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Correlation of atherosclerotic and thrombotic coronary artery disease with anatomical distribution

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ABSTRACT

Atherosclerosis is a slowly progressive disease of arteries marked by elevated fibro fatty intimal plaque involving large to medium sized muscular arteries like coronary arteries. Atherosclerotic changes occur not in a uniform pattern. It tends to occur in certain predisposed regions. The distribution of coronary artery in the coronary artery and its branches are studied in dead bodies brought for post mortem examination. The incidence of atherosclerotic change in relation to the branches of coronary arteries is studied. The incidence of atherosclerosis was found to be more at the branching site of the coronary arteries. It was maximum at the site of division of the left main coronary into anterior descending (ADB) and circumflex (LCx) branches. The branching site (BS) and its proximal part also showed equal incidence. Right coronary (RCA) showed maximum incidence at the branching site (BS). The proximal part of right coronary showed relatively lower incidence.

Key words: Atherosclerosis, coronary artery branching, coronary artery disease

INTRODUCTION

Atherosclerosis is a chronic inflammatory and healing response of the arterial wall to endothelial injury. Hemodynamic changes in the blood flow precipitate intimal changes predisposing to atherosclerosis. The whole length of the coronary arterial system is not uniformly vulnerable to atherosclerotic (AS) lesions [1]. The importance of hemodynamic turbulence in atherosclerosis is illustrated by the observation that atherosclerotic changes tend to occur at the ostia of blood vessels, branch points and along the posterior wall of abdominal aorta where there are disturbed flow pattern [2]. Hemodynamic changes in the blood flow

precipitate intimal changes predisposing to atherosclerosis [3]. Atherosclerotic changes are seen in the coronary artery branches in the following order. Firstly the major trunks, where they lie epicardially. There are sites of predilection in the three major arteries. The most common site of occlusion is the first two centimetres of the anterior descending branch of left coronary artery (LCA). The next is the right coronary artery (RCA). The third common site is the proximal part of circumflex artery soon after bifurcation from the common trunk. The present study proposes to correlate and find out whether there is an increased incidence of atherosclerosis at sites of divisions of coronary

arteries. Coronary arteries and their branches are usually epicardial. In some individuals in some regions a bunch of cardiac muscle fibres pass over these vessels like a bridge, termed as myocardial bridge [4] and such an artery is called tunnelled artery or intramural coronary artery. The clinical significance of myocardial bridges varies and most patients are asymptomatic. However angina, acute myocardial infarction, ventricular fibrillation, cardiac arrhythmias and sudden death have been reported in association with myocardial bridges [5]. The occurrence of AS in coronary artery segments under myocardial bridges is controversial, as previous studies reported that they are rarely affected [6,7]. The present study was carried out to study the atherosclerotic and thrombotic coronary artery disease with anatomical distribution.

MATERIAL AND METHODS

The study was approved by Institutional Ethics Committee. A written, informed consent was obtained from relatives and investigating officer. The study was performed in accordance with the "Ethical Guidelines for Biomedical Research on Human Participants, 2006" by the Indian Council of Medical Research and the Declaration of Helsinki, 2008.

SETTING

The study was conducted over a period of January 2012 to March 2013 in a Government Medical College.

PARTICIPANTS AND INCLUSION AND EXCLUSION CRITERIA

100 dead bodies (79 were males and 21 females) above the age of 45yrs brought for post mortem examination were analysed. In 18 cases death was due to cardiac causes and in the rest due to other causes.

METHODS

During routine autopsy the heart was removed and the coronary arteries and their main branches were dissected by making serial 3 mm cross sections. The presence of atherosclerotic changes and narrowing of the lumen if any were assessed and measured using scale. The coronary artery was opened along its length, branches identified and changes at the

branching sites are examined and documented. The severity of atherosclerotic change is noted as Simple atheroma, complicated plaques like calcified atheroma, rupture of plaques and thrombosis. Photographs were also taken and magnified and observed for early raised fatty streak formation.

DATA ANALYSIS

Data was analyzed by SPSS 20.0.

RESULTS

Results were presented in table no 1 and table no 2. Table no 1 presents atherosclerotic changes in various branches. Right coronary ostium: Anatomical dislocation was seen in 9% of cases. Right coronary origin: Proximal part of RCA showed AS in 28%. 2% showed calcified atheromatous change. 1% showed thrombosis and vessel wall calcification. Right coronary proximal to branching site: showed AS in 19%. 2% showed calcified atheromatous plaque. Right coronary branching site: Branching site of right coronary into right marginal and posterior descending showed AS in 39%. 2% showed calcified atheromatous change. Out of the cases which showed AS 44.4% were males and 33.4% were females. Right coronary distal to branching site: 10% showed AS change. Left main trunk origin: 27% showed AS. 7% showed calcified atheromatous plaque. 6% showed coronary calcification. 1% showed calcified atheromatous change. Left main trunk proximal to branching site: AS was present in 9%. 2% showed calcified atheroma. 1% showed vessel wall calcification. Left main trunk Branching site: AS present in 66%. 7% showed AS with calcification. 72.1% were males and 76.2% females. Left anterior descending branch proximal part: Showed AS in 44% of cases. 2% showed coronary calcification. 1% showed thrombus superimposed on atheroma. 50.6% were males and 52.5% were females. Left anterior descending proximal to branching site: 14% showed AS. Left anterior descending –branching site AS in 52%. Calcified atheroma in 6%. 3% showed thrombus. 67.1% were males and 39.4% females. LAD Distal to branching site: AS present in 11%. 2% showed calcified atheroma. Circumflex proximal to branching site: AS present in 36%. 1% showed AS with calcification. Circumflex Branching site: AS present in 23%. 1% showed calcified atheroma.

Circumflex Distal to branching site: None showed AS change. Myocardial bridging was present in the middle one third of LAD in two cases and two in the distal one third of LAD. One of them showed slight thickening of intima due to atherosclerosis. It was observed that the incidence of AS in males and females were almost same in

1. Branching site of LCA

2. Proximal part of LAD.

The following site showed higher incidence among males

1. Left main trunk
2. RCA branching site.
3. Branching site of LAD

Distribution of Atherosclerotic changes

Table no: 1 atherosclerotic change in various branches.

Site	Normal	Athero Sclerosis (AS)	Calcified atheroma	Thrombus	Coronary Calcification (CC)	Total AS and its complications
1.Right coronary (RC)Ostea	16	64	10	--	--	74
2.RC Proximal Branching site	79	19	2	--	--	21
3.RC Branching site	58	39	2	1	--	42
4.RC Distal Branching site	90	10	--	--	--	10
5.Left main trunk origin	59	27	7	--	6	40
6.Left main Proximal Branching site	88	9	2	--	1	12
7.Left main Branching site	27	66	7	1	--	73
8.Left Anterior descending (LAD)proximal part	49	44	4	--	--	51
9.LAD Proximal to Branching site	86	14	--	--	--	14
10.LAD Branching site	39	52	6	3	--	61
11.LAD Distal to branching site	87	11	2	--	--	13
12.Circumflex (Cx) proximal	62	36	--	--	--	36
13.Cx branching site	76	23	1	--	--	24
14.Cx distal branching site	100	0	--	--	--	0
15.Diagonal artery (Absent in16)	71	13	--	--	--	13
16. Left coronary ostea	16	73	11	--	--	84

DISCUSSION AND CONCLUSION

Evaluation of Right and left coronary ostia revealed that the left coronary ostium was more prone for

developing atherosclerotic changes than the right. The incidence of calcification of atheroma was almost the same. Anatomical dislocation of the ostia was more common on the right side. Next to

coronary ostia the branching site of the left coronary artery showed maximum incidence of atherosclerosis (73%). This is higher than the other reported incidences. Next to coronary ostia branching site of left main coronary artery showed maximum incidence of atherosclerosis. As per the previous studies the incidence of atherosclerosis is the greatest at the proximal extramural part of anterior descending branch (45-64%), followed by proximal part of right main coronary artery (24-46%), left circumflex (3-10%) and left main coronary artery (0-10%). (1). In the present study the incidence of

atherosclerosis was maximum at the site of division of the left main coronary artery into LAD and circumflex branches. The branching site of LAD and the proximal part of LAD showed equal incidence. Right coronary artery showed a maximum incidence of atherosclerosis at the branching site, near the origin of marginal artery (41%). The proximal part of right coronary artery showed a relatively lower incidence of AS compared to the branching site. The proximal part of left circumflex showed an incidence of 38%. The incidence of calcification appeared to be age related.

Branch	Proximal segment	Proximal to Branching site	Branching site	Distal to branching site
RCA	30	21	41	10
LCA main	41	12	73	---
LAD	51	14	52	13
LCx	38	24	23	Nil

CONFLICTS OF INTEREST: Nil

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