Original Research Paper

Pathology

CLINICOPATHOLOGICAL STUDY OF CORONARY ARTERY DISEASE IN AUTOPSY SPECIMENS OF HEART: A RETROSPECTIVE STUDY

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ABSTRACT

AIM/OBJECTIVES: The aim of this study was determine the prevalence, grading and site of involvement of coronary atherosclerosis in post-mortem hearts.

MATERIAL AND METHODS: This retrospective study was carried out in the Department of Pathology over a period of 18 months. 350 Heart specimens obtained from medico legal autopsies were included. Coronary arteries were inspected grossly and sections from representative areas were studied for microscopic evidence of atherosclerosis by staining with Hematoxylin & Eosin (H&E).

RESULTS: Prevalence of atherosclerotic lesions was 38.2% with marked male preponderance. Significant atheroma appeared in 3rd decade onwards and gradually increased in frequency, reaching maximum prevalence in 5th decade. Left Anterior Descending (66.2%) followed by Right Coronary Artery (42.3%) were the commonly involved vessels. Single vessel and Triple vessel disease were seen in 36.7% and 33.1 % cases respectively.

CONCLUSIONS: Autopsy based study of prevalence of Atherosclerotic lesions gives us a fair idea of Coronary artery disease burden in our population. There is a higher prevalence of atherosclerosis in Indians, which may be due to changes in life-styles and other risks factors. Adequate preventive measures should begin as early as third decade of life.

KEYWORDS : Autopsy; Atherosclerosis; Coronary Artery Disease; Atheroma

INTRODUCTION:

Coronary artery disease (CAD) is a multifactorial disease mostly affecting middle aged people. According to the World Heart Federation, 35% of deaths due to cardiovascular disease in India occur in people aged 35-64 years [1]. Documented risk factors for CAD include obesity, sedentary lifestyle, smoking, hypertension, high LDL and low HDL levels, Diabetes, Hypertriglyceridemia and Stroke [2]. Prevalence of CAD is two-times higher in urban than in rural India [3].

Atherosclerosis is a multifactorial disease involving large and medium sized arteries [4]. It is characterised by plaque like intimal deposits containing neutral fats, cholesterol, lipophages, and blood elements with presence of haemorrhage and calcifications in few of them [4]. Known complications of atherosclerosis include IHD, stroke, peripheral gangrenes etc. [5]. CAD due to atherosclerosis is an epidemic in India and incidence of CAD has doubled during last three to four decades [2]. Advances in medical and interventional therapies and effective secondary preventive measures have lead to extended life expectancy and an improvement in the quality of life in patients with CAD [2]. However despite these achievements, the prevalence of CAD remains high and the exact data on the prevalence of coronary atherosclerosis or clinical CAD is extremely diverse [2]. Autopsy plays a major role in determining the prevalence of atherosclerosis and also determines the grading and distribution pattern of atherosclerotic lesions in the population.

So this retrospective study was carried out to determine the prevalence of Atherosclerotic lesions in autopsy specimens of heart and grade these lesions according to luminal narrowing and American Heart Association Classification.

MATERIAL AND METHODS:

This retrospective study was carried out in a tertiary care centre in north India from January 2017 to June 2018. Specimens of heart obtained from the medicolegal autopsies in the institute as well as in other health care centres of the region were included. The relevant information regarding the age, sex and apparent cause of death were noted. The specimens were weighed and fixed in 10% buffered formalin. The heart was opened by modified Virchow's Method and a detailed gross examination of the heart specimen was carried out with respect to right and left ventricular wall thickness, interventricular septum thickness and the major vessels. All the coronary arteries and their branches were sectioned by multiple closely spaced cuts and the exposed arteries were carefully examined for any thickening, yellow streaks, frank plaque or calcification or other obvious macroscopic lesion. After routine processing and paraffin embedding, 3-5 micrometer thick paraffin sections were cut, dewaxed and stained with Haematoxylin and Eosin stain. Other stains were performed according to need and nature of lesion. Histopathological examination was carried out for the presence of any atherosclerotic changes and were graded according to the American Heart Association Classification and on the basis of percentage of luminal Narrowing [6,7,8].

RESULTS:

350 heart specimens formed the material of the study. Of these, 10 specimens were autolysed. Majority of the patients belonged to fifth decade of life. Out of the 340 specimens examined, atherosclerosis was seen in 130 cases, of which 120 were males and 10 females (Table 1). Overall prevalence of atherosclerosis was 38.2%. Atherosclerotic lesions were seen in 2 cases in 2nd decade, however significant atheroma was seen after third decade and maximum prevalence was seen in 5th decade (Table 1). Grade V atheroma was the commonest type of atherosclerosis (25.1% cases) followed by Grade IV (17.9) and Grade II (16.6) lesions (Table 2).

Left anterior descending artery (LADA) was most commonly involved (66.2%) followed by right coronary artery (RCA) (42.3%) and Left Circumflex artery (LCX) (29.2%). According to the percentage luminal narrowing, 39.7 % and 31.3 % cases showed Grade I and II narrowing while Grade III and IV narrowings were seen in 15.6 and 13.4 % cases respectively (Table 3). Single vessel involvement was commonest and seen in 48 (36.7%) cases. Triple vessel involvement was seen in 33.1% cases while 30% cases showed double vessel involvement.

DISCUSSION:

Medicolegal autopsies are mandatory legal requirement in unnatural deaths to assist the law and are the most useful way to determine the condition of internal organs of the body. It also has a significant role in the development of new understanding about existing diseases and provides opportunity to discover new diseases. Autopsy provides a means of understanding the basic process which sets a stage for clinically significant atherosclerotic cardiovascular disease [4]. As no valid method of sampling living population is present, so autopsy specimens in patients with deaths suspected due to cardiovascular pathology provide the best sample

of the living population for studying atherosclerosis [4].

In our study, the prevalence of atherosclerosis was found to be 38.2% similar to previous studies [4]. Majority of the cases were males (Table 1) similar to previously published studies [2,4]. This may be due to fact that males are usually bread earners, which makes them more vulnerable to accidents, violence and stress and indulging themselves in smoking, alcoholism etc [2]. Also Males have a high preponderance of CAD than females till menopause as estrogen has protective effect against atherosclerosis. No atherosclerosis was seen in 1st decade while only two cases were seen in 2nd decade. Frequency of atherosclerosis in third decade was 6.2% with a steep rise in the frequency of atherosclerosis in fourth (18.5%), fifth decade (34.6%) and sixth decades (25.4%) (Table 1). Our results were comparable to studies by Agravat AH et al [2] and Garg M et al [9] who observed significant atheroma in the third decade and thereafter increased gradually. Wig KL et al [10] found significant atheroma in two-third of cases above age 20 and maximum incidence in sixth decade. This sudden increase of atherosclerosis after second decade is likely due to increased stress, competition, employment and settlement related problems [4]. All these modifiable life style related risk factors are known to increase the risk of atherosclerosis [4].

AHA has classified atherosclerotic lesions from Type I to Type VIII and it is proposed that these lesions progressed from one type to the next [11]. Commonest atherosclerotic lesion in our study was Grade V seen in 25.1% cases, similar to previous study [4]. This was followed by Grade IV, Grade II and Grade VII lesions (Table 2). Significant coronary artery disease (type IV -VIII) was seen in 63.1% cases, similar to previous studies [11].

Coronary involvement in LADA, RCA and LCX were 69.2%, 42.3% and 29.2% respectively. Our results were in concordance with study by Sudha et al [12] who showed LADA as the commonest site for plaque formation and Yazdi et al [13] who showed LADA as the most commonly involved artery (60%) followed by RCA (50%) and LCX (42.5%). Garg M et al [9] also showed the most common involvement of LADA (38.1%) followed by RCA (35.1%) and LCX (34%). Single vessel involvement was commonest (40%) followed by triple and double vessel involvement in 37% &15% cases respectively. Virmani R et al. [6] also showed single vessel disease as the commonest pathology in their study. However Garg M et al. [9] and Yazdi [13] reported triple vessels as the most commonly involved vessels.

CONCLUSIONS:

Coronary Artery Disease is a fairly common cause of morbidity and mortality in developing countries. Types of lesions varied from fatty streaks to obstructive lesions. Left descending artery was the commonest vessel to be involved followed by Right Coronary Artery. Autopsy based studies are cost effective procedures and help in estimating the future disease burden in the population particularly in developing nations like India. The information is invaluable in policy formation for the control of coronary artery diseases in this era, where the incidence of coronary artery diseases has shown an alarming increase.

Table 1: Age and Sex Distribution of patients with Coronary Atherosclerosis (N=130)

Age Group	Atherosclerosis/ Percentage	Number of Males	Number of Females
0-10	0/0	0	0
11-20	2/1.5	2	0
21-30	8/6.2	8	0
31-40	24/18.5	24	0
41-50	45/34.6	42	3
51-60	33/25.4	29	4
61-70	12/9.2	9	3
>70	6/4.6	6	0
Total	130	120	10

Table 2: American Heart Association Grading of Atherosclerotic Lesions in coronary arteries

Type of Plaque	RCA	LCX	LAD	Total/Percentage
I	8	3	6	17/9.5
II	10	2	18	30/16.6
III	3	6	10	19/10.6
IV	12	8	12	32/17.9
V	9	12	24	45/25.1
VI	3	0	7	10/5.5
VII	8	5	11	24/13.4
VIII	0	0	2	2/1.1
Total	55	38	86	179

Table 3: Luminal narrowing grades in Coronary Arteries

Grade	RCA	LCX	LAD	Total/Percentage
I	25	10	36	71/39.7
II	12	18	26	56/31.3
III	10	4	14	28/15.6
IV	8	6	10	24/13.4
Total	55	38	86	179

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