

AGE ASSOCIATED INCREASE IN INTIMA MEDIA THICKNESS IN ADULTS

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Abstract : Caroid Imaging is the Gold Standard that provides useful information about the structure and function of carotid arteries. It is used to measure carotid intima-media thickness and provides useful information about the cardiovascular status of an individual so that early preventive measures for any future risk can be introduced. High resolution B-mode ultrasound imaging has emerged as one of the methods of choice for determining the anatomic extent of atherosclerosis and its progression and for assessing cardiovascular risks. These measurements correlate well with other pathologic changes. The present study was undertaken to see the relation of the intimal thickening with age using B-mode carotid ultrasound imaging technique. 60 subjects in the age group of 20–85 years were included in the study. As arterial parameters are markedly altered by essential hypertension and other risk factors, subjects showing these risk factors were excluded. A significant association between advancing age and intima-media thickness ($P < 0.0000001$) was found and increase in the luminal diameter of the carotid arteries was observed but it was not statistically significant ($P > 0.05$). Age is an independent risk factor for increased IMT which predicts future coronary events. The intima media thickness (IMT) of the common carotid artery measured by ultrasound imaging has been shown to be reliable and early marker of systemic atherosclerosis. Routine use of this technique in clinical settings could improve our ability to decide on preventive therapies to reduce the risk for development of clinical symptoms.

Key words : intima media thickness, carotid, ultrasound, atherosclerosis

INTRODUCTION

Aging is a continuous physiological process characterized by decline in body functions. The world's population is aging and developing countries like India and China

have the largest total population with the largest absolute number of elderly people (1). Identifying cardiovascular disease at an early stage is important to prevent fatal events. More objective indicators based on measurement of physiological parameters of

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the large arteries maybe used to assess the cardiovascular risk status besides general risk factors like hypertension, diabetes and smoking. Atherosclerosis is a disease of the aging process and is viewed as a gradual process from thickening to plaques. Increase in the carotid Intima media thickness (CIMT) plays a crucial role in the development of cardiovascular diseases. IMT is defined as the distance between the leading edge of the lumen – intima interface and the leading edge of media – adventitia interface and can easily be assessed by ultrasonography (3,4). Measurement of CIMT with B-mode ultrasound is non-invasive, highly reproducible technique for quantifying atherosclerotic burden and corresponds to the histologic intima and media (5, 6). Age is an independent risk factor for increase in IMT particularly seen in elderly individuals and it corresponds to diffuse intimal thickening and is distinct from pathologic plaque formation (7). Carotid IMT has also been shown to predict fatal coronary death and fatal stroke in elderly people (8–12). The technique is used in observational studies to determine determinants and consequences of atherosclerosis (13). The technique is not being used widely as a clinical tool.

MATERIALS AND METHODS

Demographic features (age and sex), diagnosis, and a documented history of cerebrovascular disease (CVD) or the presence of vascular risk factors were collected and subjects without these were included in the study. Hypertension was considered systolic blood pressure of greater than 140 mm Hg, diastolic blood pressure of greater than 100 mm Hg, or current treatment with antihypertensive drugs;

smokers were considered patients who had ever had a smoking habit, current or past and alcohol intake was considered from history as yes or no. 60 subjects in the age of group of 20–85 years of both sexes were included in the study. The subjects were divided into 4 groups. Group I (21–40 years), Group II (41–60 years) & Group III (61–80 years) and Group IV (81 years and above). A careful history was taken and a clinical examination was done to exclude subjects with Hypertension, Diabetes mellitus, Hyperlipidemia and Obesity. Common Carotid artery ultrasonography was performed on the subjects. Institutes permission to carry out the study was taken and an informed consent from the subjects was obtained.

Ultrasound protocol

Carotid Ultrasound was performed using duplex equipment with a high frequency transducer of 7.5 MHz in B-mode with Hitachi EUB 315 instrument. Imaging was accomplished in B Mode or Brightness Mode and the image was done in grayscale. The images were obtained bilaterally using Hard Copy Imager, ELK Video imager EL – 110-6 NISHIMOTO – SANGYO Co Ltd. available in the Department of Radiology and Imageology at Osmania General Hospital, Hyderabad, India.

Procedure

The subject is made to rest for at least 15 min and then made to lie supine with neck a little extended by placing a pillow under the shoulders. The carotid arteries are scanned as low in the neck as possible to as high in the neck as possible behind the angle

of mandible. This approach enables us to ascertain the course of the vessel as well as the bifurcation level and the direction of the branches. The common carotid intima - media thickness is measured on the distal common wall where the echoes form the intima media complex are most easily distinguished. With careful examination, it is possible to measure common carotid IMT with satisfactory reproducible accuracy.

RESULTS

Statistical analysis was done using Epi Info 2000 package for descriptive statistics. Probability value of $P < 0.05$ was considered to indicate significance.

The mean intima media thickness (Right and Left) of the common carotid artery is found to increase significantly with age from group I to IV ($P < 0.0000001$). There is no significant difference between R and L IMT, hence, the mean value was taken. An increase in the luminal diameter was found from group I to group IV but the increase is not found to be statistically significant.

TABLE I: Parameters studied.

Age groups	Group I	Group II	Group III	Group IV
Mean age (yrs)	30.65	51.91	67.52	83.67
Systolic B.P mm of Hg	121.46	133.12	142.97	150.67
Diastolic B.P mm of Hg	77.69	82.14	86	89.33
Mean IMT R & L (mm)	0.596	0.789	1.04	2.165
Mean LDL R & L (mm)	5.69	6.04	6.44	6.9

There is an increase in mean systolic and diastolic blood pressure from group I to group IV but the increase is not found to be statistically significant ($P > 0.05$).

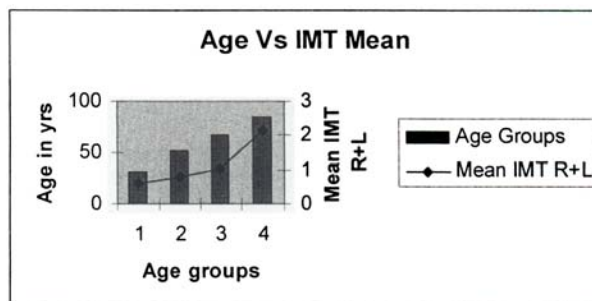


Fig. 1: Increase in mean Intima media thickness of CCA with age.

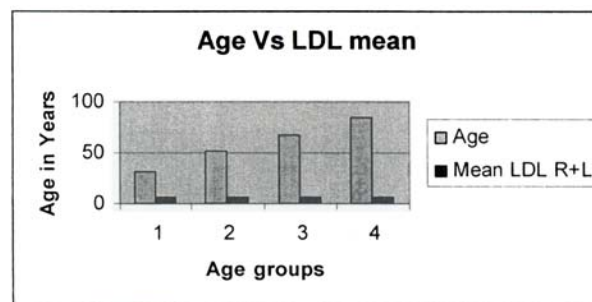


Fig. 2: Increase in luminal diameter of CCA with age.

Discussion and conclusion

Carotid Intima media thickness can be used as a valuable predictor of cardiovascular events as it reflects changes in coronary arteries. It is a simple, safe, reliable, accurate and reproducible technique for evaluating patients risk for cardiovascular disease and stroke (14, 15, 16, 17). The carotid arteries provide a convenient window to the coronary arteries and can detect changes in IMT at an early stage. In contrast to other studies, the present study was done in subjects without any risk factors so as to study only the effects of aging without any confounding factors. The present data demonstrates a strong association between IMT and age particularly older age and shows that baseline IMT predicts future vascular events in a population with a wide age range

(20–85 years). The normal common carotid intima media thickness is 0.5 to 0.8 mm. A significant increase in CCIMT was found with increasing age particularly group III and group IV subjects which supports the previous studies. As the subjects included in the study did not have any risk factors and were normotensive, there was only a small increase in the blood pressure from group I to IV which was not found to be statistically significant. The increase in the luminal diameter from 20 to 85 years is probably a compensatory mechanism by which the arteries try to maintain distensibility. Aging is associated with geometrical changes in carotid arteries (elastic arteries) independent of risk factors like blood pressure. Several studies have shown that aging process is associated with arterial changes (18, 19). Kawasaki et al (20) studied CCA and other arteries and found a significant increase in diameter of all arteries with advancing age. The study suggests that these geometrical changes associated with aging process are probably a means by which the arteries try

to maintain their distensibility. Our data suggests that measurement of common carotid IMT in subclinical subjects may be useful to obtain an estimate of risk that is more precise than that based on the measurement of conventional risk factors alone, and may thus have additional predictive value. The data also confirms the findings of previous large-scale population-based studies.

Recent prospective studies have demonstrated that these measurements of common carotid intimal thickness are potent predictors of Myocardial Infarction and Stroke. Routine use of this technique in clinical settings could improve our ability to decide on preventive therapies to reduce the risk for development of clinical symptoms.

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