

# Pattern of coronary artery dominance by coronary angiography in Iraqi patients & the relationship with coronary artery disease

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## **Abbreviations:**

CAD: Coronary artery disease

LADA: left anterior descending artery

LCx: left circumflex artery

LMS: left main stem artery

PDA: posterior descending artery

RCA: right coronary artery

## **Abstract**

**Background:** Detailed knowledge of variations in coronary arterial distribution has been of great clinical importance in the medical and surgical management of patients with specific congenital or acquired cardiac disorders.

The aim of this study is to define the pattern of dominant coronary artery in Iraqi population and the relationship of coronary artery dominance with extent of coronary artery lesions

**Patient and methods:** 657 consecutive patients suffering from coronary artery disease submitted to coronary angiography in our center were collected (female=184, male=473, mean age  $55\pm 10$ ) from January 2008 to December 2010.

**Results:** the right coronary artery was dominant in 502(76, 4%) patients enrolled in this study while left circumflex artery was dominant in 83(12, 6%) & co-dominancy occurred in 72(10%) patients. However, no significant differences were detected regarding the type of coronary circulation in relation to sex and age. There was significant association between right dominant system & coronary occlusive disease particularly with 3 vessel disease (p value  $<0.000073$ ) and also a significant association between right dominant system & right coronary occlusive lesion (p value=0.027).

**Conclusion:** The prevalence of right, left, and co dominant coronary artery were similar to previous literatures & there was significant relationship between dominant right coronary system with coronary artery disease especially 3 vessels disease & right coronary occlusive lesion.

## INTRODUCTION

The RCA is dominant in 85 percent of patients, supplying the PDA and at least one posterolateral branch (right dominant), The RCA is nondominant in 15 percent of patients. One half of these patients have a left PDA and left posterolateral branches that are provided by the distal LCx artery (left dominant circulation). In these cases, the RCA is very small, terminates before reaching the crux, and does not supply any blood to the left ventricular myocardium. The remaining patients have an RCA that gives rise to the PDA with the LCx artery providing all the posterolateral branches (balanced or codominant circulation). In about 25 percent of patients with RCA dominance, there are significant anatomical variations in the origin of the PDA<sup>1</sup>

Knowledge of variation of the pattern of coronary arterial distribution has practical application in the interpretation of coronary arteriography and in avoidance of selective perfusion of one major division of the left main artery, either at angiography or at operation <sup>2,3</sup> and also is clinically important in the management of cardiovascular diseases, their treatment, and interpretation of findings <sup>4</sup>

Detailed knowledge of variations in coronary arterial distribution has been of great clinical importance in the medical and surgical management of patients with specific congenital or acquired cardiac disorders.<sup>5</sup>

Coronary artery anomalies occur in about 1% of the general population <sup>6</sup> and certain anomalous patterns, like anomalous origin of a coronary vessel from the opposite sinus have been associated with sudden cardiac death and ischemic complications <sup>7</sup>.

The main aim of this study is to define the pattern of dominant coronary artery in Iraqi population and the relationship of coronary artery dominance with extent of coronary artery lesions.

### **Patients and methods**

This retrospective study was carried out in coronary cath lab in cardiology center in AL-SADER teaching hospital in AL-najaf city.

Six hundred fifty seven (657) consecutive patients suffering from coronary artery disease submitted to coronary angiography in our center were collected (female=184 (28%), male=473 (72%), mean age 55±10) from January 2008 to December 2010.

Detailed history from the patient regarding clinical risk factors for ischemic heart disease was taken at the time of admission including positive family history of premature atherosclerosis (occurring in men before the age of 55 and before

the age of 65 in women), current cigarette smoking, hyperlipidemia (defined as elevated cholesterol level primarily low-density lipoprotein cholesterol and elevated triglycerides), hypertension( defined as systolic blood pressure greater than 140 mm Hg or a diastolic blood pressure greater than 90 mm Hg), and diabetes mellitus ( defined as a random blood sugar more than 200 or repeated fasting blood sugar of more than 126) <sup>1</sup>.

Coronary angiography was performed by a femoral approach using the modified Seldinger technique. Standardized angiographic projections (LMS, LAD and left circumflex arteries were assessed in the right anterior oblique projection with caudal angulations, and for the right coronary artery in the left anterior oblique projection with cranial angulations) were chosen for the assessment of each arterial segment.

Coronary angiograms were visually assessed by two independent observers blinded to the identity and clinical characteristics of the patients

CAD (Coronary artery disease) defined as significant when there is >50% stenosis in the Left main artery and >70% stenosis in luminal diameter of left anterior descending, left circumflex and right coronary arteries and Total coronary occlusion is identified as an abrupt termination of the pericardial vessel. Multiple lesions when 3 and more segments had significant lesion in the same vessel

The dominant artery would be the RCA if the PDA arises from the RCA and if at least one other branch of the RCA extends past the PDA in the atrioventricular groove, giving off one or more posterolateral (PL) branch to the inferior surface of the left ventricle. In this case, the distal left circumflex artery (LCX) is very small or absent. In left dominance, the PDA and all PL branches arise from the LCX; the RCA is small and terminates before reaching the crux; it does not supply any blood to the left ventricular myocardium, where in co-

dominant circulation, the RCA gives off the PDA only, while the LCX provides all the PL branches<sup>1</sup>.

Obstructive CAD was classified as a one-, two-, or three-vessel disease.

Chi-square had been applied for categorized variables at level of significance  $\alpha=0.05$  (p value <0.05) by using SPSS programm version 17

## Results

Table and figure 1 shows that the right coronary artery was dominant in 502(76, 4%) patients enrolled in this study while left circumflex artery was dominant in 83(12, 6%) & co-dominancy occurred in 72(10%) patients. However, no significant differences were detected regarding the type of coronary circulation in relation to sex and age.

Table 2 study the relationship of coronary arterial dominancy with number of coronary affected vessels & this demonstrate that there was significant association between right dominant system & coronary occlusive disease particularly with 3 vessel disease (p value <0.000073).

Table 3 shows significant association between right dominant system & right coronary occlusive lesion (p value=0.027).

Table (1): The number and percentage of patients according to the dominant vessel.

<b>Dominancy</b>	<b>RCA</b>	<b>LCX</b>	<b>CODOM.</b>
<b>Patients</b>	<b>502 76 %</b>	<b>83 13 %</b>	<b>72 11 %</b>

Figure (1): The number and percentage of patients according to the dominant vessel.

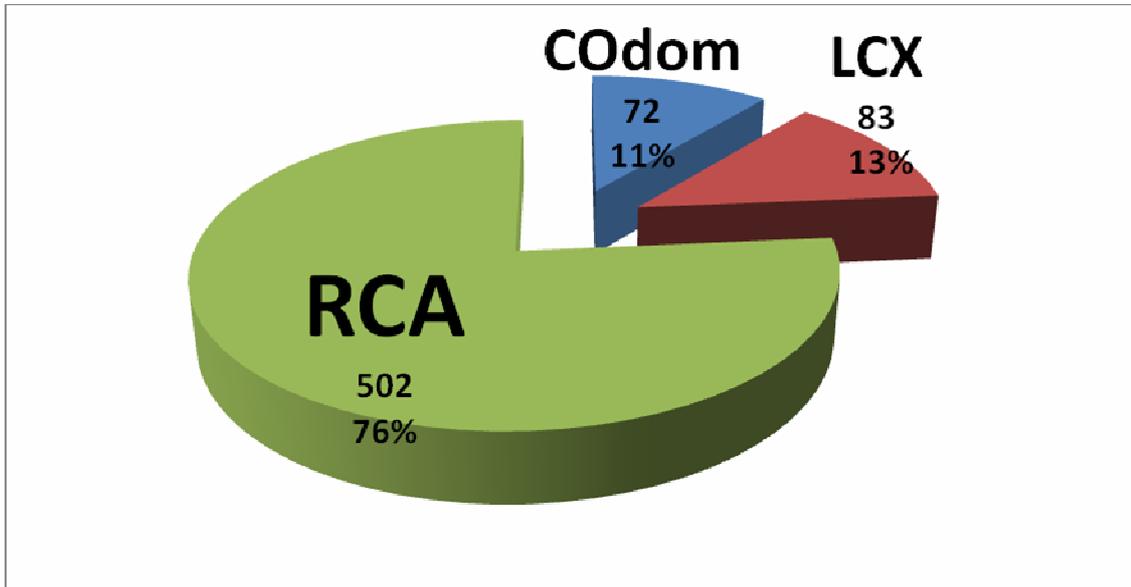


Table (2): The relation between the dominance of the vessel and the number of the affected vessels.

DOMINANCY	SINGLE	2 V.S	3 V.S	-VE
RCA	87	93	211	111
LCX	20	22	18	23
CODOM	12	24	13	23

Chi square =28.57

DF=6

P value = 0.000073

Figure (2): The relation between the dominance of the vessel and the number of the affected vessels.

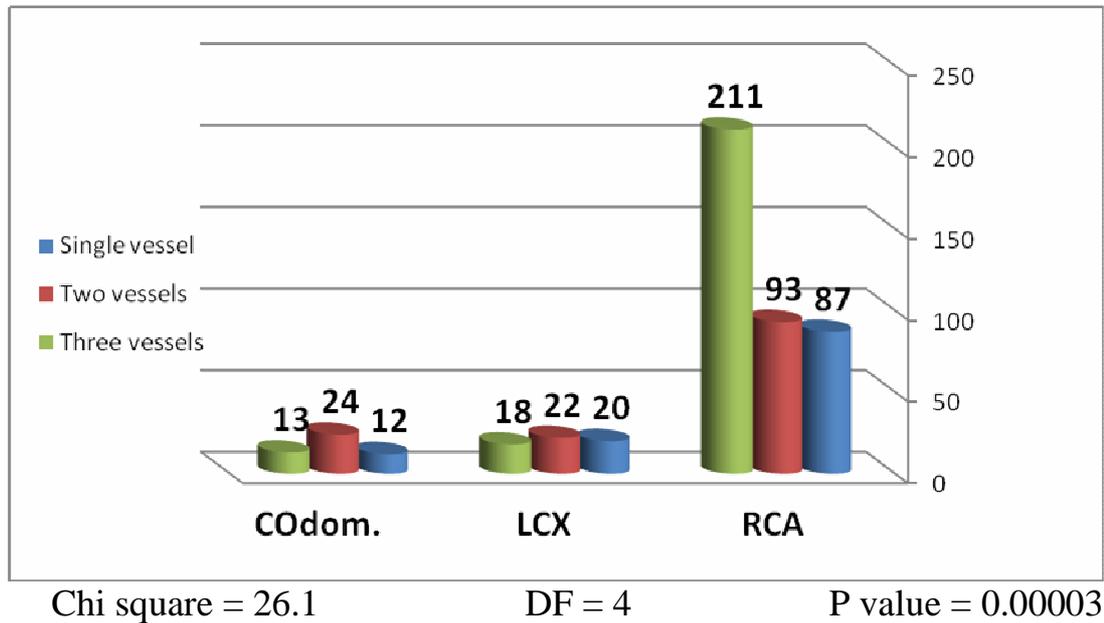


Table (3): The relation between the dominance of the vessel and the RCA lesion

DOMINANCY	RCA lesion	No lesion	Sum
RCA	268	234	502
LCX	36	47	83
CODOM	28	44	72

Chi square = 7.24

DF = 2

P value = 0.027

### Discussion

The results of this study demonstrated that the prevalence of right, left, and co-dominant coronary artery were 76, 4%, 12, 6% and 10% respectively.

On the other hand, there was significant association between the right dominant system & coronary occlusive disease particularly with 3 vessel disease (multi-vessel involvement) and with right coronary artery lesion.

The pattern of coronary artery dominance is different in different communities and studies. In Kenya, Brazil, and Iran the studies had been showed that the RCA was found to be dominant in 82% to 84.2% of the hearts <sup>8,9,10</sup> while in

Pakistan the pattern of dominance in the patients enrolled in the study was 60.50% had RCA dominance, 19.50% had LCx dominance and 20% had co-dominant coronary circulation.<sup>11</sup>

There are variations in the anatomy of the coronary arteries in patients with left dominant circulation. The influence of anatomical variations in patients with left dominant circulation on coronary arteriosclerosis is not clear.<sup>9</sup>

Some studies showed high incidences of left coronary dominance in patients with isolated aortic stenosis but not associated with disease progression or with short-term adverse outcome following valve replacement<sup>12</sup> and others also had stated that both the coronary diseases and coronary artery variations are more common in individuals with left dominance circulation.<sup>4</sup>

The distribution of atherosclerotic lesions has been shown both in animals and in man to be patchy but non-random.<sup>13</sup>

However, in Balci et al. study reported that the extent of coronary atherosclerosis does not depend on the type of dominant coronary circulation.<sup>9</sup>

In some studies, the variations in the length, branches quantity, origin and irrigated territories of RCA and left coronary artery should be taken into account regarding the hemodynamic procedures, cardiac surgery and arrhythmias from coronary occlusive disease because of wide variability in the morphological expression of the vessels.<sup>14, 15</sup>

Little information is available regarding the clinical significance and relationship of the myocardial bridges, which may be recognized as the narrowing of the systolic coronary artery as seen in an angiography with coronary dominance as The incidence of myocardial bridge may vary according to population.<sup>16, 17</sup>

On the other hand, other study demonstrated the relationship between the angiographic severity of CAD and the pattern of coronary artery dominance and also relationship between the involved arterial territory and dominance.<sup>10</sup>

Limitations of this study include that it is not a randomized and data-based analyses as we select the patient who had coronary artery disease prior to submitting to routine coronary angiography & it is retrospective study.

### **Conclusion**

The prevalence of right, left, and codominant coronary artery were similar to previous literatures & there was significant relationship between dominant right coronary system with coronary artery disease especially 3 vessels disease & right coronary occlusive lesion.

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