

ORIGINAL PAPER

Correlation between atherosclerotic plaques in aorta and morbid pathology of heart

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ABSTRACT

Introduction: Coronary heart disease is now the major killer of humans all over the world. Many studies have shown positive correlation between atherosclerosis of aorta and coronary artery disease. **Objectives:** Coronary heart disease is now the major killer of humans all over the world. Many studies have shown positive correlation between atherosclerosis of aorta and coronary artery disease. This study tries to analyse correlation between presence of atherosclerotic plaques in aorta and morbid pathology of heart. **Methods:** It is a Descriptive, Observational, Cross sectional study, carried out on 406 cases from the autopsies done in RG Kar Medical College Police Morgue selected by Purposive Random Sampling from 1st April, 2014 to 31st March, 2015. All autopsy cases were included except grossly mutilated or decomposed bodies. **Result:** Out of 406 cases, 156(38%) cases showed atherosclerotic plaques in aorta. Weight of heart was significantly more in cases with atheromatous plaques in aorta. Cases with grade II or III atheromatous plaques in aorta showed higher weight of heart and thicker left ventricular wall. **Conclusions:** Presence of atherosclerotic plaques in aorta shows positive correlation with increased heart weight and thicker left ventricular wall. However more thorough multidisciplinary research is needed for better understanding of the role atherosclerosis plays in coronary heart disease.

Keywords: Aorta, Atheroma, atherosclerotic plaques, coronary artery disease, heart, left ventricular wall thickness

INTRODUCTION

The 20th century witnessed profound, unprecedented changes in the natural, man-made, and social environments-dramatic changes in the patterns and distribution of human disease were inevitable. Gone are the days of black plague, now we are living in a time when obesity, hypertension, diabetes have reached pandemic proportions.¹

There is considerable increase in prevalence of coronary heart

disease in urban areas of India since last decade. In the majority of cases, atherosclerosis is the single most important pathological mechanism responsible for coronary heart disease.²

Arteriosclerosis is a generic, inclusive term that describes thickening and hardening of arterial wall. Atherosclerosis is a type of arteriosclerosis. The name comes from the Greek words athero (meaning gruel or paste) and sclerosis (hardness).³ Atherosclerosis is a complex multifactorial inflammatory process, characterized by intimal lesions called atheromatous plaques. Epidemiology has identified acute thrombus anchored on ruptured atheromatous plaques in 70% to 80% of cardiovascular deaths.⁴

Objectives: To note the gross morphology of the heart in autopsy cases with atherosclerotic plaques in aorta and to find out its association with presence of plaques, if any.

METHODS

Study setting: After getting clearance from the Ethics Committee, the present work has been conducted in the RG Kar Medical College & Hospital Police Morgue from 1st April, 2014 to 31st March, 2015.

Definition of study population: The study has been carried on all dead bodies brought to RG Kar Medical College & Hospital Police Morgue for medico-legal autopsy.

Inclusion/exclusion criteria: All autopsy cases were included

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except grossly mutilated or decomposed bodies.

Sample size: The study has been carried out on total of 406 cases from the autopsies done in RG Kar Medical College Police Morgue selected by Purposive Random Sampling.

Study design: It is a Descriptive, Observational, Cross sectional study.

Consent: As the study included the cases on medico-legal autopsy, so, consent is not required.

RESULT

Out of 406 cases, atherosclerotic plaques in aorta were found in 156 cases. **Table I** shows distribution of cases with highest grade of atheromatous plaques in aorta with mean weight of heart. In cases with grade II or III plaques in aorta, mean weight of heart increases. Correlation analysis gives Pearson’s $r = 0.526$, i.e. a positive correlation exists between the two variables; P value $<.01$, i.e. this correlation is statistically significant.

Table 1 Highest grade of atheromatous plaques in aorta with mean weight of heart

Highest Grade of Atheromatous Plaque	Mean Weight of Heart
Grade I	287.89
Grade II	290.47
Grade III	297.52

Table 2 shows Distribution of cases according to highest grade of atheromatous plaques and left ventricular wall thickness. Cases with atheromatous plaques of higher grade have thicker left ventricular wall than others. Correlation analysis gives Pearson’s $r=+0.326$; i.e. there exists a positive correlation between grade of atheromatous plaques in aorta with left ventricular wall thickness- with presence of higher grade of atheromatous plaque in aorta, thickness of left ventricular wall increases. P (2-tailed signify) : <0.001 i.e. the correlation is statistically significant.

Table 2 cases according to LV wall thickness

Grade of Atheromatous Plaques	LV wall thickness			
	<15 mm	15-20 mm	>20mm	>20mm
Grade I	18	17	1	36
Grade II	14	58	13	85
Grade III	3	19	13	35

Out of these 156 cases with Atheromatous plaques in aorta, 24(15%) died of natural causes as found during autopsy. **Table 3** shows frequency distribution of cases with atherosclerotic plaques in aorta who died of natural causes according to weight of heart (n=24). Out of 24 cases with atherosclerotic plaques that died of natural causes, 16(67%) cases had hearts weighing more than 300 grams.

Table 3 cases who died of natural causes according to weight of heart (n=24)

Heart weight	No. of cases
<250	1
250-299	7
300-349	9
350-400	5
>400	2
Total	24

Table 4 shows frequency distribution of cases with atherosclerotic plaques in aorta who died of natural causes according to left ventricular wall thickness (n=24). Out of 24 cases with atherosclerotic plaques in aorta that died of natural causes, in 17 of them left ventricular wall was thicker than 15 mm, including 4 cases where left ventricular wall thickness was more than 20 mm.

Table 4 cases who died of natural causes according to left ventricular wall thickness (n=24)

Left Ventricular Wall Thickness	No. of cases
<15mm	7
15-19mm	11
20-24mm	4
<25mm	2
Total	24

Table 5 showing incidence of atheroma at coronary ostia in cases with atherosclerotic plaques in aorta who died of natural causes according to atheromatous stenosis of coronary ostium (n=24). Out of 24 cases with atherosclerotic plaques in aorta that died of natural causes, 15 cases had atheroma at coronary ostia.

Table 5 Incidence of atheroma at coronary ostia (n=24)

Atheromatous stenosis of Coronary Ostium	No. of cases
Present	15
Absent	9



Photo 1 Original Coloured photograph showing multiple grade II atheroma’s in ascending aorta

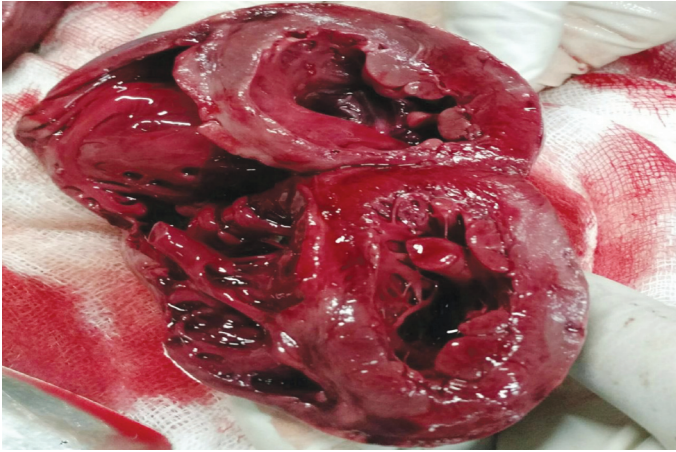


Photo 2 Original Coloured photograph of heart cut along short axis showing thick left ventricular wall

DISCUSSION

In today's modern world, chronic non-communicable diseases or 'life style diseases' have emerged to be responsible for maximum no. of deaths.⁵ Atherosclerosis plays a major role in the pathogenesis of ischemic heart disease and stroke.⁶ This study was done on 406 cases among the medicolegal autopsies done at R.G Kar Medical College & Hospital Police Morgue from 1st April, 2014 to 31st March, 2015. On dissection and examination of aorta, in 156(38%) cases atherosclerotic plaques were seen.

Weight of heart was significantly more in cases with grade II or III plaques or with plaques of all 3 grades in aorta. Similar trend was also seen in case of left ventricular wall thickness of heart-cases with plaques of higher grade had thicker left ventricular wall. Out of 156 cases with atheromatous plaques in aorta, 24(15%) cases died of natural causes. Among these 24 cases with atheromatous plaques in aorta who died of natural causes, weight of heart was more than 300 gms in 16 cases and left ventricular wall thickness was more than 15 mm in 17 cases. 15 of these cases had atheromatous stenosis of coronary ostium. In 5 cases heart showed macroscopic scar secondary to infarction, in 4 cases valves were calcified and in 9 cases coronary arteries were thickened and stenosed. Though the incidence of morbid gross pathological features of heart was found to be more in subjects with atherosclerotic plaques in aorta under this study, conclusions about their correlation cannot be drawn without doing individual corrections for other risk factors of atherosclerosis. This requires a multi-disciplinary approach which was out of scope of this study.

Kallikazaros Ioannis E. et al studied extent of atherosclerosis in aorta and found that among Sixty-two consecutive cardiac patients (mean age 57 years) without a history of atherosclerotic cardiovascular disease 35 patients (56.5%) had atherosclerotic plaques.⁷

Michiel A. de Graff et al published an article elaborating the association of atherosclerotic plaques in thoracic aorta with coronary artery disease in 2013 where they have showed that 81% of cases with CAD showed atherosclerotic plaques in thoracic aorta. They also showed significant correlation between

prevalence of atherosclerotic plaques in aorta and increased left ventricular wall thickness of heart.⁸

Bashe WJ Jr and Baba N, Keller et al studied Pathology of atherosclerotic heart disease in sudden death in 1975 in 121 cases of sudden death and the authors concluded with statistically significant histological evidences that sudden cardiac deaths are results of functional instability of the myocardium produced by advanced coronary atherosclerosis.⁹

Meissner Irene et al in 2004 found that during five-year median follow-up of a random sample of 585 persons, cardiac events had occurred in 95 subjects. Complex plaques were found to be associated with cardiac event only after adjusting for other clinical risk factors.¹⁰

Agmon Yoram et al studied relation of coronary artery disease with atherosclerosis of the thoracic aorta in the general population in 2002. They found that Coronary artery disease was found to be strongly associated with complex aortic atherosclerosis in the general population.¹¹

Hence, findings of this study corroborates with similar studies done around the world regarding positive association between atherosclerosis and morbid changes in heart. However, it is also a proven fact that with lifestyle modification like dietary changes, light aerobic exercises, cessation of smoking or with better control of blood sugar and hypertension, atherosclerosis progression not only can be stopped, but can be reversed also.¹² Studies done using modern technologies like Trans-Oesophageal Echocardiography¹³ or 18-FDG PET among cases and controls selected on the basis of various risk factors, have yield valuable inputs regarding factors contributing to progression of atherosclerosis.

CONCLUSION

Many studies done around the world has proved that inception of atherosclerosis may be seen in childhood, even in infancy. If sufficient support becomes available from public and private fronts, on the basis of the findings from these studies, mass awareness programmes need to be adopted by governments and as well as by NGOs to educate people about the benefit of lifestyle modification and early medical intervention in reducing morbidity and mortality from Atherosclerotic Cardio-vascular Diseases and ischemic strokes.

Conflict of interest: No conflict of interest associated with this work.

Contribution of authors: We declare that this work was done by the author(s) named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. We declare that We contributed significantly towards the research study i.e., (a) conception, design and/or analysis and interpretation of data and to (b) drafting the article or revising it critically for important intellectual content and on (c) final approval of the version to be published.

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