

Simple Provisional Stenting or two-stent Strategies to Treat Anomalous Right Coronary Originating from the mid of left Anterior Descending Coronary Artery

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Abstract:

Congenital anomalies of coronary arteries (CAAS) are very rare and usually documented as an incidental finding during routine catheter or CT angiograms performed for other reasons. Their prevalence ranges from 0.2% to 1.3% based published series. The most common coronary artery anomaly is origination of the left circumflex coronary (LCX) artery from the proximal of right coronary artery (RCA) or right sinus of Valsalva. The second is separate origination of the left anterior descending coronary artery (LAD) and LCX artery from the left sinus of Valsalva. Herein, we present three cases that the anomalous RCA arises from the mid of left anterior descending coronary artery (LAD). The bifurcation lesions of first case was treated using two-stent strategies of DK culotte, excellent angiography results was observed. The last two cases were treated using simple provisional stenting strategy: one stent was deployed crossover the ostium of the anomalous coronary artery, final angiographic results were excellent. These cases are extremely rare. We bring forth them in an attempt to highlight their significance, and make cardiologist to understand what important the anomalies are, and the strategy how to treatment these bifurcation lesions.

Keywords: percutaneous coronary intervention; single coronary anomaly; anomalous right coronary artery; bifurcation lesions; DK- culotte crush stenting

Introduction

Congenital anomalies of coronary arteries (CAAS) are very rare and usually documented as an incidental finding during routine catheter or CT angiograms performed for other reasons. Their prevalence ranges from 0.2% to 1.3% based published series [1-4]. The most common coronary artery anomaly is origination of the left circumflex coronary (LCX) artery from the proximal of right coronary artery (RCA) or right sinus of Valsalva. The second is separate origination of the left anterior descending coronary artery (LAD) and LCX artery from the left sinus of Valsalva. Bifurcation disease accounts for 15-20% of coronary interventions. According to the 2011 American College of Cardiology (ACC) guidelines, provisional side branch stenting should be the initial strategy (class I recommendation) when the side branch is not large and has only mild to moderate ostial disease, while elective side branch stenting is reasonable (class IIA) if the side branch is large with a high risk of occlusion and the likelihood of side branch reaccess is low. Herein, we present three cases that the anomalous RCA arises from the mid of left anterior descending coronary artery (LAD). The bifurcation lesions of first

case was treated using two-stent strategies of DK culotte, excellent angiography results was observed. The last two cases were treated using simple provisional stenting strategy: one stent was deployed crossover the ostium of the anomalous coronary artery, final angiographic results were excellent. These cases are extremely rare. We bring forth them in an attempt to highlight their significance, and make cardiologist to understand what important the anomalies are, and the strategy how to treatment these bifurcation lesions.

Case 1. A 47-year-old man was admitted to the cardiology department with chest pain for two hours accompanied with sweating after exertion. His coronary risk factors were hypertension, hyperlipidemia and ex-smoker. Physical examination was normal. Electrocardiography (ECG) showed ST elevation 0.2-0.4mv in leads V1-4. Echocardiography showed normal left ventricular systolic function without regional wall motion abnormality. Coronary angiography was performed through trans-radial access, and only a solitary ostium could be cannulated, which give off left main coronary artery (LMCA), left anterior descending (LAD) artery, left circumflex (LCX) artery, and an anomalous right coronary

artery (RCA) originating from the mid of LAD segment (**Figure 1a, 1b**). The single coronary artery anomaly was classified as type [4] L-II A. The left main coronary artery was patent, but there was 99% stenosis in the

mid segment of LAD, and LCX was normal. There was 50% stenosis in the ostium of anomalous RCA which originating from the mid of the LAD artery was a dominant (**Figure 1a-c**).

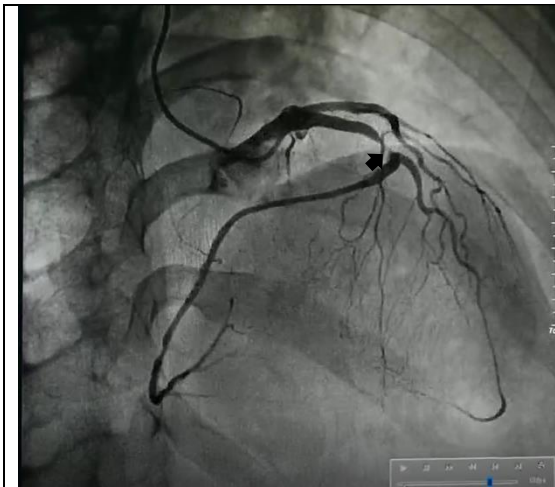


Figure 1a: The AP cranial view. In this view shows there is 99% stenosis in the mid of LAD segment, and the anomalous RCA originating from the mid of LAD segment.

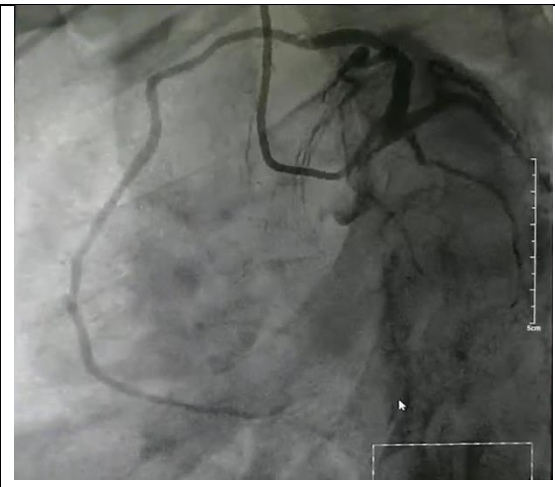


Figure 1b: The LAO caudal view. In this view demonstrates the anomalous RCA originating from the mid of LAD segment.

Based on coronary angiogram findings, the decision was made to proceed with percutaneous coronary interventions (PCI) of the bifurcation lesions to the mid of LAD and the ostium of anomalous RCA using DK-culotte stenting strategy. A 7 Fr sheath was inserted through right radial artery, and the left coronary ostium was engaged with an 7 Fr EBU 3.5 guiding catheter. Two 0.0014 inch balance middle weight (BMW) wires were inserted into the LAD and the anomalous RCA artery. We pre-dilated the LAD and the ostium of anomalous RCA using a 2.5×15-mm Quantum Maverick RX balloon (Boston Scientific Corporation, USA). Thereafter, we deployed a 3.0× 23 mm Firebird (MicroPort Medical Corporation,

Shanghai, China) stent to LAD-RCA lesions. Adjunctive post-stenting balloon dilatation was done using a 2.5×15-mm Quantum Maverick RX balloon at mid LAD and a Quantum Maverick RX balloon 3.0×15-mm at the LAD-RCA. We performed DK culotte crushing with a 3.0× 18 mm Firebird (MicroPort Medical Corporation, Shanghai, China) stent at the mid LAD. Additional kissing ballooning was performed using a Quantum Maverick RX balloon 3.0×15-mm at LAD-RCA and a post-stenting balloon Firebird 3.0× 18 mm at the mid LAD. Finally a good angiographic result was seen (**Figure. 1d-f**).

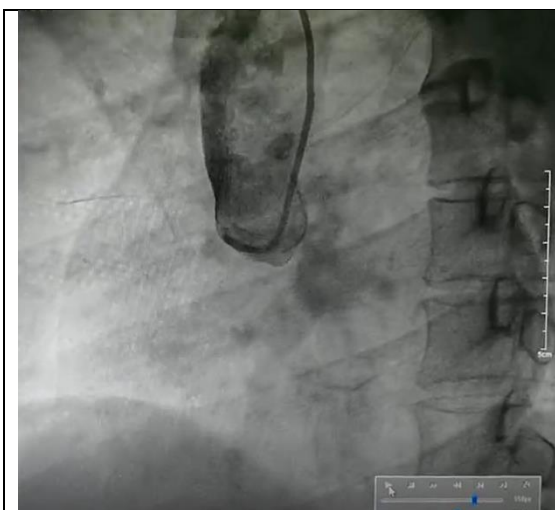


Figure 1c: The LAO 45° view. In this view demonstrates no RCA originating from the right sinus Valsalva.

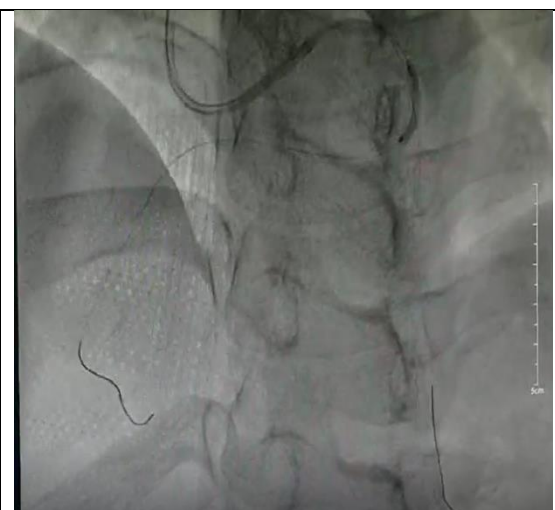


Figure 1d: LAO Cranial view. In this projection shows a 3.0× 23 mm Firebird stent was deployed in LAD-anomalous RCA segment.

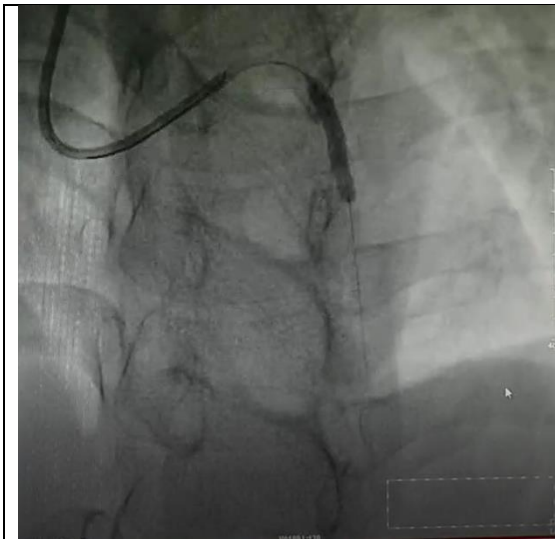


Figure 1e: LAO Cranial view. In this projection shows a 3.0× 18 mm Firebird stent was deployed in the mid of LAD segment.

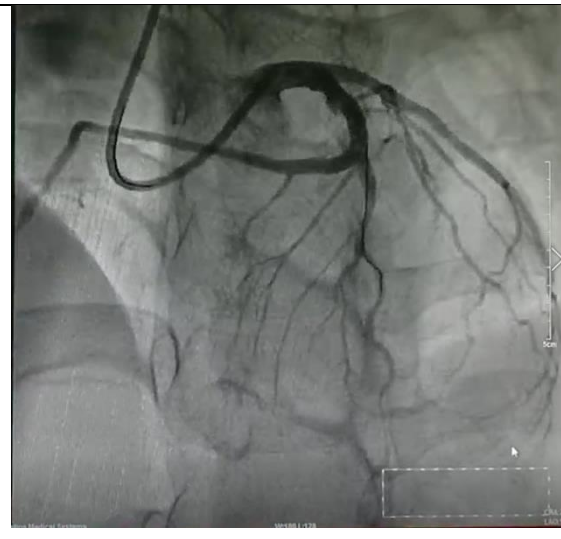


Figure 1f: LAO Cranial view. In this view demonstrates finally a good angiographic result was observed after PCI procedures.

Case 2. A 74-year-old woman presented with a history of progressive angina pectoris for 3 months, she suffered from diabetes mellitus and hypertension for ten years. Coronary angiogram was performed through trans-radial approach. The coronary angiography results showed nonobstructive ostial LMCA and diffuse LAD disease extending from the

proximal to the mid segment. The left circumflex artery (LCX) was long lesions in the proximal segment, and the anomalous right coronary artery (RCA) originating from the mid of LAD was patent (shown in figure 2a, 2b).

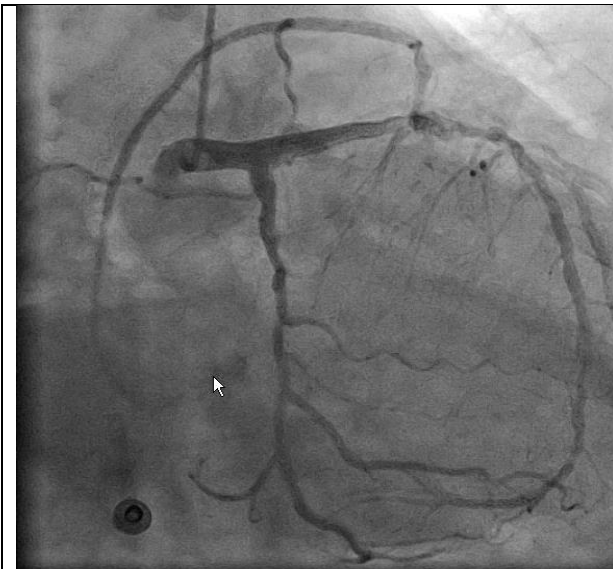


Figure 2a: The RAO caudal view. In this view demonstrates RCA originating from the mid of LAD segment.

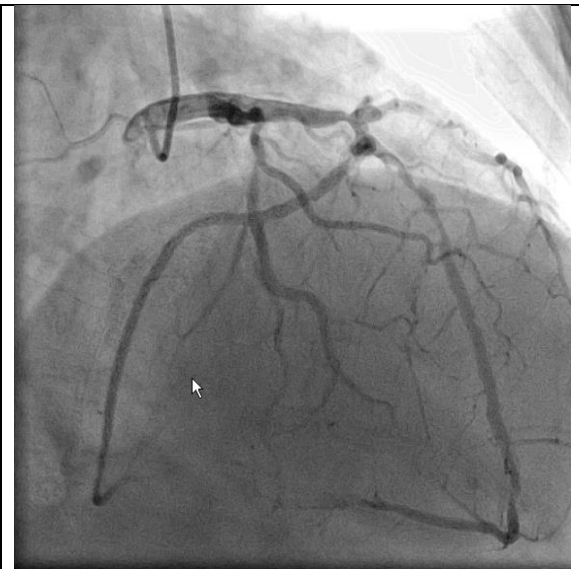


Figure 2b: The RAO cranial view shows long lesions in the proximal and mid of LAD segment, RCA arising from the mid of LAD and the lesions of LAD segment.

Based on coronary angiography findings, the decision was made to proceed with percutaneous coronary interventions (PCI) to the proximal and mid LAD and LCX. A 6Fr EBU 3.5 guiding catheter was used to engage the left coronary system. A 180-cm balance middle weight (BMW) wire was used to cannulate the LAD, and the other BMW was used to cannulate the anomalous RCA to protect it. The proximal and mid LAD lesion was predilated with a 2.0× 20-mm Maverick 2 balloon (Boston Scientific Corporation, Natic, MA, USA) at 12 atm. A 2.5× 30 mm Endeavor (Medtronic Corporation, Minneapolis, MN, USA) stent

was implanted at the mid LAD segment, and a 3.0× 23 mm Firebird (MicroPort Medical Corporation, Shanghai, China) stent, it crossed over the anomalous RCA, was deployed at the proximal LAD at 14 atm, jailing the wire in the RCA. The mid LAD stent appeared to be underexpanded, so it was postdilated with a 3.0×12-mm Quantum Maverick RX balloon (Boston Scientific Corporation, USA) up to 14 atm. Finally a good angiographic result was observed, and the ostium of anomalous RCA originating from the mid of LAD is not affected (see figure 2c-d).

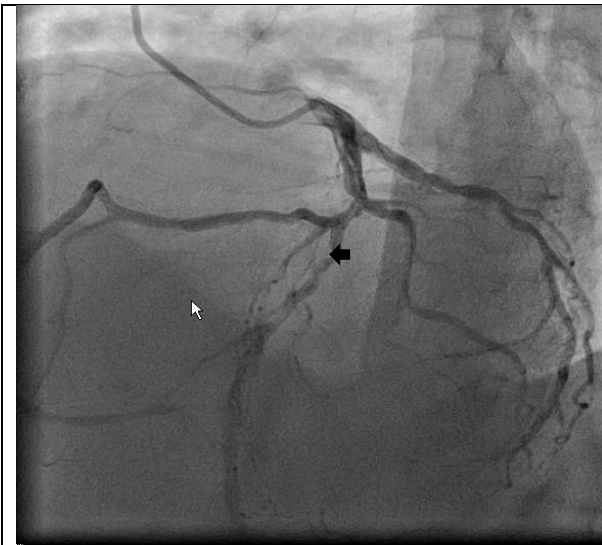


Figure 2c: LAO Cranial view. In this view shows the anomalous right coronary artery originates from the mid of LAD segment. There was 70-80% stenosis in proximal and mid of LAD segment.

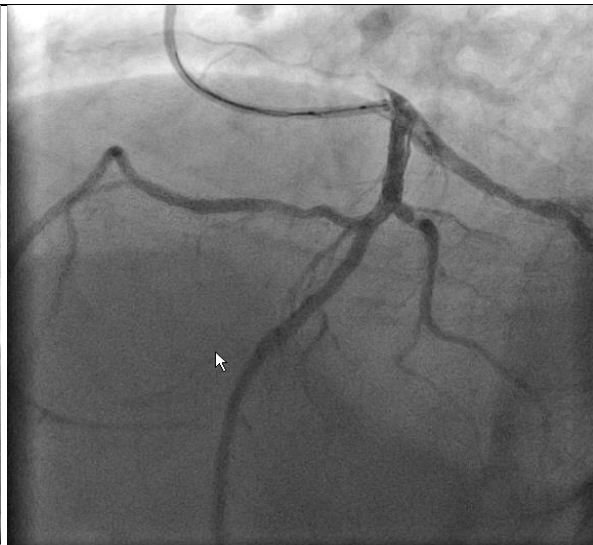


Figure 2d: LAO Cranial view. In this view demonstrates excellent angiographic results after two stents were deployed at the mid of LAD segment.

Case 3. A 54-year-old man was admitted with effort chest pain for three months. His coronary risk factors were hypertension and history of ex-smoking. The echocardiography showed normal left ventricular function (EF=54%) without regional wall motion abnormality. The physical exam was normal. The ECG showed T-wave inversion in leads V1-4 and chest

x-ray was normal. Coronary angiography was performed through trans-radial access. Left coronary angiography showed the left main coronary was normal. There was 80% stenosis at the mid LAD segment, while LCX 70% stenosis in the proximal segment. The anomalous right coronary artery originating from the mid of LAD segment (**Figure. 3a-d**).



Figure 3a: The RAO cranial view. In this view shows RCA originating from the mid of LAD segment. There was 80% stenosis in the mid of LAD segment.



Figure 3b: The RAO caudal view. In this view shows there was 70% stenosis in the proximal of LCX segment.



Figure 3c: The LAO view. In this view shows RCA originating from the right sinus of Valsalva.

Figure 3d: RAO Caud view. In this view demonstrates the anomalous originates from the mid of LAD segment.

According to coronary angiography findings, the decision was made to proceed with percutaneous coronary interventions (PCI) of the bifurcation lesions to the mid of LAD. A 6Fr Jukin's 3.5 guiding catheter was used to engage the left coronary system. A 180-cm balance middle weight (BMW) wire was used to cannulate the LAD, and the other runthrough (NS) wire was used to cannulate the anomalous RCA to protect it. The

mid of LAD lesions was predilated with a 2.5- \times 15-mm Maverick 2 balloon (Boston Scientific Corporation, Natic, MA, USA) at 12 atm. A 3.0- \times 30 mm Resolute (Medtronic Corporation, Minneapolis, MN, USA) stent was implanted at the mid LAD segment, it crossed over the anomalous RCA, was implanted at the mid LAD at 14 atm. Finally a good angiographic result was observed (**Figure. 3e-f**).



Figure 3e: The LAO cranial view. In this view shows excellent angiographic result after stent was implanted in the mid of LAD LAD segment.

Figure 3f: The RAO caudal view. In this view demonstrates was good angiographic result in the LAD segment.

Discussion

Congenital anomalies of coronary arteries (CAAS) are very rare and usually documented as an incidental finding during routine catheter or CT angiography performed for other reasons. Their prevalence ranges from 0.2% to 1.3% based published series [1-4]. The most common coronary artery anomaly is origination of the left circumflex coronary (LCX) artery from the proximal of right coronary artery (RCA) or right sinus of

Valsalva. The second is separate origination of the left anterior descending coronary artery (LAD) and LCX artery from the left sinus of Valsalva. The third is the anomalous right coronary artery (RCA) originating from the aortic trunk of ascending artery or left sinus of Valsalva. When the anomalous right coronary originates from the mid of left anterior descending coronary artery, it is called single coronary artery (SCA) [2], its prevalence is less than 0.024% [3]. The anomalous coronary artery is first designated with "R" or "L" depending upon whether the

ostium is located in the right or left sinus of Valsalva. It is then designated as group I, II, III. Group I has anatomical course of either a right or left coronary artery. Group II anomalies arise from the proximal part of the normal right or left coronary artery, and cross the base of the heart before assuming the normal position of the inherent coronary artery. Group III describes the anomaly where the LAD and LCX arise separately from the proximal part of the normal right coronary artery [4]. Herein, we presented three extremely rare cases of anomalous RCA detected incidentally during routine coronary angiography. The first case is the anomalous RCA arising from the mid of left anterior descending coronary artery (LAD). The bifurcation lesions was treated using DK culotte stent technique, finally excellent angiographic results were observed (**Figure. 1f**). The last two cases are treated using simple provisional stent technique: single stent placement covering the the side branch. Final good angiographic results were obtained (**Figure. 2d, 3f**). All the cases are belongs to L-IIA subtypes according to Lipton's classification [3].

Despite advances in the field interventional cardiology, the optimal stenting technique for bifurcation disease remains the subject of debate. Bifurcation disease accounts for 15-20% of coronary interventions. According to the 2011 American College of Cardiology (ACC) guidelines, provisional side branch stenting should be the initial strategy (class I recommendation) when the side branch is not large and has only mild to moderate ostial disease, while elective side branch stenting is reasonable (class IIA) if the side branch is large with a high risk of occlusion and the likelihood of side branch reaccess is low [5]. The case we present is that the anomalous right coronary originates from the mid of left anterior descending coronary artery, and the bifurcation lesions were treated using simple provisional stent or two-stent strategy (DK-culotte), final excellent angiography results were observed. The case is extremely rare, so we bring forth them to attempt their significant in our clinical practice [6].

Coronary anomalies are usually detected during coronary angiography. However, X-ray angiography is limited by its inability to provide information regarding the spatial orientation of the anomalous artery with regarding to the surrounding cardiovascular structures [6,7,8]. MSCT coronary angiography has proven to be effective not only in the identification and characterization of coronary artery disease, but also in

the evaluation of the anatomical coronary details, and clearly demonstrate the surrounding cardiovascular structures of the anomalous coronary artery.

Conflict of interest

None

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