Angiographic Coronary Artery Study: Anatomy, Variation and Anomalies

Fares G Altaii, Makhloof Youssef, Moudar Takla
University of Damascus, Faculty of Medicine, Anatomy Department.

ABSTRACT

The objectives were to study the normal coronary artery anatomy, to determine the incidence of the normal coronary artery variations and anomalies from coronary angiographic studies. This is a descriptive, retrospective study carried out in Damascus Heart Surgical Centre on patients seen during the period from Jan 2006 to Dec 2008. The coronary artery angiography data was collected by a checklist and was revised by the authors. Five hundred who had coronary angiography which showed no coronary artery pathology were included in this study. 55% were females. The mean age of the patients was 54.32 year. Four hundred and sixty five patients (93%) had normal coronary artery anatomy, 30 (6%) had normal coronary artery variations and 5 (1%) had coronary artery anomalies. Right dominant circulation was found in 77% of the patients, while 15% of subjects had co dominant and 8% left dominant circulation. The incidence of normal coronary artery anatomy and anomalies in this study are similar to those reported in the literature. The majority of the hearts were right dominant and the co-dominant circulation was twice the left dominant ones.

Keywords: coronary angiography, coronary artery, artery variations, anatomic abnormalities, angiogram, arterial dominance, Human heart, incidence.

INTRODUCTION

The coronary arteries, which supply the myocardium and epicardium, are the first branches of the aorta. The right and left coronary arteries arise from the corresponding aortic sinuses at the proximal part of the ascending aorta, just superior to the aortic valve\(^1\).

Absence of the left main coronary artery and the separate origin of the left anterior descending and left circumflex coronary arteries (from the left coronary sinus of the aorta), have been reported and are considered as normal variants in about 1% of patients undergoing angiography. Moreover, one or more infundibular (conal) arteries may arise from separate ostia in the aorta. Minor variations in the location of the ostia within the coronary sinuses of the aorta are observed frequently and are of no clinical significance\(^2\).

Coronary anomalies comprise many different entities, of which few have consistent clinical manifestations. Most reported cases require specific and critical review because the association of anatomic abnormalities with clinical events might well be casual rather than causal, or indirect rather than direct\(^3\). The reported incidence of all coronary anomalies is 0.23% in autopsy series and ranges between 0.3% and 12% in angiographic series\(^4\). Data relating to the pattern of normal angiographic coronary artery anatomy with normal variations and to the sites or frequency of coronary artery anomalies in Syrian subjects has not, to our knowledge been reported. This paper reports on the anatomical analysis of coronary artery angiograms performed in 500 patients who presented to Damascus Heart Surgical Centre.

Objectives

The objective is to study the pattern of normal angiographic coronary artery anatomy, frequency of coronary artery anomalies, the coronary arteries commonly affected by anomalies and the arterial dominance of the heart.

PATIENTS & METHOD

This was a retrospective study carried out on patients reporting to Damascus Heart Surgical Center from January 2006 to December 2008 whose coronary artery angiography revealed non-pathological coronary arteries. Patients with pathological coronary artery angiography were excluded from this study. Data collected about each patient included, age, gender, coronary
artery anatomy and anomalies, and the dominance of the heart. The data was collected by a checklist, and revised by the authors.

RESULTS

Five hundred patients who underwent diagnostic coronary artery catheterization in Damascus Heart Surgical Centre were included in this retrospective hospital based study. 225 patients (45%) were males and 275 (55%) were females. Patient’s age ranged from 7 to 85 years, with a mean age of 54.32± 11.6 years. Three hundred and nineteen patients (63.8%) were between 41 and 60 years. Regarding the coronary artery anatomy, 465 (93%) of the arteries were found to be normal. Thirty subjects (6%) had normal anatomical variants and anomalous arteries occurred in 1% of patients (Figure 1). There were 24 patients with anatomical variations of the coronary arteries, in these the left main artery was absent while both the left anterior descending (LAD) and circumflex arteries had originated from one ostium in one sinus in 23 patients and from two ostia in one sinus in 5 patients. Out of the 5 patients who were found to have anomalous coronary arteries; 3 had no left circumflex artery, one patient had a single right coronary artery which gave rise to the left main artery. The fifth patient had a mid segment left coronary artery- pulmonary artery fistula. In 77% of cases, the blood supply of the heart was right dominant, while the co-dominant supply represented 15% and the left dominant, only 8% (Figure 2).
Figure (3): Dominance of the heart

Figure (4): Dominance of the heart

Figure (5): Angiogram; fistula between pulmonary artery and circumflex artery
Figure (6): Angiogram; there is one ostium for RCA and LCX with absent of left anterior descending artery

Figure (7): Angiogram; the LCA originate from the anterior aortic sinus with RCA

Figure (8): Angiogram; the LCA originate from the anterior aortic sinus with RCA
DISCUSSION

Out of the 500 patients who were included in this study, 55% were females; while, in the literature most of the patients were males\(^3,5,6\). Concerning the normal anatomical variations and the coronary artery anomalies, no significant difference was found between the males and females and this is similar to the result reported by Shirani\(^2\).

The incidence of coronary artery anomalies was found to be 1%, which is slightly less than that found by Yamanaka and Hobbs (1.3%)\(^7\), and equal to that reported by others (1%)\(^4,8\). The normal variations of the coronary arteries were found in 6% of patients which is more than that mentioned by Shirani\(^2\) and Villagona\(^4\). These variations included the absence of the left main coronary artery; the origin of the circumflex and left anterior descending arteries from the left aortic sinus, either by one or two ostia. Anomalous circumflex artery was documented in 3 out of the 5 patients with anomalous coronary arteries. Absence of the left circumflex artery with small right circumflex artery was found in 3 patients (0.6%) of the study population, which is higher than that reported by Villagona, (0.45%)\(^4\) and Charles et al, (0.48%)\(^3\). A single coronary artery originating from the right aortic sinus and coronary artery fistula, are rare coronary
anomalies. Nurten et al(9) reported that a single coronary artery occurred in 0.024%; while, Charles et al(3) reported that it occurred in 0.06 %. In this study, we found that a single coronary artery occurred in 0.02 % of the study population. Coronary artery fistula was found in 0.02% of patients in the present study. Saema et al at, has reported that the incidence of coronary artery fistula is about 0.1%(10), while the incidence reported by Charles et al was 0.07%(3).

Grossman reported that the right dominance and co dominance were 85% and 7% respectively(11). In this study, the right dominance was 77% and the co dominance was 15%. There is no difference between the finding in this study that the left dominant circulation occurred in 8% and that reported in the international literature.

Conclusions

We conclude that females who underwent cardiac catheterization which revealed normal coronary arteries were more than males. The incidence of 1% coronary artery anomalies in this study is similar to that reported in the literature. The majority of the hearts were right dominant and the co dominant circulation was twice the left dominant ones.

REFERENCES