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Evaluation of Coronary Atherosclerosis and Other Pathological Findings in Heart Autopsy in A Tertiary Care Hospital: A Retrospective Study

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Abstract

Introduction: Cardiac autopsy is the main diagnostic tool to study various histomorphological changes in normal and diseased heart. An autopsy study gives a good measure of the prevalence, grading and distribution pattern of atherosclerotic lesion especially in developing country where resources are limited. *Methodology:* This retrospective study was conducted in Department of Pathology, Hassan Institute of medical sciences, Hassan . The study period was between January 2013 to August 2016. Heart specimens were obtained from medico legal autopsy performed in the Department of Forensic Medicine,Hassan Institute of Medical science. Heart specimens received as a part of examination of multiple viscera or only heart was taken out from dead body for pathological examination. *Results:* Out of 149 autopsied heart130(87%) of cases showed significant coronary artery atherosclerosis in one or more vessels and Triple artery disease was commonest involvement seen in 114 (76%) cases. *Conclusion:* This study highlights the cardiovascular risk factor screening from early ages of third decades. Most of our observation correlated with the similar studies.

Keywords: Coronary Atherosclerosis; Histopaothology; Heart Autopsy.

Introduction

Coronary artery disease is a leading cause of death in both men and women representing 30% of mortality in the world; An estimated 17.5 million people died from cardiac cause in2005; out of these 7.6 million were caused by coronary artery disease [1], and now it is projected by the year 2015, coronary arteries would cause around 2.95 million deaths, of which 14% of mortality will be in population under 30 yrs of age and 31% deaths will occur in subjects below the age of 40 yrs [2].

Considering the fact that the rate of atherosclerotic lesion is increasing in India, studying the prevalence of atherosclerosis in a population helps the health administrators to plan preventive measures and possible measures for reversal of atherosclerosis. In view with the race, risk factors and geographical diversities present in India, exact data and prevalence of coronary artery diseases are extremely diverse.

Cardiac autopsy is the main diagnostic tool to study various histomorphological changes in normal and diseased heart [3]. An autopsy study gives a good measure of the prevalence, grading and distribution pattern of atherosclerotic lesion especially in developing country where resources are limited.

Materials and Methods

This retrospective study was conducted in Department of Pathology, Hassan Institute of medical sciences, Hassan. The study period was between January 2013 to August 2016. Heart specimens were obtained from medico legal autopsy performed in the Department of Forensic Medicine,Hassan Institute of Medical science.Heart specimens received as a part of examination of multiple viscera or only heart was taken out from dead body for pathological examination.

We received about 169 heart specimens during the

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study period, out of which 19 specimens were autolysed and in onecase only part of the heart specimen was sent were coronaries could not be traced.These 20 specimens were excluded from the study. The details about age and sex were taken from requisition forms , for majority of the cases previous medical history was unavailable. The study was approved by the institute ethical committee.

The heart was dissected by following standard autopsy protocol. The heart was fixed in 10% formalin, weighed and then investigated for the presence of scars of MI. Measurements of right ventricular wall, left ventricular wall, interventricular septa were taken. Circumferences of mitral,tricuspid,pulmonary and aorticvalves were noted. The three coronary arteries were dissected out. Each coronary artery was then sectioned by closely spaced cuts. The exposed artery was carefully examined for any thickening, yellow streaks, frank plaque or calcification, then theventricles were sectioned transversely at 10 mm intervals commencing from apex.

All histological sections were examined microscopically for the presence atheroma,heart disease, MI. Modified American Heart Association (AHA)grading of atherosclerotic plaque was done which classify the atherosclerosis based on morphological description [2].

Grade 1: Isolated intimal foamy cells (minimal change)

Grade 2: Numerous intimal foamy cells often in layers (fatty streak)

Grade 3: Pools of extracellular lipid without a well defined core (intermediate lesion or Preatheroma)

Grade 4: Well defined lipid core with luminal surface covered by normal intima (atheroma or fibroplaque)

Grade 5: lipid core with a fibrous cap with or without calcification (fibro-atheroma)

Grade 6: fibroatheroma with cap defect such as hemorrhage and thrombosis

Grade 7: calcification prominent

Grade 8: fibrous tissue change prominent

The degree of atherosclerosis was also classified as unremarkable (Grade 0), mild (Grade1-2), moderate (Grade 3-4), and severe (Grade 5-8) [3].

Results

During the study period from Jan 2013 to Aug 2016, 169 autopsied hearts were submitted to the department of pathology. Of which 19 specimens were autolysed and one of the specimen consists of only part of cardiac tissue, these 20 specimens were excluded from the study.

For many of the cases previous medical history were not available and came with various causes of death like sudden death, road traffic accidents, poisoning and other medico legal causes.

The age of subjects ranged from 2-80 yrs. Among 149 cases which were under study, 119 (78.8%) were males and 30(20.13%) were females. The average weightof heart of 149 subjects in males and females was found to be 297 gms and 245gms respectively.

All the subjects were grouped into specific age groups based on the age at the time of death. The age and sex distribution of all 149 cases are given below.

Table 1: Age and sex distribution

	Sex		
Age GR	**F**	**M**	**Total**
<20	1 (3.3%)	7 (5.88%)	8 (5.37%)
21-30	4(13.3%)	16 (13.5%)	20(13.4%)
31-40	8(26.7%)	34(28.6%)	42 (28.2%)
41-50	12(40%)	32(26.9%)	44(29.5%)
51-60	1(3.3%)	24(20.2%)	25(16.8%)
>60	4(13.3%)	6(5%)	10(6.7%)
TOTAL	30(100%)	119(100%)	149(100%)

Out of 149 autopsied heart130(87%) of cases showed significant coronary artery atherosclerosis in one or more vessels and Triple artery disease was commonest involvement seen in 114(76%) cases.

The involvement of individual coronary artery and severity of atherosclerosis is shown below

Table 2: Showing degree of atherosclerosis

GRADE	RCA (%)	LAD (%)	LCA (%)
Unremarkable	3(2.01%)	3(2.01%)	2(1.34%)
Mild	16(10.74%)	12(8.05%)	12(8.05%)
Moderate	82(55.03%)	58(38.93%)	78(52.35%)
Severe	48(32.21%)	76(51.01%)	57(38.26%)
TOTAL	149(100.00%)	149(100.00%)	149(100.00%)

Table 3: Age wise distribution of atherosclerotic lesion in Right coronary artery using AHA grading

	Right coronary artery (AHA grading)								
AGE GR	0	1	2	3	4	5	6	7	Total
<20	3	1	3	1	0	0	0	0	8
21-30	0	0	7	11	2	0	0	0	20
31-40	0	0	3	27	8	4	0	0	42
41-50	0	0	0	5	22	16	0	1	44
51-60	0	0	0	2	2	9	10	2	25
>60	0	2	0	1	1	1	3	2	10
Total	3	3	13	47	35	30	13	5	149
	2.01%	2.01%	8.72%	31.54%	23.49%	20.13%	8.72%	3.36%	100.00%

Table 4: Age wise distribution of atherosclerotic lesion in left anterior descending coronary artery using AHA grading

	Left anterior descending coronar artery (AHA grading)									
AGE GR	0	1	2	3	4	5	6	7	8	Total
<20	3	1	2	2	0	0	0	0	0	8
21-30	0	0	5	9	6	0	0	0	0	20
31-40	0	1	2	11	22	6	0	0	0	42
41-50	0	0	0	0	6	23	11	4	0	44
51-60	0	0	0	0	1	6	9	7	2	25
>60	0	1	0	1	0	0	2	5	1	10
TOTAL	3	3	9	23	35	35	22	16	3	149
	2.01%	2.01%	6.04%	15.44%	23.49%	23.49%	14.77%	10.74%	2.01%	100.00%

Table 5: Age wise distribution of atherosclerotic lesion in Left circumflex artery using AHA grading

	Left circumflex coronary artery (AHA grading)								
AGE GR	0	1	2	3	4	5	6	7	Total
<20	2	2	4	0	0	0	0	0	8
21-30	0	0	2	18	0	0	0	0	20
31-40	0	0	3	19	19	1	0	0	42
41-50	0	0	0	0	21	19	2	2	44
51-60	0	0	0	0	0	14	11	0	25
>60	0	1	0	1	0	0	1	7	10
TOTAL	2	3	9	38	40	34	14	9	149
	1.34%	2.01%	6.04%	25.50%	26.85%	22.82%	9.40%	6.04%	100.00%

3rd decade of life appears to be a watershed line in pathogenesis of coronary vascular atherosclerosis, we also obsereved steady increase in overall frequency and severity of atherosclerosis from 3rd decade onwards.

Table 6: Frequency and degree of atherosclerosis in different coronary vessels before and after 3rd decade of life

Atherosclerosis grading	<30 YRS				>30 YRS			
	RCA	LAD	LCX	AORTA	RCA	LAD	LCX	AORTA
UR	4	4	4	4	0	0	0	0
MILD	14	10	9	25	0	0	0	5
MOD	11	15	16	0	71	43	62	110
ADV	0	0	0	0	49	77	58	5
TOTAL	29	29	29	29	120	120	120	120

Table 7: Sex wise distribution of atherosclerotic lesion

	RCA (no. of cases)				LAD (no. of cases)				LCX (no. of cases)			
	Normal	Mild	Mod	Severe	Normal	Mild	Mod	Severe	Normal	Mild	Mod	Severe
Male	2	16	60	41	2	12	45	60	1	12	60	46
Female	1	0	22	7	1	0	13	16	1	0	18	11
Total	3	16	82	48	3	12	58	76	2	12	78	57

Evidence of acute MI was observed in found in 17(12%) of cases healed scar was found in 5 (3%) of the cases. The other cardiac pathology were observed during study withdissecting aortic aneurysm (1 case), hypertrophic cardiomyopathy (3 cases), and Rheumaticheart disease (1case), Granulomatous pericarditis (1 case).

Discussion

In our study out of the 149 heart studied , 119 (78.8%) were males and 30(20.13%) were females and this proportion is similar to most of the studies conducted by Garg et al [9], Choudary et al [5], Suri AK et al [6] and Priti et al [3] indicating coronary atherosclerosis was more common in men.

The average heart weight of male and female subjects were 297grams and 245grams respectively which correlated with studies conducted by Priti et al, Garg et al. In our study we encountered 3 cases of hypertrophic cardiomyopathy with heart weight was ranging from 480—560 grams.

Cases were divided into different age group, maximum incidence of atherosclerosis were seen in 4th decade followed by 3rd decade which correlated with studies of Yazdi et al [7] and Thej et al [8], Prabhu et al [9].

American heart association classified atherosclerotic lesion from grade 1 to grade 7. It was proposed that these lesions progressed from one type to another. Now plaque rupture is established to be the most important determinant of thrombus mediated acute coronary syndrome [15]. Theatheroma(grade4) type was more common type followed by preatheroma type (Grade 3). Together (Grade 3 & 4) accounted for the moderate atherosclerosis accounted for 52% of cases which correlated with studies done by and Thej et al [8]. But significant number of cases showed advanced lesion like fibro atheroma with capsular defect like hemorrhage and thrombosis. Incidence of advanced lesions in RCA (32.21%), LAD (51%), LCA (38.26%) and aorta (28.19%). LAD was most common coronary artery involved . Similar findings were seen in studies of Yazdi et al [7], Garg et al [4], Thej et al [8], choudary et al [8].

Atherosclerotic lesion develop very early in lifeand progresses as the age advances. Majority of the studies, Priti et al [3], Thej et al [8], Choudary et al [10]) showed increased in frequency and severity of atherosclerosis after 3rddecade. In present study even though features of atheroma seen even before 20 yrs but significant atheroma appeared third decade onwards and thereafter there is a gradual increase both in frequency and severity.

In our study maximum cases (76%)had involvement of all the three vessels. When compared with other studies conducted by Garg et al [4], Yazdi et al [7] and Priti et al [3].

In the present study it was observed that both Frequency and severity of coronary atherosclerosis was more in males when compared to females which is in concordance with study done by Prabhu et al [9], Thej et al [8]. Only one case of MI (3%) was seen who was in her 5th decade with advanced lesions in all 3 coronaries.

Acute MI was seen in 16 (10.74%)cases concordant with the data given by Priti et al(10.8%) [3], slightly more when compared to Garg et al (3%) [4]; age of MIpatients ranged between 30-80 yrs,maximum number of patients were in their 5th decade. This was in concordance with data given by Garg et al and Priti et al [5,9].

During our study period we all observed varities of other cardiac pathologies. There was a case of Granulomatous Pericarditis, patient was 22 year old female showed multiple tubercular granuloma in myocardium and over pericardial surface. A 55 year old male came with a history of sudden death , On dissecting aortic aneurysm was detected on cardiac autopsy. We also witnessed a case of Rheumatic artery disease in 35 year old female with tricuspid incompetence and severe mitral stenosis, microscopically aschoff bodies were seen . There were 3 cases of Hypertrophic cardiomyopathy were seen with ventricular thickness ranging from 3.8 -4 cms.

Conclusion

In our study, although we saw variety of cardiac pathologyin autopsied hearts coronary atherosclerosis

being the most significant pathogenetic mechanism and three vessel disease is the common pattern of involvement. The study showed unexpectedly high prevalence ofcoronary atherosclerosis in study population

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