Dual left anterior descending coronary artery

F Moreno-Martínez, L Vega, H Fleites, R Ibargollín, R González, O López

Citation
F Moreno-Martínez, L Vega, H Fleites, R Ibargollín, R González, O López. Dual left anterior descending coronary artery. The Internet Journal of Thoracic and Cardiovascular Surgery. 2004 Volume 7 Number 1.

Abstract
The normal anatomy of coronary arteries is well known but there is a great variety on its origin and distribution. Congenital coronary anomalies are uncommon and the vast majority is diagnosed incidentally during coronary angiogram or necropsy. Isolated coronary anomalies are uncommon diseases (0.64-1.3% of all patients who underwent coronary angiography) and the anomalous origin of left anterior descending (LAD) artery from the proximal portion of the right coronary artery or from the right sinus of Valsalva is extremely rare ranging between 1.2-6.1% of all coronary anomalies. We report the case of a 52-year-old obese woman with smoking habit and non-insulin dependent diabetes mellitus who had been complaining of chest pain for two months. Coronary angiography revealed dual LAD coronary artery type IV but we noticed that it is not a typical type IV of Spindola-Franco classification because the major septal perforators did not originate from the short, but from the long LAD artery. Therefore, we have to ask the following question: Is the LAD that we present a typical type IV of Spindola-Franco classification or just a new variant never described before?

INTRODUCTION
Normal anatomy of coronary arteries (CA) is well known, and it is possible to assure that two exactly equal coronary trees do not exist. Of this asseveration it is inferred that there is a great variety in distribution, route and anatomy itself, of the main CA and its branches.

The anomalies in the origin of CA are infrequent, constitute significant changes of the normal structure, and may course asymptomatic or be presented like an ischemic disease, being able to cause angina, myocardial infarction, arrhythmias, syncope and sudden death. There are many congenital malformations, but in most of the cases they are simple variations in the origin of the main branches.

The origin of left anterior descending (LAD) artery in the right Valsalva sinus is an uncommon variant, reason why we motived ourselves to present this case.

CASE REPORT
We present a 52-year-old obese woman with smoking habit, and noninsulin dependent diabetes mellitus, who had been complaining of chest pain for two months. Lipid profile demonstrated mild disturbances, and electrocardiogram showed no abnormalities. Treadmill stress test revealed chest pain at maximal exercise without electrical changes, but the patient did not reach submaximal heart rate. That was why she underwent thallium-201 myocardial perfusion scintigraphy where inferior hypcaptation was observed. Coronary angiography revealed a dual LAD coronary artery type IV, without organic stenosis. Diagonal branches originate from the short LAD (figure 1), and major septal perforators originate from the long LAD which originates on right coronary sinus with an independent ostium (figure 2), and runs over the right side of interventricular sulcus until the apex (figure 3). Not any diagonal branch arises at this location.
Figure 1
Figure 1: Diagonal branches arising from the short LAD. Notice that there is no any vessel on the rest of the LAD territory. The arrow points short LAD. Spider view.

Figure 2
Figure 2: Major septal perforators (arrows) originating from the long LAD. Right anterior oblique.

Figure 3
Figure 3: LAD runs over the right side of interventricular sulcus until the apex. Left anterior oblique.

DISCUSSION
Congenital anomalies of CA are infrequent, and there is a great variety of them. The vast majority is diagnosed incidentally during coronary angiography or necropsy because many do not produce symptoms due to they do not, necessarily, reach a functional meaning. Others were looked consciously, like in Tetralogy of Fallot and the transposition of great arteries, in order to know the origin and the route of the CA because it is essential to achieve the wished surgical success. In addition, although it has been a finding, in the setting of the occlusive-artery disease it represents an important functional meaning and it is even useful for defining the most appropriate therapeutic strategy and prognosis.

Tuccar and Elhan found 0.5% (25/5000) of anomalous origin of CA. Forty eight percent of their affected patients (12/25) had anomalous origin of circumflex artery, which emerged from the right coronary sinus (8 patients) or directly from the right coronary artery (RCA) (4 patients). In these cases LAD artery was originated normally from left coronary sinus and not any portion of circumflex artery was observed, reason why LAD was seen with a “long” proximal segment. Eight patients (32%) had RCA originating from the left Valsalva sinus. Left main coronary artery was originated in the right sinus in 3 patients (12%), near the ostium of the RCA, and in 2 of them the LAD (the authors say: with a very
Dual left anterior descending coronary artery

rare origin) was originated in right coronary sinus, it traveled in front of the trunk of the pulmonary artery, and after, it ran throughout the interventricular sulcus. This work excluded, obligatorily, the most severe coronary anomalies because these were diagnosed earlier due to they usually produce symptoms or sudden death.

Morentín et al. presented a case of LAD originating in the pulmonary artery. This is a very rare variant (there were only 9 cases published until July 2004) and has better prognosis than when the left main coronary artery is originated at that location; nevertheless, the patient, a 9-year-old boy, was dead after doing a physical exercise, in accord to his age.

Occasionally a unique coronary trunk exists where the three branches were originated, but more important than the origin of these branches is its route, because when the aberrant artery passes between the aortic root and the right ventricle outflow tract, it would cause exertion angina or sudden death during the exercise.

Ono et al. presented two patients who needed coronary artery bypass surgery due to the anomalous origin of the LAD artery. In the first case LAD ran over the front side of the right ventricle outflow tract, and in the second one, the route was between the aorta and the trunk of the pulmonary artery. Situations like these, where extrinsic compression of the vessel is demonstrated, will always produce ischemic symptoms, mainly on exertion. Another example is shown in the section Casos de Interés (Cases of Interest) of the webpage of Latin American Society of Interventional Cardiology (Sociedad Latinoamericana de Cardiología Intervencionista), where the case of a similar patient is described in detail. She presented angina with electrocardiographic changes, refractory to treatment. LAD artery was originated in the same ostium of the RCA and passed between aorta and pulmonary artery. They documented the extrinsic compression of the vessel and, finally, the patient underwent coronary artery bypass graft surgery with left-internal mammary artery, after which she was withdrawn without symptoms.

Isolated coronary anomalies are uncommon diseases (0.64-1.3% of all patients who underwent coronary angiography), and the anomalous origin of LAD artery from the proximal portion of the RCA or from the right sinus of Valsalva is extremely rare, ranging between 1.2-6.1% of all coronary anomalies.

The presence of dual LAD artery has very little clinical importance, due to, despite its abnormal anatomy, functional status does not present alteration because the territory irrigated by abnormal artery receives suitably oxygenated blood, and, in absence of estenosis, it is not justify the appearance of myocardial ischemia, except for certain situations associated with its route.

Spindola-Franco and coauthors provided an angiographic description of the variants of dual LAD artery as follows:

Type I. Running in the anterior interventricular sulcus (AIVS), the short LAD is generally the source of all the major proximal septal perforators. The long LAD also runs in the AIVS, descending on the left ventricular side of the AIVS, and then reentering the distal AIVS in order to reach the apex.

Type II. The short LAD is the same as in Type I. The long LAD descends over the right ventricular side before reentering the AIVS.

Type III. The short LAD is consistent with that described in Types I and II. The long LAD travels intramyocardially in the ventricular septum.

Type IV. High in the AIVS, a very short vessel is formed by the LAD proper and the short LAD. From this vessel, the major septal perforators, as well as the diagonal branches, originate. The long LAD is unusual in its origin, arising from the RCA.

Our case corresponds with type IV of this classification, which is the less frequent type; but, fortunately, it did not present stenosis. However, we noticed that long LAD did not originate from RCA, but from the right coronary sinus with an independent ostium. Besides the major septal perforators did not originate from the short LAD, therefore it is mandatory to ask the following question: Is the LAD that we present a typical type IV of Spindola-Franco classification or just a new variant never described before?

CONCLUSION

The anomalous origin of LAD artery from the proximal portion of the right coronary artery or from the right sinus of Valsalva is extremely rare, ranging between 1.2-6.1% of all coronary anomalies. Dual LAD coronary artery that we present corresponds with type IV of Spindola-Franco classification, but it has substantial differences; that is why we consider it as a new variant never described before.
Dual left anterior descending coronary artery

CORRESPONDENCE TO
Francisco L. Moreno-Martínez, MD
Unidad de Hemodinámica y Cardiología Intervencionista
Gaveta Postal 313 Morón 2, CP 67220 Ciego de Avila,
Cuba e.mail: flmorenom@yahoo.com

References
1. Tuccar E, Elhan A. Examination of coronary artery anomalies in an adult Turkish population. Turk J Med Sci 2002; 32: 309-12. Available at: http://journals.tubitak.gov.tr/medical/issues/sag-02-32-4/sag-32-4-5-0201-15.pdf
2. Morentín B, Peciña T, Aguilera B. Muerte súbita debida a origen anómalo de la coronaria izquierda descendente anterior desde eltronco pulmonar en un niño de 9 años. Rev Esp Cardiol 2003; 56(2): 294-6. Available at: http://www.revespcardiologo.org/cgi-bin/wdbcgi.exe/cardio/mrevista_cardio.fulltext?pident=9413
3. Oliver JM, Mateos M, Bret M. Evaluación de las cardiopatías congénitas en el adulto. Rev Esp Cardiol 2003; 56(6): 607-20. Available at: http://www.revespcardiologo.org/cgi-bin/wdbcgi.exe/cardio/mrevista_cardio.fulltext?pident=13048159
4. Flox A, Salguero R, Hernández F. Doble arteria descendente anterior tipo IV. Rev Esp Cardiol 2003; 56(9): 915. Available at: http://www.revespcardiologo.org/cgi-bin/wdbcgi.exe/cardio/mrevista_cardio.fulltext?pident=13051619
5. Ono M, Brown DA, Wolf RK. Two cases of anomalous origin of LAD from right coronary artery requiring coronary artery bypass. Cardiovasc Surg 2003; 11(1): 90-2.
6. Anonymous. Anomalía del origen de la arteria coronaria descendente anterior retractaria al tratamiento médico. Reporte de Caso. [Accessed 27 Julio 2004] Available at: http://www.solaci.org/casos/06dic2001.html
7. Sajja LR, Faroogi A, Shaik MS, Yarlagadda RB, Baruah DK, Potheneni RB. Dual Left Anterior Descending Coronary Artery: Surgical Revascularization in 4 Patients. Tex Heart Inst J 2000; 27(3): 292-6. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=101083
Dual left anterior descending coronary artery

Author Information

Francisco L. Moreno-Martínez, M.D.
Cardiologist, Intensive-Care Specialist, Professor (Virtual Medical University of Cuba), Cardiocentro "Ernesto Ché Guevara"

Luis F. Vega, M.D.
Cardiologist, General Integral Medicine Specialist, Cardiocentro "Ernesto Ché Guevara"

Héctor A. Fleites, M.D.
Cardiologist, Master in Interventional Cardiology, Cardiocentro "Ernesto Ché Guevara"

Rosendo Ibargollín, M.D.
Cardiologist, Cardiocentro "Ernesto Ché Guevara"

Ramón González, M.D.
Radiologist, General Integral Medicine Specialist, Cardiocentro "Ernesto Ché Guevara"

Omaida J. López, M.D.
Pathologist, Cardiocentro "Ernesto Ché Guevara"