Effect of Dominance on Atherosclerosis

SHAMIMA PARVIN LASKER [a], ZAHIDUL HASAN [b], M. R. SARKER [c], LABUDA SULTANA [d], LUTFUN NESSA [e]

ABSTRACT: Coronary arteries were studied on 110 postmortem human hearts during January 2000 to December 2001 in the department of Anatomy and Microbiology, Bangladesh Medical College to observed. The pattern of coronary dominance and its relation with atherosclerosis was observed. Atherosclerosis was found in 49(44.5%) samples, among which 37(56.%) were from male and 12(26.7%) from female hearts. This difference was significant (P<0.01). Right dominance was observed in 72 (65.5%) cases while 17 (15.5%) had left dominance and 21 (19.1%) had balanced type of circulation. Balanced type of circulation was observed more among females (14; 66.7%) while left dominance was more frequent among males (13; 76.5 %). This defference on the basis of sex was significant (P<0.05). Significant (P<0.001) relationship was also observed between atherosclerosis and dominance of coronary artery. It may be concluded that atherosclerosis was present in almost half of the studied subjects and was found more among males. Left dominance was more frequently present among males it was associated with atherosclerosis.

Key Words: Arthrosclerosis, dominance, gender

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a. Shamima Parvin Lasker , Assistant Professor, Dept of Anatomy, Bangladesh Medical College.
b. Prof. Zahidul Hasan , Professor and the Head , Dept of Microbiology, Bangladesh Medical College.
c. Prof M.R. Sarker, Professor and Head, Dept of Anatomy, Bangladesh Medical College.
d. Dr. Labuda Sultana, Assistant Professor and Head, Dept of Children, Preventive and Community Dentistry, Dental Unit, Bangladesh Medical College.
e. Dr. Lutfun Nessa MBBS, Managing Director, Lutfa Nursing Home and Family Health Care, Mirpure, Dhaka.

*Corresponding author: Shamima Parvin Lasker
                     Assistant Professor,
                     Dept of Anatomy, BMC
                     Email:splasker04@yahoo.com

INTRODUCTION

Cardiovascular disease (CHD) remains the leading cause of the death in the United State today [1]. In UK, it causes about one third of all deaths in men and about a quarter of all deaths in women [2]. In 1985, the incidence of ischemic heart disease (IHD)in Bangladesh was reported to be 14 per thousand [3]. So cardiovascular disease (CVD) are a major causes of mortality, morbidity and disability of the elderly in both developed and developing country [4].

It is said that anatomical variation of coronary artery is associated with heart disease. Shorter length of left coronary artery is associated with development of atherosclerosis, left dominance is related with aortic valve lesion and myocardial bridge is related with ischemia, atherosclerosis, angina and sudden death etc [5-9]. No study has yet been done to determine the relationship between atherosclerosis and dominance in Bangladesh. The present study has been undertaken to determine the frequency of dominance of coronary arteries and its relationship with atherosclerosis among people of Bangladesh.

MATERIALS AND METHODS

This observational study was carried out on 110 postmortem hearts of people of Bangladesh. The study was conducted during January 2000 to December 2001 at the Department of Anatomy and Microbiology, Bangladesh Medical College (BMC) Dhaka. The specimens were collected from dead bodies that underwent medico legal examinations in the morgue of Dhaka Medical Collage, Dhaka. Since no routine postmortem examination is done in our country for cases other than unnatural deaths, only medico legal cases such as accidental, suicidal or homicidal cases could be selected for the study. Thus, their deaths were not caused by any known cardiovascular ailment. Specimens that had any sign of putrefaction were rejected. The subjects below age of 20 years were also excluded from the study.

When posterior interventricular artery arises from right coronary artery it is called right dominance, and when it arises from left coronary artery it is called left dominance. If this artery is double in number and arise from both right and left coronary arteries it is then known as balance type of circulation.

Atherosclerosis from coronary arteries was detected by method recommended by WHO [10,11.] The right coronary artery was cut from its root up to first 3 cm. For left coronary artery, first 3 cm of anterior descending and circumflex arteries were taken. They were then split longitudinally and pressed tightly between two glass slides. The flattened arteries were then kept in this state and immersed into formalin for 48 hours. Then the vessels were stained with Sudan-IV solution (Herxheimer's solution). Atherosclerotic lesions stained bright red.

Significant difference in the association of two features in the various group were sought using the chi-square test.

RESULTS

The study was carried out on 110 postmortem hearts of which 65 were from males and 45 from female's hearts. The age of the subjects ranged between 20 to 48 years with a mean ($\pm$ SD) of 28.5 ($\pm$ 7.0) years irrespective of sex.

Atherosclerosis was found in 49(44.5%) samples. Figure 1 shows the atherosclerotic plaque and calcification. Atherosclerosis was found in 37(33.6%) male and 12(10.9%) female hearts (Table 1). This difference was significant (P < 0.01).

Figure 2,3,4 shows the different types of dominance. Table II shows the different type of dominance in relation to sex. It also shows that the right dominance was observed in 72 (65.5%) while left and balanced type of circulation was present in 17(15.5) and 21(19.1) respectively. Balanced type was observed more (14; 66.7%) among females. On the other hand, left dominance was more frequent among males (13; 76.5 %). Significant difference was observed between different types of

dominance among males and females (P<0.05). Table III shows highly significant relationships between atherosclerosis and dominance of coronary arteries (P<0.001). The balance type of circulation was least affected by atherosclerosis and maximum was from female hearts (Table II). Right dominance was most affected by atherosclerosis but there was no significant difference between among sex. Left dominance was moderately affected by atherosclerosis and maximum were from male (Table II).

Table 1. Atherosclerosis in coronary arteries relation to sex.

Atherosclerosis	Sex		Total	X^2	P
	Male	Female			
Present	37 (56.9%)	12 (26.7%)	49 (44.5%)	9.854	.002
Absent	28 (43.1%)	33 (73.3%)	61 (55.5%)		

Table 2. Dominance in relation to sex.

Dominance	Sex				Total	X2	P
	Male		Female				
	No	%	No	%	%		
Right	45	62.5	27	37.5	72 (65.5 %)	8.234	0.016
Left	13	76.5	4	23.5	17 (15.55 %)		
Balanced	7	33.3	14	66.7	21 (19.11%)		

Table 3. Atherosclerosis and dominance

| Dominance	Atherosclerosis			X2	P
	Present	Absent	Total		
Left	11 (64.7%)	6 (35.3%)	17	21.641	.000
Right	38 (52.8%)	34 (47.2%0	72		
Balanced	0	21 (100.01)	21		
Total	49	61	110		
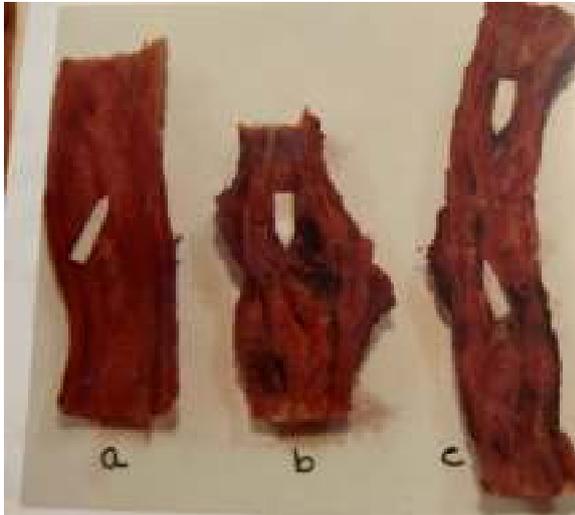
Fig. 1: Shows the atherosclerosis plaque (a) and calcification (b, c)

Fig.-3: Posterior Interventricular artery arose from left coronary artery (No 6) casing left dominance.
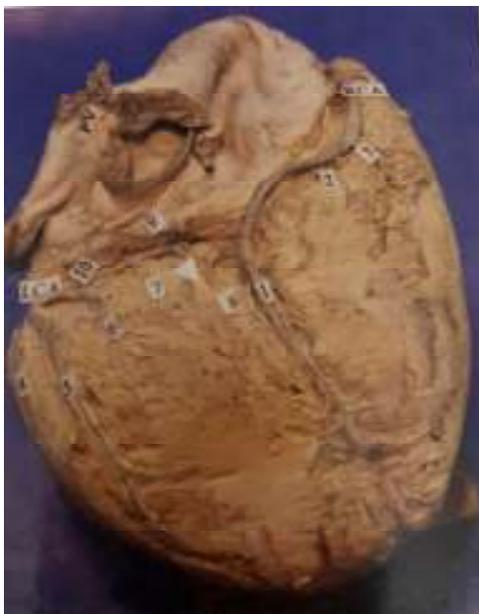
Fig.-2: Posterior Interventricular artery arose from right coronary artery (No 1) casing right dominance.

Fig.-4: Posterior Interventricular artery arose from both right (No 2) and left (No 6) coronary artery casing balanced dominance.

DISCUSSION

The age of the individuals was taken from police report at the Department of Forensic Medicine, Dhaka Medical College. These records depended on the statements made by the attendants of the deceased or an eye estimation made by concerned officer. Therefore, the age of each individual should be considered as approximate one.

Hearts of individuals whose age were below 20 were excluded from the study. Firstly, because adult weight of the heart is achieved between 17 and 20 years and secondly, the evidence of atherosclerosis in coronary artery starts from second decade [9,10]. Postmortem studies on diseased heart may some times introduce bias as the terminal illness could influence the presence or extent of atherosclerosis. In this study chance of such bias was less as our samples were taken from accidental deaths. Holman indicated that no difference existed between the hearts of accidental and natural deaths[9]. He also concluded that atherosclerotic condition of hearts from accidental death could be representative of living population.

In the past, studies on heart diseases were mostly focused on males. Females were supposed to suffer less from ischemic heart diseases as they were thought to be protected by hormonal influences during the premenopausal period [10,11]. But Giardina suggested that cardiovascular disease has claimed more lives of females than in males in the United States of America since 1984 [12]. She studied on primary prevention of cardiac disease by hormonal replacement therapy. But she did not find any relationship between atherosclerosis and estrogen / progesterone replacement. Though the complete result will be available in 2004. Reis et al worked on 159 women and their mean age was 52.9 years. They found similar results [13]. In our study female sample size was small moreover their mean age was 28.5 (±7.0) (not shown in table). Furthermore, we also found that almost half of the studied subject had atherosclerosis. Since mem age of our study population was only 28.5 yerars, tn may be presumed that frequency of occurrence of coronary atherosclerosis might be much higher among elderly people of Bangladesh. Because it is said that Atheros lerosis increase with age[10-14].

Frequency of dominance of our study was almost similar to the findings of other studies [15-16]. We also found that left dominance was more among males and associated with atherosclerosis, Female had balance type of circulation and not effected by atherosclerosis. These observations are similar to others [5,7,16]. However, Hutchins et al suggested that the type of dominance starts at the beginning of development and it is fixed throughout life. They also suggested that left coronary artery has

physiological dominance because it supplies greater myocardium[16].

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REFERENCE

1. Walter HJ,Hofman A,Vaughan FD,Wynnder El. Modification of risk factors for coronary heart disease .N Engl J Med 1988;318:1093-99.

2. Fowler G, Fullard E. Coronary heart diseases: Prevention and risk factors. Practitioner 1989; 233:423-26.

3.Amanullah M. Intravenous thrombolytic in acute myocardial infraction (Editorial0. Bangladesh heart journal 1994; 9:1-4.

4.Malic A. Congenital and acquired heart disease. BMRC Bulletin 1976;11(2):115.

5. Chandrasekar B, Sudarsana G and Abraham KA. Aortic valve disease and left dominant coronary system a significant association. J Assoc physicians India 2000 Feb; 48(2): 210-2

6. Ishii T, Asuwa N, Masuda S and Ishikawa Y. The effect of myocardial bridge on coronary atherosclerosis and ischemia. J Pathol 1998; 185(1): 4-9.

7. Kober G, Klepzig HJr. and Kaltenbach M. Left predominant coronary circulation in patient with valvular aortic stenosis. Clin cardiol 1986 Aug; 9(8): 383-7.

8. Gazetopoulos N, Ioannidis PJ, Karydis C, Lolas C, Kiriakou K and Tountas C. Short left coronary artery trunk as a risk factor in the development of coronary atherosclerosis. Br Heart J 1976 Nov; 38(11): 1160-5.

9. Holman RL, McGill HC Jr, Strong JP and Geer JC. The natural history of atherosclerosis. The early aortic lesions as seen in New Orbans in middle of the 20th century. Ann J Pathol 1958b; 34:209.

10. Mathur KS, Patney NL and Kumar V. Atherosclerosis in India: An autopsy study of aorta and coronary, cerebral, renal and pulmonary arteries. Circulation; 1961July; 24: 68:75.

11. Rose G, Prineas RJ and Michell JRA. Myocardial infarction and intrinsic caliber of coronary arteries. Brit Heart J 1967; 29(4): 548-52.

12. Giardina EG. Heart disease in women. Int J Fertil Womens Med 2000 Nov-Dec; 45(6): 350-7.

13. Reis SE, Holubcov R, Conrad SAJ, Kelsey SF, Sharaf Bl and Reichek N. Coronary microvascular dysfunction is highly prevalent in women with chest pain in the absent of coronary artery disease: results from the NHLBI WISE study. AM Heart J 2001 May; 141(5): 735-41.

14. Turjman MW, Krusacute S and Fiejka E. Compatative morphology of the hepatic and coronary artery walls. Part I. Differences in the distribution and intensity of non-atherosclerotic intimal thickening and atherosclerosis. Med Sci Monit 2000 Jan; 6(1): 19-23.

15. Neimann JL, Ethevenot G, Cuilliere M and Cherrier F. Variations of distribution of the coronary arteries (apropos of 3,000 coronarographies) Bull Assoc Anal (Nancy) 1976 Dec; 60(171):769-78.

16. Stemmerman GN, Steer A, Rhoads GG, Lee K, Hayashi T, Nakashima T and Keehn R. Lab Invest 1976; 34(6): 592-600.

17. Vanecek R. Atherosclerosis of the coronary arteries in five towns. Bull World Health Org 1976; 53:509-18.

16. Hutchins GM, Nazarian IH. Bulkley BH. Association of left dominant coronary arterial system with congenital bicuspid aortic valve. Am J Cardiol 1978; 42:57-9.