Original Article

Pak Armed Forces Med J 2015; 65(Suppl): S16-19

CORONARY ARTERY DOMINANCE: CT ANGIOGRAPHIC FINDINGS IN 1000 PATIENTS

Muhammad Nadir Khan, Muhammad Adil*, Muhammad Shabbir, Sohail Aziz, Shabnam Hamid*

Armed Forces Institute of Cardiology / National Institute of Heart Diseases Rawalpindi, *Army Medical College Rawalpindi

ABSTRACT

Objective: To determine the pattern of coronary artery dominance in patients undergoing computerized tomography coronary angiography (CTCA).

Study Design: Descriptive study

Place and Duration of Study: Catherization laboratory Armed Forces Institute of Cardiology, Rawalpindi from Aug, 2012 to Aug, 2013 over a time period of one year.

Patient and methods: All 1000 consecutive patients who presented to Catherization laboratory for CTCA for various indications were included in our study. All the patients were selected by non-probability purposive sampling technique. Patients with previous coronary graft bypass surgery, supraventricular arrhythmias, renal insufficiency, allergy to contrast agents, epilepsy, claustrophobia and pregnancy were excluded from the study. All the CTCA images were evaluated in terms of coronary artery dominance and findings were recorded by a checklist. Patients demographic and CT angiography findings were recorded. Finally data was analyzed by using SPSS version 21. Various descriptive statistics were used to calculate frequencies, percentages, means and standard deviation. The numerical data such as age were expressed as Mean ± Standard deviation while the categorical data were expressed as frequency and percentages.

Results: A total of 1000 patients undergoing CTCA were included in this study out of which 705(70.5%) were males and remaining 295(29.5%) were females with male to female ratio of 2.54:1. Age range of the patients was 16-95 years with mean 51.89±12.59 years. Right coronary artery was dominant in 849(84.9%) patients while left coronary artery was dominant in 113(11.3%) patients and 38(3.8%) patients were co-dominant.

Conclusion: Right coronary artery is dominant in most patients while co-dominance is least and there is no significant association between coronary artery dominance and gender.

Keywords: Co-dominance, CTCA, Left dominance, Right dominance.

INTRODUCTION

The arterial supply of the heart is very critical for the normal functioning of the myocardium. The variation which exists in its branches are gaining importance because of different bypass surgeries and angiographic procedures[1]. The coronary arteries supplying the heart are first branches of aorta i.e. right and left coronary arteries. They arise from the corresponding aortic sinuses at the proximal part of the ascending aorta, just superior to aortic valve[2]. The right coronary artery divides into posterior descending artery and acute marginal artery which supply blood to right ventricle, right atrium, SA node, AV node and a variable portion of the left ventricle. While the left coronary artery branches, left anterior ascending artery and circumflex artery supply blood to the front of the left side of the heart, lateral side and base of the heart[3].

Coronary circulation is defined in different ways. However Hettler defined coronary circulation as right coronary artery dominance, left coronary artery dominance and co-dominance[4]. The coronary artery is defined by the relationship between the coronary artery branches in the region of the confluence of the atrial, ventricular and atrioventricular groove; the crus cordis and is determined by the artery that emits the posterior interventricular branch[5,6]. The blood vessel supplying the posterior descending artery and at least one posterolateral branch is called the dominant vessel. In people having right dominance, right coronary artery gives rise to posterior descending artery and at least one posterolateral branch. The RCA is dominant in about 85% of patients. While in left coronary artery dominant patients left circumflex artery gives rise to posterior descending artery. In co-

Correspondence: Dr Muhammad Nadir Khan, AFIC / NIHD Rawalpindi
Email: yesnadirkhan@gmail.com

dominant patients RCA gives rise to PDA and the LCx provides the posterolateral branches[7].

CTCA has revolutionized the cardiac field and is increasingly used in patients with known or suspected coronary artery disease[8]. It is a useful diagnostic as well as prognostic tool[9]. CTCA not only describes the dominance pattern but also gives information regarding the presence and degree of stenosis.

The pattern of dominance of coronary arteries varies in different regions of the world. In general population right dominance is more prevalent being 87-89%, left dominance has a prevalence of 7-8% while co-dominance is least with prevalence of about 4%[10]. Anomalous origin and distribution of coronary artery may be the cause of exertion syncope, myocardial infarction, exercise induced arrhythmias or sudden cardiac arrest often in association with physical exertion. Therefore the angiographer should be able to identify anomalies in order to perform accurate evaluation and avoid subsequent errors in management. The cardiac surgeon must have knowledge of abnormal anatomy in order to avoid accidental ligation or transection at the time of surgery[11].

Table: 1 Coronary artery dominance with gender.

Characteristic	Right dominance	Left dominance	Co-dominance
Male (70.5%)	595 (84.39%)	82 (11.63%)	28 (3.9%)
Female (29.5%)	254 (83.05%)	31 (10.5%)	10 (3.3%)

Table-2: Comparison of different studies.

Author	Place	Year	Right dominance	Left dominance	Co-dominance
AAA Abdellah[2]	Sudan	2004	77%	8%	15%
Vasudeva Reddy J[3]	South India	2012	86.25%	11.26%	2.5%
F G Altaii[10]	Damascus	2008	77%	8%	15%
Depik Chandra Das[7]	Assam	2010	70%	18.57%	11.43%
Mehboobur Rehman[4]	Pakistan	2011	60.5 %	19.5%	20%
Dr.Hussein Ali[11]	Iraq	2010	76.4%	12.6%	10%
Jyoti P Kulkarni[12]	India	2013	90%	10%	

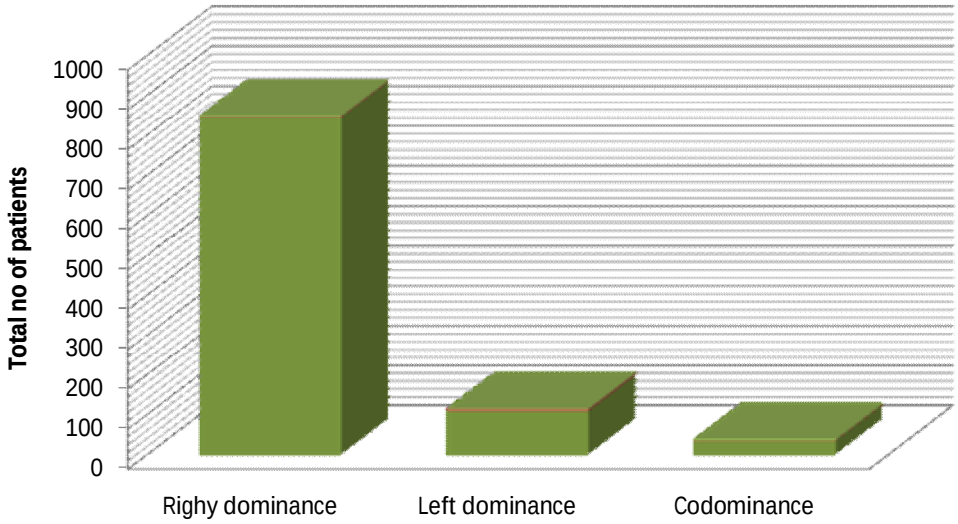

Figure-1: Showing coronary artery dominance.

MATERIAL AND METHODS

This descriptive study was carried out at Catherization laboratory, Armed Forces Institute of Cardiology Rawalpindi over a

period of one year. All the patients above the age of 16 years who were prescribed CTCA for different indications like typical or atypical chest pain or suspected CAD were included in this study. While patients with previous coronary artery bypass graft surgery (CABG), supra-ventricular arrhythmias, renal insufficiency, known allergy to iodinated contrast agent, severe claustrophobia and pregnant ladies were excluded from the study. All the 1000 patients were selected by non-probability sampling technique.

Informed written consent was taken. Before angiography, the patients blood pressure and heart rate was measured and heart rate was brought below 65 b.p.m by i/v or oral metoprolol. Iodinated contrast material 100 ml was injected through antecubital vein of the right arm for contrast enhancement. CTCA was performed by using 64 slice CT scanner. Reconstruction data set was assessed typically during the mid-diastolic phase. Images were analyzed. Coronary artery dominance was assessed by a standardized manner. Patients demographic data and dominance pattern data was recorded. Finally data was analyzed using SPSS version 21. Descriptive statistics were used to describe the results.

RESULTS

Out of 1000 patients, 705(70.5%) were males and remaining 295(29.5%) were females. Male to female ratio was 1:2.54. Age range of patients was 16-95 years with mean 51.89±12.59 years. Right coronary artery was dominant in 849(84.9%) patients while left coronary artery was dominant in 113 (11.3%) patients and 38 (3.8%) patients were co-dominant. Pattern of coronary artery dominance is depicted in fig (1) and pattern of coronary artery dominance with gender is shown in table-1.

DISCUSSION

Vascular anatomy can be visualized by using different methods: simple dissection, dissection associated with filling of the vessels using latex resin, filling of the vessels with a polymerizing substance (vinylite, acrylic etc.) with subsequent corrosion of the organ tissue using acidic solutions and angiographies[9]. Yet CTCA is the simplest procedure used for diagnostic as well as prognostic purpose. Coronary artery dominance pattern and their percentages vary from population to population. In our study right coronary artery dominance was found in 84.9% patients, left dominance was found in 11.3% while co-dominance was found in 3.8% patients. Similarly in a study by Mehboob in Pakistan[4] results were almost similar i.e. right coronary artery was dominant in 60.5% peoples. Similar studies performed by Abdellah in Sudan[2], Vasudeva in South India[3], Altii in Damascus[10] were equally contributing to our study. Table-2 compares the result of our study with results of other studies.

Dominance pattern of coronary arteries is clinically important. Although most of the cases in our study have right coronary artery dominance but left dominance have higher rates of coronary artery disease and mortality than right dominance[4,13]. Left coronary artery dominance with gender dominance also shows a role in left anterior descending artery stenosis. Dominance also plays an important role in inferior infarct of the heart which can cause AV block in 30% of the cases[7]. Another study highlights that the extent of coronary atherosclerosis does not depend on the type of dominant coronary artery but in patients with atherosclerosis left dominance is a significant and independent predictor of increased long-term mortality[14]. On the other hand, there was significant association between the right dominant system & coronary occlusive disease particularly with 3 vessel disease (multivessel involvement) and with right coronary artery lesions[11].

Therefore detailed knowledge of variations in coronary arterial distribution is of great clinical importance in the medical and surgical management of patients with specific congenital or acquired cardiac disorders.

Our study has some limitations. As all the patients included in our study were suffering from coronary artery disease, so it is not a true representative of general population.

CONCLUSION

Right coronary dominance pattern is more prevalent in patients visiting our clinical setup while co-dominance is least.

Conflict of Interest

This study has no conflict of interest to declare by any author.

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