, studied 75 consecutive male patients who underwent coronary angiography for assessment of chest pain and 40 normal age and sex matched controls. The CIMT for the controls was 0.71±0.16 mm, in patients with normal coronary angiogram the CIMT was 0.73±0.1 mm, in the group with one-vessel disease it was 0.9±0.17 mm, in the group with two-vessel disease it was 0.96±0.17 mm, and in the group with three-vessel disease it was 0.99±0.21 mm.[22]

Small sample size and cross-sectional nature are the two main limitations of the present study. A large randomized clinical trial is needed to strengthen the present study findings.

CONCLUSION

CAD is more prevalent among males than females. CIMT can be used as an important diagnostic tool for coronary artery disease and atherosclerosis. Identification of risk factor can decrease the mortality related to CAD. CIMT offers many advantages of being non-invasive and cost effective for the developing countries like India.

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