

Frequency of Coronary Artery Anomalies in Adult Patients Undergoing Coronary Angiography for Ischemic Heart Disease

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ABSTRACT

Objective: To find frequency of congenital coronary artery anomalies in patients, undergoing coronary angiography.

Study Design: Observational Cross Sectional study.

Place and duration: This study was conducted at the Cardiac Catheterization Laboratory of Lady Reading Hospital Peshawar from March 2009 to March 2020.

Materials and Methods: In this study, a total of 21,362 coronary Angiographies were performed for work up of Coronary artery disease.

Results: Coronary Artery Anomalies were found in 1.9% (n=405) patients. Mean age was 48.5±12.5 years. Males were 69.2% (n=280) and female were 30.7% (n=124). The most common anomaly was anomalous origin of Right Coronary Artery from posterior sinus of Valsalva. It was found in 38.5% (n=156) patients. The diagnostic catheter used was Judkin Right 4, while in 15 patients, it was engaged with Amplatz Right catheter, AR 1. Second most common anomaly was separate origin of Left Anterior Descending artery and Left Circumflex artery. It was found in 30.7% (n=124) patients. All were engaged with Judkin Left, JL 4 Catheters. The third most common anomaly was abnormal origin of Left Circumflex from right sinus of Valsalva in 15.3% (n=62). All were engaged with Judkin Right 4 catheters except in 15 cases, which required 3DRC. Anomalous origin of Right Coronary Artery from left sinus of Valsalva was found in 11.5% (n=46) patients. All were engaged with JL 4 catheters. Only 1% (n=4) patients had LAD-RV fistula. All were engaged with Judkin Left 3.5 catheter.

Conclusion: Coronary artery anomalies were rare findings in adults. Most common anomaly was the anomalous origin of Right Coronary Artery from posterior sinus.

Key Words: coronary artery anomalies, coronary artery disease, catheters

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INTRODUCTION

Coronary artery anomalies, CAD, defined as those angiographic findings in which the number, origin, and termination of the arteries are rarely encountered in the general population.

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It occurs in less than 1% of the population.¹ It is important to appropriately identify the coronary anomalies because they have the propensity to develop fixed or dynamic myocardial ischemia and sudden cardiac death.²

Coronary artery anomalies, although less frequent than congenital anomalies of the heart chambers and valve morphology, should be considered in a wide range of ages, in both sexes and as a possible etiology in myocardial ischemia, infarction, and sudden death, as well as in the planning of heart surgery for coronary revascularization, correction of congenital heart malformations or valve replacement. From the 3660 angiographies they identified 25 patients (0.68%) with coronary artery anomalies and report the prevalence and types of these anomalies in the population studied.³ In a series of 3000 consecutive coronary angiographies carried out in adults (period October 1988 through February 1991) the incidence of coronary artery anomalies was investigated. In approximately 1% of patients, origin anomalies of coronary arteries were

observed. Coronary artery anomalies were discovered in less than 1% of angiography series. Since the number of angiographies and coronary bypass operations are increasing significantly every day, these anomalies are of clinical importance. However, data about left anterior descending artery anomalies in literature is still scarce.⁴⁻⁶

Few studies have been conducted on congenital coronary artery anomalies in our set up. The rationale of the study is to find the frequency of congenital coronary artery anomalies. This study may enable us to plan proper management strategy for patients with congenital coronary artery anomalies. It can also help us in selecting proper catheters for cannulation of these anomalous arteries.

MATERIALS AND METHODS

This observational, cross-sectional study was conducted at Department of Cardiology, Postgraduate Medical institute, Lady Reading Hospital, Peshawar Pakistan; from March 2009 to March 2020. This is a tertiary care hospital which receives patients from across the City and the province. Non probability sampling was done and sample size was calculated to be 1362 using WHO sample size calculator.

Patients were included from both genders, undergoing coronary angiography for work up of coronary artery disease in Post Graduate Medical Institute, Govt. Lady Reading Hospital Peshawar. All those patients were excluded from study who had undergone percutaneous coronary intervention previously, undergone CABG (Coronary artery bypass grafts.), and those having congenital valvular heart diseases and congenital heart disease.

Patients admitted to Cardiology Unit Lady Reading Hospital Peshawar, via Out Patient Department or Casualty and undergoing Coronary angiography for Work up of CAD were enrolled in the study. The diagnostic Criteria for CAD was defined in terms of stable angina, unstable angina, Q-wave MI and non Q-wave MI.¹² Approval of ethical committee was taken from Lady Reading Hospital. The patients were requested to give written informed consent. Coronary angiography was then performed in these patients through femoral artery or radial artery. The angiography report was analyzed and those with anomalous coronary arteries were selected for further assessment. The films were reviewed by two cardiologists independently before being finally classified. In case of difference of opinions, a consensus was reached. The data thus collected were documented on a pre designed questionnaire. The types of catheters used for cannulation of these anomalous arteries were also documented in the questionnaire.

Data obtained after coronary angiograms were documented on the proforma. SPSS version 20 was used for data analysis. Ratio for sex distribution and

Mean ± SD for age distribution was computed. For categorical variables like Anomalous origin, single coronary artery, intercoronary communication, and coronary artery fistulae, frequencies and percentages were computed. The results were presented as Tables and Graphs wherever required.

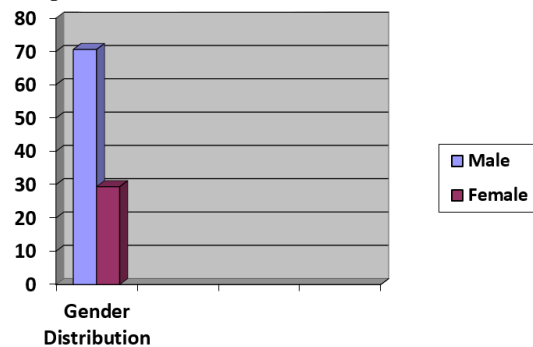
RESULTS

Out of 21,362 patients, 29.4% (n=400) were females as compared to 70.6% (n=962) males. It is shown in Fig 1. The mean age of the sample was 53.86 years with a SD of 10.65 years. Coronary Artery Anomalies were found in 1.9% (n=405) patients as shown in figure 2.

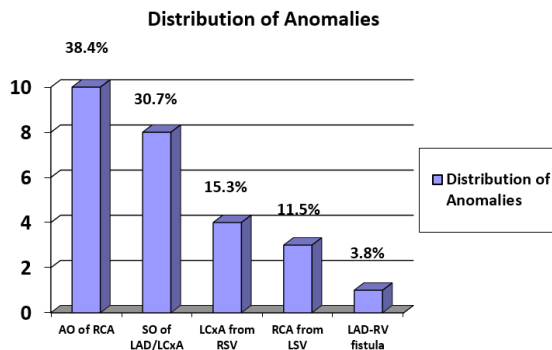
Out of these 405 patients, mean age was 48.5±12.5 years. Males were 69.2% (n=280) and females were 30.7% (n=124).

The most common anomaly was the anomalous origin of Right Coronary Artery from posterior sinus of Valsalva. It was found in 38.4% (n=156) patients. The diagnostic catheter used was Judkin Right 4. Only in 15 patients, it was engaged with AR 1.

Second most common anomaly was separate origin of Left anterior descending artery and Left circumflex artery. It was found in 30.7% (n=124) patients. All were engaged with JL 4 Catheters. The third most common anomaly was anomalous origin of Left Circumflex from right sinus of Valsalva in 15.3% (n=62) patients.

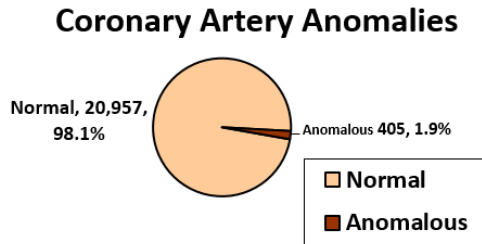


Graph No.1: Gender distribution of coronary artery anomalies



Graph No.2: Frequency of Coronary artery anomalies
All were engaged with Judkin Right 4 catheter except 14 cases, with 3DRC. Anomalous origin of Right Coronary Artery from left sinus of Valsalva was found

in 11.5% (n=46) patients. All were engaged with JL 4 catheters. Only 4 patients (1%) had LAD-RV fistula. It was engaged with Judkin Left 3.5 catheter. The results are shown in the Figure 3 and table 1.



Graph No.3: Distribution of coronary artery anomalies

Table No.1: Different types of catheters used for engagement of anomalous arteries

Sr. No.	Anomalies	%ages	Catheters
1	Anomalous origin of Right Coronary Artery from PSV.	38.4%	All were engaged with JR 4, 15 cases engaged with AR 1.
2	Separate origin of left anterior Descending and Left Circumflex artery.	30.7%	JL 4.
3	Left Circumflex from RSV.	15.3%	All were engaged with JR 4 except 15 with 3DRC.
4	Anomalous RCA from LSV	11.5%	JL 4.
5	LAD from RC fistula.	3.8%	JL 3.5

AO-Anomalous Origin:

- SO-Separate Origin
- RCA-Right Coronary Artery
- LAD-Left Anterior Descending Artery
- RSV-Right Sinus of Valsalva
- LCxA-Left Circumflex Artery

DISCUSSION

Coronary artery anomalies are rare and found in less than 1% population. It is important in a sense that they are an important source of ischemia and sudden cardiac death.⁷⁻¹⁰ According to our knowledge this is the largest study dealing with the frequency of congenital coronary artery anomalies in Northern Pakistan.

We studied 21,362 coronary angiographies from March 2009 to March 2020 in a cross sectional way for work up of Coronary Artery Disease. Anomalies were found in 405 patients (1.9%). The mean age of the patients having anomalies was 48.5 ±12.5 years. Males were 69.2% (n=280) and females were 30.7% (n=124). This is consistent with international studies. Normal coronary anatomy has not been well described in studies on the embryological development of heart and the pathophysiology of coronary anomalies is not well

understood. There are no major works based on unselected large populations defining normal anatomy or variations in the normal arrangements of coronary arteries.¹⁰

A description of the normal is necessary in order to define the abnormal. The work of Angellini, published in 1989, brought to bear a definitive concept in this area. As stated in this work, the primary assumption is that the term normal must apply to 99% of the population, which automatically implies that the prevalence of the coronary artery anomalies must be below 1%.¹¹ Similar ratios have been reported in several large reports.^{12, 13} In these studies, the incidence of coronary artery anomalies is given as 0.2-1.34%. The incidence of coronary anomalies in our study is 1.9%. In this way, this figure is quite consistent with these studies.

The vast majority of the patients who visited our catheterization lab are adults. Probably for this reason, coronary artery anomalies co-existing with major cardiac congenital anomalies were not found in our study. Also, clinically more dramatic pictures, with lethal natural histories in early infancy, such as Bland White Garland syndrome, are not present. Anomalous left coronary artery originating from the pulmonary artery (ALCAPA) is a rare congenital anomaly, present in 1 out of 300,000 live births. This anomaly may cause myocardial ischemia or infarction, mitral insufficiency, congestive heart failure, and death in early infancy, if not treated. Since 90% of these die in infancy of myocardial infarction, congestive heart failure, or sudden death, it is not surprising that in our grown-up population we did not find a patient with Bland-White-Garland syndrome.^{14, 15}

Coronary arteriovenous fistulae (CAVF), represent an anomalous termination. CAVF, first described by Krause in 1865, are present in 1 of 50,000 live births i.e 0.002% of the general population. It is present in 4 out of 1362 cases (1%) our study. This may be congenital or acquired (traumatic, infections or iatrogenic). An angiographic classification scheme has been proposed by Sakakibara et al.¹⁶⁻¹⁷

Coronary artery fistula is treated as left to right shunts. The magnitude of the shunt can be determined by hemodynamic studies; if there are no ischemic symptoms due to coronary steal, surgical indications depend primarily on the magnitude of the shunt. Coronary left sided cameral fistulae must be evaluated as aortic sufficiency. These may also cause ischemic symptoms, and the treatment modality for these anomalies should depend on the symptoms and left ventricular junction.^{10,18}

Anomalies of the aortic origins of the coronary arteries represent one third of all coronary anomalies. This figure is same in our series. In our series, there were 15.3% of left circumflex arising from RSV. While there were 11.5% of RCA from LSV. LMCA from RSV

represents the most serious coronary anomaly of the origin, associated with the highest incidence of symptoms and sudden death.^{10, 19} Fortunately, there were no such cases in our series of patients. The reason could be that since it is a rarity. Thus further large studies are needed to find it.

Most common anomalies in our patients were anomalous origins of RCA from posterior sinus of valsalva. It was found in 156 patients (38.4%). Second most common anomaly was separate origins of Left anterior descending artery and Circumflex artery. They usually pose no serious threats. The problem is engagement of these vessels during coronary angiography. Their frequency is the same as in international studies.^{1,20}

CONCLUSION

Coronary artery anomalies are rare findings in adults. Most are discovered incidentally in adult population. The most common anomaly was the anomalous origin of Right Coronary Artery from posterior sinus of Valsalva. They are usually engaged with Judkin Catheters.

Author's Contribution:

Concept & Design of Study: Noor ul Hadi
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 Revisiting Critically: Noor ul Hadi, Tariq Nawaz
 Final Approval of version: Noor ul Hadi

Conflict of Interest: The study has no conflict of interest to declare by any author.

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