



Length of left anterior descending coronary artery in relation to right & left dominance: A retrospective CT coronary angiographic study.

A thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَيَسْأَلُونَكَ عَنِ الرُّوحِ قُلِ الرُّوحُ مِنْ أَمْرِ رَبِّي

وَمَا أُوتِيتُمْ مِنَ الْعِلْمِ إِلَّا قَلِيلًا ❁

صدق الله العظيم

سورة الأسراء

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List of Abbreviations

RCA	Right coronary artery.
LCA	Left coronary artery.
LAD	Left anterior descending.
PDA	Posterior descending artery.
LCX	Left circumflex artery.
LMCA	Left main coronary artery.
AM	Acute marginal artery.
PLV	Posterior left ventricular artery.
OMBs	Obtuse marginal branches
CT	Computed tomography.
MRI	Magnetic resonant image
RAA	Right atrial appendage
MDCT	Multidetector computed tomography.
EBCT	Electron beam CT.
ECG	Electrocardiogram.
MPR	Multiplanar reformatting.
CPR	Curved planar reformatting.
MIP	Maximum intensity projection.
VR	Volume rendering.
SSCT	Single slice CT.
SSD	Surface shaded display.
IMW	Inferior myocardial wall.

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Abstract

The arterial blood supply to the heart is achieved by two coronary arteries and their branches. The right & left coronary arteries arise from aortic sinuses of valsalva at the beginning of ascending aorta and then descend in right and left atrioventricular grooves respectively. The left anterior descending and circumflex arteries are the main branches of the left coronary artery whereas the acute marginal and posterior interventricular arteries arise from the right coronary artery.

The term dominance is used to describe the anatomical pattern of the coronary arteries; the dominant vessel is the one that supplies the posterior diaphragmatic portion of the interventricular septum and the diaphragmatic portion of the left ventricle. So the dominant vessel refers to the coronary artery which gives the posterior descending artery.

The LAD artery supplies blood to a large part of the myocardium. However, the amount of myocardium supplied varies depending on the length of LAD artery and as a result; occlusion at different portion may influence perfusion of different part of myocardial.

In this study light was focused on the length of LAD artery and the possible relationship between it and the pattern of coronary arterial dominance.

Among patients who underwent CT coronary angiograms in Ain-Shams hospitals & other private centers a sample of one hundred CT coronary angiograms with right and left dominance pattern was chosen by systemic random sampling. The collected sample was divided into two groups each of fifty:

- 1- CT coronary angiograms with right dominance pattern.
- 2- CT coronary angiograms with left dominance pattern.

The entire cases were chosen to be young adult male aged between 40-60 years and had normal CT coronary angiograms based on visual assessment of absence of any luminal irregularities while those patients with history of renal diseases and cardiomyopathy were excluded.

The entire cases were examined by using Optima GE 64 CT scanner and Philips Brilliance 64 CT scanner and the obtained data were interpreted in the following manner:

- 1- The coronary artery which gave rise to the posterior interventricular artery was regarded as the dominant one.

- a- If the posterior interventricular artery arose from the right coronary artery, then it was said to be right dominant.
 - b- If the posterior interventricular artery arose from the left coronary artery, then it was said to be left dominant.
- 2- Whether LAD artery didn't reach, reached or reached and wrap around the cardiac apex.
- a- If it didn't reach the cardiac apex, then it was said to be LAD type I.
 - b- If it reached the cardiac apex but didn't wrap around it, then it was said to be LAD type II.
 - c- If it reached and wrap around the cardiac apex, then it was said to be LAD type III.

The data were analyzed using SPSS software & the variables expressed as percentages and analyzed by Chi square test to study the relationship between length of LAD artery and dominance pattern. The results revealed that there was significant relationship between the length of LAD artery and the pattern of dominancy since the P- Value appeared to be < 0.001 .

In conclusion the length of LAD artery appeared to be dependent on the dominance pattern (i.e. length of LAD artery depends on which of the two main coronary arteries is the dominant one). Thus length of LAD artery was appeared to be taller in left coronary dominant pattern.

Key words: LAD, length, dominancy

Introduction and aim of the study

Introduction:

There are several postmortem studies regarding dimensions of coronary arteries. However there are only few studies regarding real life dimensions. Dimensions of the coronary arteries are an important predictor of outcome especially after percutaneous coronary interventions (PCI) and coronary artery bypass graft surgery (CABG). In this study we will investigate the relationship between length of LAD and coronary dominance.

Arterial blood supply to the heart is achieved by two coronary arteries & their branches. The right & left coronary arteries arise from aortic sinuses of valsalva at the beginning of ascending aorta & then descend in right & left atrioventricular grooves respectively. The anterior interventricular & circumflex arteries are the main branches of the left coronary artery whereas marginal & posterior interventricular arteries arise from the right coronary artery (**Gray, H., et al., 1999**).

Left Coronary Artery (LCA) normally arises from the left sinus of Valsalva. It passes for a variable distance before giving rise to the left anterior descending artery (LAD) and the left circumflexed artery (LCx). LAD artery passes anterolaterally in epicardial fat of anterior interventricular groove & supplies

majority of the left ventricle. The major branches of LAD artery are the diagonal & septal perforating arteries. Diagonal branches pass laterally to supply the wall of left ventricle. The septal branches pass medially & supply majority of interventricular septum **(Fuster, V., et al, 2005)**.

Thus LAD artery supplies blood to a large part of the myocardium. However, the amount of myocardium supplied varies depending on the length of LAD artery & as a result; occlusion at different portion may influence perfusion of different part of myocardium **(Ilia, R., et al., 2014)**.

LCx artery is the other major branch of the LCA. It passes in the left atrioventricular groove, giving rise to obtuse marginal branches. LCx artery & its branches supply the LV free wall. It variably gives rise to posterolateral branches & posterior descending artery (PDA) supplying the diaphragmatic portion of left ventricle **(O'Brien, J., et al., 2007)**.

Right coronary artery (RCA) normally arises from right coronary sinus of valsalva & passes in right atrioventricular groove toward right border of the heart. It gives off many branches & the main one among them is the posterior descending branch which supplies diaphragmatic surface of the

heart & posterior portion of interventricular septum **(Stankovic, I. and Jesic, M., 2004).**

The concept of right or left dominant used to refer to the coronary artery that gives the PDA which supplies the diaphragmatic surface of the heart. Thus dominance is determined as follow:

- 1) If RCA gives rise to the PDA, the pattern is termed to be right dominant.
- 2) If LCA gives rise to the PDA, the pattern is termed to be left dominant.
- 3) If both RCA & LCA give rise to PDA arteries then it is termed to be co-dominant.

Now a day, with the widespread use of new imaging diagnostic techniques and the development of non-invasive modality, a thorough knowledge of the normal coronary anatomy & its variations and/or anomalies is essential **(Shukri, I.G., et al, 2014).**

Several studies have been conducted to evaluate dimensions of coronary arteries, including angiography & autopsy studies, by many researchers to study the relation between the coronary