Type 4 Dual Left Anterior Descending Artery Demonstrated by 64-MDCT

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A 62-year-old man, who was a smoker and had a history of type 2 diabetes mellitus, was admitted to our intensive care unit for a sudden onset of chest pain accompanied by cold sweating and near-syncope. His symptoms improved after medical therapy with aspirin, clopidogrel, diltiazem, nitrate and heparinization. Serial electrocardiograms showed dynamic T-wave inversion over the leads V2-V6, II, III and aVF. Cardiac enzymes measurements were within the normal limits. The following day, left coronary angiograms revealed a short left anterior descending artery (LAD), which terminated at the distal part of the anterior interventricular sulcus after giving rise to two septal and two diagonal branches (Fig. 1, A and B). There was a 50% stenosis within the middle portion of the LAD. Surprisingly, the right coronary angiograms showed an anomalous LAD arising from the proximal right coronary artery (Fig. 1, C and D). There was 80% stenosis within the proximal portion and 90% stenosis within the distal portion of the RCA. Percutaneous coronary intervention for the RCA lesions was performed successfully. Subsequently, 64-slice multi-detector-row computed tomography (MDCT) confirmed that the anomalous LAD arose from the proximal portion of RCA, which coursed anterior to the pulmonary artery trunk (Fig. 2, A and B).

Spindola-Franco et al. were the first to classify dual LAD into four types (1). A dual LAD consisted of a short LAD and a long LAD. The short LAD ends in the anterior interventricular sulcus and does not reach the apex. The long LAD most commonly arises as an early branch of the LAD proper (types 1-3), but can arise anomalously from the RCA or the right coronary sinus (type 4) on rare occasions. The incidence of dual LAD in an otherwise normal heart is about 1%. In a large series involving 70850 adult patients undergoing coronary angiography, a type 4 LAD was observed only in only three patients (an incidence of 0.004%) (2).

Although dual LAD is thought to have a benign outcome, recognition of this anomaly is essential in order to prevent errors of interpretation during coronary angiography and for the planning of optimal percutaneous or surgical revascularization (1). Conventional coronary angiography may fail to visualize an additional blood vessel, especially those with separate ostia from the right coronary sinus, and therefore the variant anatomic features can be misinterpreted as a total occlusion of the middle...
Fig. 1  Left coronary angiograms (A: in the left anterior oblique cranial view; B: in the right anterior oblique cranial view) showing a short left anterior descending artery (LAD) that terminates after giving off the second diagonal branch. Right coronary angiograms (C: in the left anterior oblique cranial view; D: in the right anterior oblique cranial view) showing the origin of anomalous LAD (L-LAD) from the proximal right coronary artery (RCA) and the two stenoses present within the proximal and distal portions of the RCA. LCX = left circumflex artery; L-LAD = long LAD; S-LAD = short LAD

or distal portion of the LAD.

Conventional coronary angiography is the standard procedure for assessment of coronary artery disease, but it only provides limited information about the spatial relationships surrounding an anomalous coronary artery with regard to other structures. This is particularly important when the anomalous artery courses between the aorta and the pulmonary artery trunk because this condition may induce myocardial ischemia and sudden death\(^{[3]}\). MDCT allows a three-dimensional comprehensive analysis of the coronary artery anatomy and it is extremely useful way to identify coronary artery anomalies.
Fig. 2 Volume rendering images (A: from anterior view; B: from right anterior oblique cranial view) showing the anomalous left anterior descending artery (LAD) arising from the proximal right coronary artery (RCA) and coursing anterior to the pulmonary artery (PA) trunk. Ao = aorta; LCX = left circumflex artery; L-LAD = long LAD; S-LAD = short LAD

References