FREQUENCY OF CORONARY ARTERY ANOMALIES IN PATIENTS OF ISCHEMIC HEART DISEASE

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ABSTRACT

Background: Congenital anomalous origins of the coronary arteries are a rare but well-described cause of myocardial ischemia and sudden death. **Objective:** To determine the frequency of coronary artery anomalies in adult patients undergoing coronary angiography for ischemic heart disease. **Methodology:** A total of 493 consecutive patients with diagnosed Ishemic Heart Disease (IHD) visiting Department of Cardiac Catheterization, Ch. Pervaiz Elahi Institute of Cardiology, Multan were included in this cross sectional study from 15th June to 15th December 2014. Diagnostic coronary angiography was carried out. The outcome variable i.e. coronary anomalies as defined in operational definition were noted on the performa. **Results**: There were 493 patients. Males were 293 (59.4%) while females were 200 (40.6%). Mean age of the patients was 54.45 $\pm$ 13.02 years ranging in age from 18 to 70 years. Coronary artery anomaly was identified in 8 (1.6%). Separate left anterior descending and left circumflex artery was observed in 2 (0.4%), Left circumflex artery arising from right coronary sinus was observed in 1 (0.2%), Right coronary artery arising from left coronary sinus was observed in 2 (0.4%), left coronary artery arising from right coronary sinus was observed in 1(0.2%) while myocardial bridging was observed in 3 (0.6%). One of the patients with myocardial bridging also has left coronary artery arising from right sinus. **Conclusion:** Myocardial bridges were the most frequently encountered problem followed by separate origins of LAD and left circumflex and then right coronary artery arising from the left coronary.

Key words: Coronary artery, Anomalies, Origin

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INTRODUCTION

Coronary angiography remains the standard for indentifying the presence or absence of atherosclerotic coronary artery disease. It provides the most reliable anatomic information for determining coronary anomalies. Coronary anomalies are defined as those angiographic findings in which the number, origin, course and termination of the arteries are rarely encountered in the general population.[1] Normally there are two main coronary arteries. One is left main coronary artery (LMCA) originating from left coronary sinus and the second is right coronary artery (RCA) originating from right coronary sinus. The left main coronary artery has two sub-branches, One is Left anterior descending artery (LAD) and the other is Left circumflex artery (LCX).[1] The major reason for appropriate identification and classification of coronary anomalies is to determine the risk of myocardial ischemia and sudden cardiac death, particularly in young and otherwise healthy individuals.[2] About 80% of coronary artery anomalies are benign while 20% of them cause life threatening symptoms like arrhythmias, syncope, myocardial infarction, or sudden death.[3,4] Prevalence of coronary artery anomalies was estimated as 0.6% to 1.3% in angiographic patients and 0.3% to 0.6% in autopsy cases.[5] The incidence of major coronary anomalies, causing acute myocardial infarction at autopsy (< 35% years of age) was 4%.[6] There are several classifications for coronary artery anomalies but principally divided in 2 groups; anomalies of origin, distribution, intercoronary communications, and coronary artery fistulae.[7,8] Separate origin of LAD and LCX (0.41%) and LCX arising from RCA or Right Coronary Sinus (0.37%) are the most frequently diagnosed anomalies.[9]

In adults, the clinical interest in coronary anomalies relates to their occasional association with sudden death, myocardial ischemia, congestive heart failure, or endocarditis. In addition, presence of coronary artery anomalies may, at times, create challenges during coronary angiography, percutaneous coronary interventions, and coronary artery surgery.[10] Numerous variations in the architecture and course of coronary arteries occur in association with structural cardiovascular malformation e.g. Tetralogy of Fallot (TOF).[11,12,13,14] The objective of this study was to determine the frequency of coronary artery anomalies in adult patients undergoing coronary angiography for ischemic heart disease.

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METHODOLOGY

This cross sectional study was conducted from 15th June to 15th December 2014. After permission from hospital ethical committee and taking consent from patient, 493 consecutive patients visiting Department of Cardiac Catheterization and Interventional Cardiology, Ch. Pervaiz Elahi Institute of Cardiology, Multan were included in this study. Patients with congenital heart disease were excluded from study. Informed consent was taken from each patient describing them the objective of the study, ensuring them confidentiality and the fact that there was no risk involved to them while participating in this study. Diagnostic coronary angiography was carried out and interpreted. Different coronary anomalies were noted, separate origins of LAD and LCX, LCX arising from right coronary sinus, RCA arising from left sinus, artery arising from right coronary sinus and myocardial bridging. The data was analyzed with appropriate statistical procedure by using SPSS version 10. The quantitative variables such as age and duration of disease were recorded as mean ± S.D and qualitative variables like gender and coronary anomaly were recorded as frequencies and percentages.

RESULTS

There were 493 patients included in this study. Males were 293 (59.4%) while females were 200 (40.6%). Mean age of the patients was 54.45 ± 13.02 years ranging in age from 18 to 70 years. Coronary artery anomaly was identified in 8 (1.6%). (Fig I). Separate left anterior descending and left circumflex artery was observed in 2 (0.4%), Left circumflex artery arising from right coronary sinus was observed in 1 (0.2%), Right coronary artery arising from left coronary sinus was observed in 2 (0.4%), left coronary artery arising from right coronary sinus was observed in 1 (0.2%) while myocardial bridging was observed in 3/493 (0.6%). One of the patient having myocardial bridging has also left coronary artery arising from right sinus (Table I). Among these 8 patients in whom congenital anomaly was identified, the mean age of the patients was 45.62 ± 13.75 years. Males were 4/8(50%) while females were 4/8 (50%). When the distribution of gender was noted on frequency of various anomalies, it was noted that overall congenital anomalies were observed in 4/200 (2%) females as compared to 4/293 (1.3%) males (p-value = 0.721). Separate left anterior descending and left circumflex was present in 1/200 (0.5%) females and 1/293 (0.3%) males. Left circumflex artery arising from right coronary sinus was observed in 1/200 (0.5%) females and 0/293 males. Right coronary artery arising from left coronary sinus was identified in 1/200 (0.5%) females and 1/293 (0.3%) males. Left main coronary artery arising from right coronary sinus was observed in 0/200 females and 1/293 (0.3%) males. Myocardial bridging was observed in 1/200 (0.5%) females and 2/293 (0.6%) males.

Figure I: Percentage of patients coronary artery anomalies

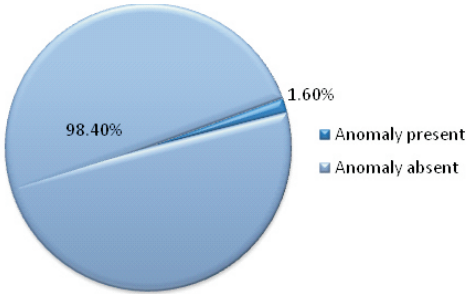

Table I: Frequency of various coronary artery anomalies

Coronary Artery Anomaly	Total Number of patients (n=493)	Percentage
Separate origins of LAD and LCX	2	0.4%
LCX arising from right coronary sinus	1	0.2%
RCA arising from left coronary sinus	2	0.4%
Left coronary artery arising from right coronary sinus	1	0.2%
Myocardial Bridging	3	0.6%

When the distribution of age group was noted on the frequencies of various anomalies it was noted that separate origins of LAD and left circumflex was present in 1/207 (0.4%) patient in age group 46-60 years while it was not found in any patient in 98 patients in age group ≤ 45 and in 188 patient with age above 60 years of age. Left circumflex arising from right coronary sinus was observed in 1/98 (1.02%) patient in age group ≤ 45 while it was not present in any patients in age groups 46-60 years and in those above 60 years. Right coronary artery arising from left coronary sinus was identified in 1/98 (1.02%) patient in age group ≤ 45 and 1/188 (0.5%) patient in age group > 60 years while it was not found in any

patient in age group 46-60 years. Left main coronary artery arising from the right coronary sinus was found in 1/207 (0.4%) patients in age group 46-60 years but was not present in other age groups. Myocardial bridging was identified in 1/98 (1.02%) patient in age ≤ 45, 2/207 (0.9%) patients in age 46-60 years.

DISCUSSION

The subject of coronary artery anomalies (CAAs) is undergoing profound evolutionary changes related to the definition, morphogenesis, clinical presentation, diagnostic workup, prognosis, and treatment of these anomalies.[15,16] Initially, CAAs were the subject of anatomic discussions that centered around the description and classification of unusual morphologies,[1] eventually, the ischemic mechanisms of CAAs and the incidence of these anomalies in the normal human population were addressed in autopsied patients and coronary angiography populations.[17] More recent studies have dealt with vexing questions related to pathophysiological mechanisms and clinical prognoses for different forms of CAAs. In our study there were 493 patients in total. Males were more frequent than females with 293 (59.4%) males while females were 200 (40.6%). Mean age of the patients was 54.45 ± 13.02 years ranging in age from 18 to 70 years. Coronary artery anomaly was identified in 8/493 (1.6%). Our data is similar to that observed in other studies. In one large study in which data was collected retrospectively by analyzing the angiographic data of 12457 consecutive adult patients undergoing coronary angiography between September 2002 and October 2007. Coronary artery anomalies were found in 112 patients (0.9% incidence), 100 patients had origin and distribution anomalies, and 12 patients had coronary artery fistulae. Their mean age was 52 ± 8 years (range, 22-79 y).[18] The mean age as well as the frequency of coronary artery anomalies is comparable to that observed in our study. In another study separate origins of left anterior descending and left circumflex coronary artery from the left sinus of Valsalva was the most common anomaly followed by right coronary artery rising from the left coronary sinus of Valsalva was found in 10 patients, anomalous origin of the left circumflex coronary artery from the right sinus of Valsalva was seen in 10 patients. The left main coronary artery from the right coronary sinus of Valsalva was found in 1 patient while an isolated single coronary artery was seen in 2 patients. In another study myocardial bridges were identified in in 28 (17%) of 165 subjects,[19] which is higher to that seen in our study. Among 8 patients in whom congenital anomaly was identified, the mean age of the patients was 45.62 ± 13.75 years. Males were 4/8. Separate origins of LAD and left circumflex was identified in 2/8 patients. Left circumflex arising from right coronary sinus was observed in 1/8, Right coronary artery arising from left coronary sinus was present in 2/8, left main coronary artery arising from right coronary sinus was identified in 1/8 and myocardial bridging was present in 3/8 patients. When the effect of gender was noted on frequency of various anomalies, it was noted that overall congenital anomalies were observed slightly more frequent females as 2% of the females exhibited the anomalies as compared to 1.3% males. Separate left anterior descending and left circumflex was again present slightly more frequently in females with 1/200 (0.5%) females having this anomaly as compared to 1/293 (0.3%) males. Left circumflex artery arising from right coronary sinus was observed in 1/200 (0.5%) females and 0/293 males. with a statistically non-significant difference (p-value = 0.406). Right coronary artery arising from left coronary sinus was identified in 1/200 (0.5%) females and 1/293 (0.3%) males. Myocardial bridging was more frequent in males as 2/293 (0.6%) males had myocardial bridges as compared to 1/200 (0.5%) females. These findings are consistent with data from other studies in which there was no gross difference between occurrence of coronary artery anomalies among males and females. When the effect of age was noted on the frequencies of various anomalies it was noted that separate origins of LAD and left circumflex was present more frequently in age group 46-60 years with 1/207 (0.4%) patients exhibiting this problem while it was not found in any patient in age group ≤ 45 and those above 60 years of age. Left circumflex arising from right coronary sinus was observed more frequently in age group ≤ 45 with 1/98 (1.02%) patients exhibiting the problem while it was not found in any patients in age groups 46-60 years and in those above 60 years. Right coronary artery arising from left coronary sinus was identified in 1/98 (1.02%) patient in age group ≤ 45 and 1/188 (0.5%) patient in age group > 60 years. Myocardial bridging was identified in 1/98 (1.02%) patient in age ≤ 45, 2/207 (0.9%) patients in age 46-60 years but was not found in any patient in

age > 60 years. Coronary artery anomalies (CAAs) are a diverse group of congenital disorders whose manifestations and pathophysiological mechanisms are highly variable. To understand the clinical impact of CAAs, the fundamental challenge is the firm establishment, for a particular type of CAA, of a mechanism capable of interference with the coronary artery's function, which is to provide adequate blood flow to the dependent myocardium. Frequency of anomalous origination of a coronary artery from the opposite sinus was studied in our study which is the subgroup of CAAs that has the most potential for clinical repercussions, specifically sudden death in the young. For this subgroup, solid diagnostic screening protocols should be established, especially for athletes and other young individuals subjected to extreme exertion. Intravascular ultrasonography is the preferred means to evaluate the mechanisms responsible for ischemia in anomalous origination of a coronary artery from the opposite sinus and other potentially significant CAAs. Patients symptomatic of anomalous origination of a coronary artery from the opposite sinus may undergo medical treatment/ observation, coronary angioplasty with stent deployment, or surgical repair. To be competent to advise CAA carriers, especially in the context of sporting or military activities, cardiologists should undergo specific training in these disorders. Only multicenter collaboration on protocols dedicated to CAAs can give rise to the large-scale studies needed to define the prognosis and optimal treatment of these disorders.

CONCLUSION

The frequency and pattern of coronary artery anomalies in our patient population were identical with those seen in other international studies with myocardial bridges the most commonly encountered problem followed by separate origins of LAD and left circumflex. Left coronary artery arising from right coronary sinus was the least encountered anomaly.

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