RESEARCH ARTICLE

INCIDENCE OF ATHEROSCLEROSIS IN DIFFERENT CORONARY ARTERIES AND ITS RELATION WITH MYOCARDIAL INFARCTION: A RANDOMIZED STUDY IN 300 AUTOPSY HEARTS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Cardiovascular disease especially myocardial infarction is one of the major causes of death in today's world. Atherosclerosis is thought to be one of the most important factors behind the increasing incidence of myocardial infarction.

Aims & Objective: This study was undertaken to find out the incidence of atherosclerosis in different coronary arteries, its correlation with increasing age and sex and with that of myocardial infarction of heart.

Material and Methods: Study was performed on 300 hearts received from medicolegal autopsy cases in a tertiary care hospital, that were examined to find out the incidence of myocardial infarction and atherosclerosis in different coronary arteries.

Results: Incidence of atherosclerosis and myocardial infarction was found to be more in men than in women (M:F ratio is 7:1 in atherosclerosis and 11:1 in myocardial infarction). The incidence of both increases with age. The left anterior descending artery (LAD) was the most common coronary artery involved by atherosclerosis (33%), especially type V atherosclerosis and in myocardial infarction (31%). Root of aorta was involved by atherosclerosis in only 16% cases and in 35% cases of myocardial infarction (MI). Triple vessel disease was most commonly (67.5%) associated with myocardial infarction, but a single case of myocardial infarction without involvement of any of the coronaries was reported. Regarding MI and type of atherosclerosis, more number of coronaries in MI was involved by type V atherosclerosis with occlusion, but type VI was more associated with MI.

Conclusion: Atherosclerosis and myocardial infarction are more common in men and with increasing age group. Atherosclerosis of coronary arteries may lead to myocardial infarction, but the confounding effect of other lifestyle factors and age, sex and comorbid diseases can't be excluded, for which further study is required.

Key-Words: Atherosclerosis; Myocardial Infarction; Coronary artery

Introduction

Cardiovascular disease is one of the leading cause of death in the south Asian countries especially India. Cardiovascular disease accounts for 24% of death in India out of the total 53% non-communicable deaths.[1,2] Coronary atherosclerosis is known to be one of the major culprits behind myocardial infarction and subsequent mortality. Detailed demographic study to find the incidence of coronary atherosclerosis in deaths in different sexes and age groups in western India especially Surat has not been carried out. Similar studies in other parts of India have shown that the incidence of coronary artery atherosclerosis increases with age and there is an increased incidence in males.[2-5] The purpose of this study is to find the incidence of coronary atherosclerosis in different age groups and sex in the district of Surat, South Gujarat (India) and determine the correlation between atherosclerosis and myocardial infarction and ischemia.

Materials and Methods

The study was carried out on 371 medico legal cases in autopsy section of pathology department, Government Medical College, Surat. Heart was not received in 18 cases and was completely autolysed in 47 cases. So these 71 cases were excluded from the study. All the hearts received were dissected by short-axis method.[6-8] The heart was cut from the apex horizontally upto 2.5 cm from the atrioventricular junction with every 1 cm interval. The was looked for any pale or white

areas. One section each from apex, left ventricular wall, right ventricular wall & interventricular septum was given. After that, the heart was cut in the direction of blood flow i.e. superior & inferior vena cava ⇒ right atrium ⇒ right ventricle ⇒ pulmonary artery & pulmonary vein ⇒ left atrium ⇒ left ventricle ⇒ aorta.

The coronaries were looked and palpated for thickened or calcified areas and one section each from left coronary artery, right coronary artery, left circumflex artery & aorta was given. The section from aorta was from root of aorta. All the sections were then processed routinely in an automatic tissue processor and stained by haematoxylin and eosin stain. Myocardium was looked for presence of ischaemia or infarction. Coronaries & aorta were looked for presence of atherosclerosis. The grading of atherosclerosis has been done according to American Heart Association. Those arteries having more than 60% occlusion of lumen were mentioned in the study.

Results

300 post-mortem hearts were studied for CHD. Heart was examined grossly as well microscopically for chronic ischemic changes, healed infarct & acute myocardial infarction. Coronaries and aorta were examined for presence of atherosclerosis and then graded for morphological type according to the American Heart Association. The study comprised of cases spanning 14 - 90 years. Out of 300 cases, 262 (87%) were males and 38 (13%) were females (Table 1). Majority of the cases belonged to the 5th decade of life (27%), followed by the 3rd and 4th decade of life (each 22%) (Table 1). 50% (151) of the cases were young individuals (aged < 40yrs) of which 84% (126) were males and 16% (25) were females.

Atherosclerosis

Regarding involvement of coronary arteries by atherosclerotic lesions, the LAD was the most commonly involved (33%) and the RCA the least (29%). The aorta was involved to a lesser extent (15%) than the coronaries. Left anterior ascending (LAD) was more associated with Type V and Type VI atherosclerosis (table 2).

Table-1: Age & Sex wise Distribution of Cases (n=300)

Age (years)	Male	%	Female	%	Total	%
<19	11	4	04	1	15	19
20-29	55	18	13	4	68	22
30-39	60	20	08	3	68	23
40-49	72	24	09	3	81	27
50-59	38	12.5	00	0	38	12.5
60-69	17	5.5	02	1	19	6.5
>70	09	3	02	1	11	4
Total	262	87	38	13	300	100

Table-2: Incidence and Type of Atherosclerosis in Different Coronary Arteries and Root of Aorta (n=300)

Type of Atherosclerosis	LAD	LCX	RCA	Aorta
Type III	29	37	29	29
Type IV	33	26	35	16
Type V	33	20	20	05
Type VI	06	03	05	0
Total	101	86	89	50
Total in %	33	28	29	16

Table-3: Incidence of Atherosclerosis in Different Age Groups

Age	No. of Cases	No. of Arteries Examined	No. of Arteries Showing Atherosclerosis	%
20-29	68	272	28	10
30-39	68	272	52	19
40-49	81	324	112	34
50-59	38	152	75	49
60-69	19	76	37	48
>70	11	44	24	54

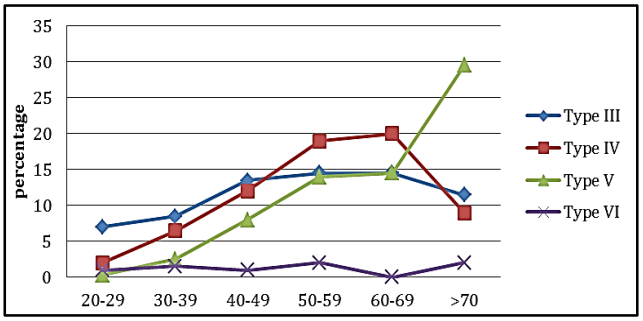

Figure-1: Age wise Distribution of Atherosclerosis

Table-4: Involvement by Different Grades of Atherosclerosis in Different Age Groups

Age	Type III (%)	Type IV (%)	Type V (%)	Type VI (%)
20-29	7	2	0.3	1
30-39	8.5	6.5	2.5	1.5
40-49	13.5	12	8	1
50-59	14.5	19	14	2
60-69	14.5	20	14.5	0
>70	11.5	9	29.5	2

Table-5: Incidence and Type of Atherosclerosis Associated with Occlusion in Coronaries

Types	LAD (101)	LCX (86)	RCA (89)	Total	%
Type III (95)	-	1	-	1	
Type IV (94)	9	3	9	21	22
Type V (73)	19	13	10	42	57
Type VI (14)	4	2	4	10	71
Total	32	19	23	74	
%	31	11	25		

Figure in bracket indicates the total number of coronaries involved by atherosclerotic changes

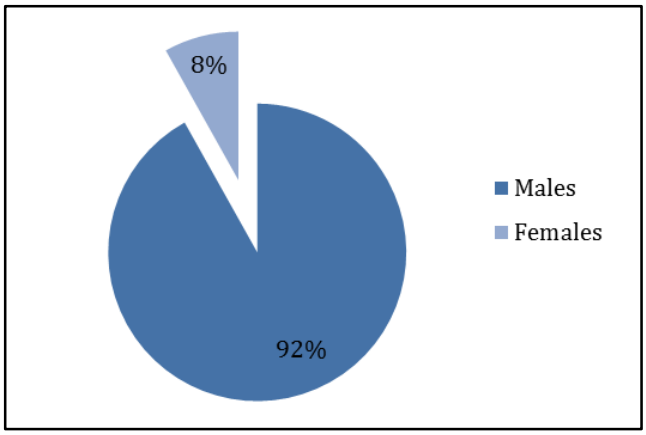

Figure-2: Incidence of Ischemia/Infarction in Different Sexes

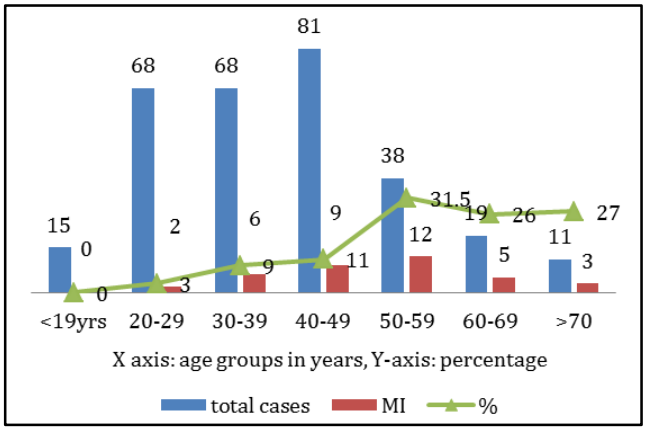

Figure-3: Age Wise Distribution of MI Cases

Table-6: Involvement of No. Coronaries in Myocardial Infarction

3 Coronaries	2 Coronaries	1 Coronary	No Coronary
25	5	6	1

Table-7: Atherosclerosis associated with Occlusion in Individual Coronary Artery in Cases of Ischemia/Infarction

Coronary	Atherosclerosis + Occlusion
LAD	14
LCX	10
RCA	08
Total	32

Table-8: Incidence of Type of Atherosclerosis associated with Occlusion in cases of Ischemia/ Infarction

Type	Ischaemia/ Infarction	Atherosclerosis with Occlusion	%
Type III	26	01	4
Type IV	35	07	20
Type V	31	17	55
Type VI	9	07	78

Table-9: Comparison of Incidence of Atherosclerosis with Occlusion in All Cases with Cases of Ischemia and Infarction

Arteries	All cases	Cases of Ischaemia or Infarction
LAD	32	14
LCX	19	10
RCA	23	8

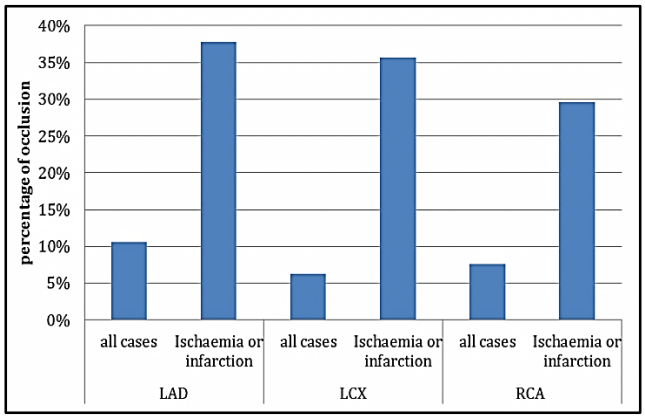

Figure-4: Comparison of Incidence of Atherosclerosis with Occlusion in All Cases with Cases of Ischemia and Infarction

The percentage of atherosclerotic lesions in the arteries increased with age of the persons, with persons above 70 yrs having the highest involvement (52%) (Table 3, figure 1). The incidence of type III atherosclerosis decreases with age while that of type V increases (Table 4, figure 1). A total of 74 coronaries showed occluded atherosclerosis, out of which LAD was the most commonly involved (31%) and LCX the least (11%). Type VI atherosclerosis was more (71%) associated with a complete occlusion and type III the least (table 5).

Myocardial Ischemia

Only 12.3% (37) showed changes of myocardial ischaemia or infarction, of which 92% were male and 8% female (figure 2). Maximum number of ischemia/infarction occurred in the 6th decade (31.5%) (Figure 3). Out of the 37 cases that showed changes of myocardial ischaemia/ infarction, only 25 cases (67.5%) had a triple vessel disease, 5 cases (13.5%) had involvement of 2 coronary artery, 6 (16%) cases had involvement of 1 coronary artery and only 1 (3%) case had involvement of none (table 6). LAD occlusion was found in more number of cases of ischaemia/infarction and RCA the least (Table 7). While the numbers of vessels with type V atherosclerosis with occlusion in myocardial ischaemia cases were more, type VI was more associated with occlusion (78%) (table 8). Table 9 shows incidence of occlusive atherosclerosis in all 300 cases and 37 cases showing changes of ischemia/ infarction. In 300 cases occlusive atherosclerosis was present in 74 (26%) coronaries, while in cases showing ischemia/ infarction it was present in 32 (86%) coronaries.

Discussion

The purpose of this study is to find the incidence of coronary atherosclerosis in different age groups and sex in the district of Surat, Gujarat (India) and determine the correlation between atherosclerosis and myocardial infarction and ischemia. The present study shows that the incidence of atherosclerosis increases with age, the highest being the 7th decade. Also, the type of atherosclerosis changes from type 3 to type 5 as age increases. The finding collaborated with that of other studies.[9,10] This may be due to increased incidence of comorbid factors like diabetes, hypertension, chronic smoking and other lifestyle risk factors that increases with age. Regarding the involvement of individual arteries by atherosclerotic lesions, left anterior descending (LAD) was the most commonly involved with the type of atherosclerosis being type 4 or type 5. This can be explained with the help of the fact that LAD supplies the major part of left ventricle and any occlusive atherosclerosis (type 5) leads to decrease blood supply to major part of the left ventricle and also the conducting systems leading to arrhythmias and left ventricular failure and ultimately death.

Regarding incidence of ischemia and myocardial infarction, maximum number of cases occurred in the 6th decade. The finding is in sync with the previous finding that incidence of atherosclerosis is more in the 7th decade of life, suggesting that both atherosclerosis and ageing may play an important role in causing death due to myocardial ischaemia in later age groups. Only 12.3% showed changes of myocardial ischaemia or infarction, of which 92% were male and 8% female. Myocardial infarction may have a sex predilection, but it is not possible to infer this point from this study as various comorbid factors like lifestyles, smoking, alcohol, diabetes, hypertension etc. can act as compounding factors in the causation of myocardial ischaemia. Further cohort studies with a larger group are required to find out the role of individual factors behind myocardial ischemia.

When it comes to the involvement of coronary arteries in myocardial ischemia, triple vessel disease was more associated with infarction than double or single vessel involvement.[9,10]

One case of myocardial infarction had no coronary artery involvement, pointing to the fact that there may be other factors other than atherosclerosis behind the causation of infarction.

Conclusion

From this study it can be concluded that atherosclerosis is one of the most important factors for myocardial infarction and its incidence and severity increases with age. The LAD is one of the most common sites of atherosclerosis and its involvement along with the other two coronaries is one of the major causes behind myocardial ischemia. Further studies are advised to find out the role of individual factors behind myocardial infarction.

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