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Short communication

Percutaneous coronary intervention in patients with anomalous origin of coronary artery presenting with acute coronary syndrome: A case series

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ABSTRACT

Coronary artery anomalies are found in 0.6%–1.5% of patients undergoing diagnostic coronary angiogram. Intervention in these patients poses a particular technical challenge secondary to the aberrancies in the vessel origin and course. From March 2011 to February 2013, 13 cases with complex coronary artery anomalies were observed among 2482 patients undergoing CAG (0.52%) at our cath lab. Only three patients had severe stenosis in the anomalous artery sufficient to require an intervention and had presented with myocardial infarction. PCI was performed successfully in these 3 patients two of which had anomalous left circumflex artery and the other having an anomalous right coronary artery.

1. Introduction

Coronary artery anomalies are found in 0.6–1.5% of all coronary angiograms (CAG).[1] The most common anomaly is an aberrant circumflex artery arising from the right sinus of Valsalva through a common or separate ostium along with the right coronary artery (RCA) or directly as a branch of the RCA itself, occurring in approximately 0.48–0.7% of cases.[2] There has been a tremendous surge in the utilization of CAG and angioplasty in recent years.[3] Cardiologists are encountering a wide variety of coronary anatomies, including aberrant coronaries and the detection of which is increasing day by day.[3] These aberrant arteries present a major challenge for both diagnosis and coronary intervention, if required.[4] The aim of the present study was to demonstrate the safety and efficacy of the technique used for percutaneous coronary intervention (PCI) in acute coronary syndrome (ACS) patients with anomalous origin of coronary artery.

2. Case description

From March 2011 to February 2013, 2482 patients had undergone diagnostic CAG through femoral route under the study unit. Among them, only 13 cases (Male: 10 & Female: 3) had anomalous origin of coronary artery (0.52%). Of these, 11 cases had anomalously originating left circumflex coronary artery (LCX) and only two cases had anomalously originated RCA. High or posterior origin of RCA and separate origin of conus artery were excluded. Only three cases of these (all male patients) were admitted with acute inferior wall myocardial infarction (IWMI) in which the coronary angiogram showed significant stenosis in the anomalous coronary artery amounting to the requirement of a percutaneous intervention, have been discussed. Two patients had significant stenosis of anomalously originating LCX and another patient had significant stenosis of anomalously originating RCA. PCI with stenting was done in all these three cases and one case also underwent a simultaneous PCI with stenting of left anterior descending coronary artery (LAD).

2.1. Case 1

A 47-year-old smoker, diabetic, non-hypertensive male, experienced an acute IWMI (STEMI) and was given injection streptokinase for thrombolysis with a window period of 4 h. The symptoms improved after lysis and the patient was pain free hence an immediate invasive strategy was deferred. On admission his ejection fraction (LVEF) was 47%. He was in Killip class I at presentation. CAG performed one day later, demonstrated significant stenosis (90%) of proximal LAD along with significant stenosis (80%) of LCX which

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was arising from a separate ostium located in close proximity in right aortic sinus (Fig. 1). As a part of a routine protocol in cases with suboptimal eyeball assessment of lesions, the lesion significance was assessed with quantitative coronary angiography (QCA) which demonstrated the lesion to be significant hence the patient was planned for a PCI to both the vessels. First, the anomalously originating LCX was stented following which the lesion in the LAD was also stented. We used Judkin's Right guiding catheter (JR, 3.5, 6 F), floppy wire (0.014′) and Driver (2.5 × 23 mm) stent for direct stenting across the lesion in the anomalously originating vessel. The reason for the choice of the Judkin's catheter in this case was that during the diagnostic angiogram the Judkin's right catheter had provided an optimal engagement and image and also because we did not want to engage into the anomalous vessel deeply lest the vessel would dissect or an arrhythmia would occur. In this case only single guide wire was used after selective engagement of guiding catheter. Injection of unfractionated heparin (UFH) 8000 units was given during procedure and activated clotting time (ACT) immediately after procedure was 290 s. Injection of GP IIb/IIIa inhibitor was not used. Patient had Thrombolysis in Myocardial Infarction (TIMI) III flow in both the diseased vessels after the procedure (Fig. 2). The patient had been pre-medicated with oral clopidogrel (300 mg), aspirin (300 mg) and atorvastatin (40 mg) and was discharged on clopidogrel (75 mg/day), aspirin (150 mg/day) and atorvastatin (40 mg/day) along with anti-diabetic medication, metoprolol succinate and ramipril. He has been asymptomatic since discharge during his follow up even after 9 months.

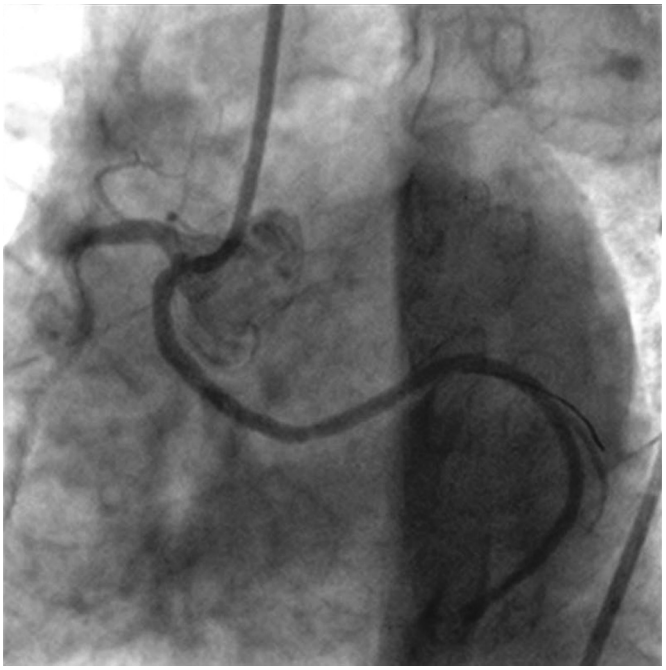

Fig. 2. CAG showed TIMI grade III flow after angioplasty in anomalous LCX.

2.2. Case 2

A 50-year-old smoker, non-diabetic and non-hypertensive male, presented with an evolved IWMI (STEMI) with a chest pain of >48 h duration and was not given thrombolytic therapy on account of his late presentation. The ECG at the time of admission showed that the ST segments had settled and the infarction had evolved and the biomarkers were positive indicating an acute event. Primary PCI was deferred as the patient was relatively asymptomatic at the time of presentation and his pain was negligible as compared to that at its onset. The coronary angiogram, a day later, demonstrated significant stenosis (80%) of distal RCA which was arising from left aortic sinus. The severity of the stenosis was confirmed by QCA (Fig. 3). PCI with stenting of the lesion in the anomalously originating RCA was done. We used Amplatz left guiding catheter (AL 2, 6 F), floppy wire (0.014′) and Driver (2.75 × 18 mm) stent for the procedure and direct stenting across the lesion was performed. The

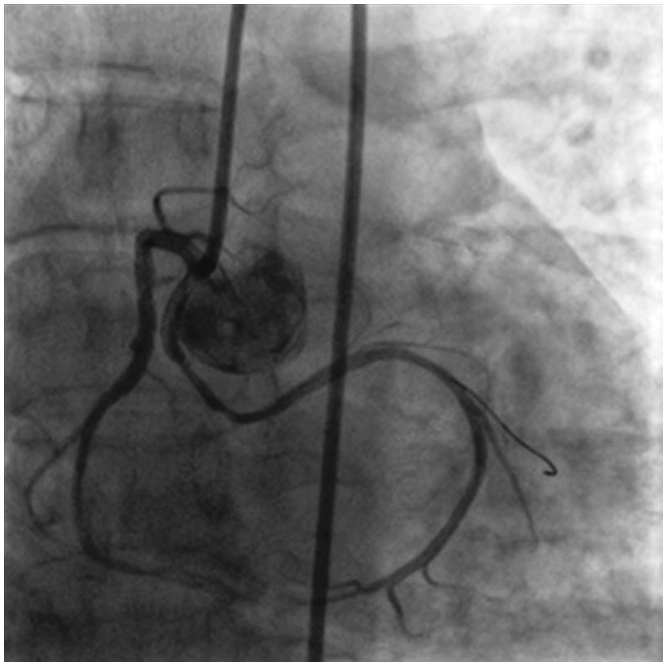

Fig. 1. CAG showed that both the RCA and LCX arising from right aortic sinus from separate ostium from the same coronary sinus and the anomalous LCX has significant proximal stenosis.

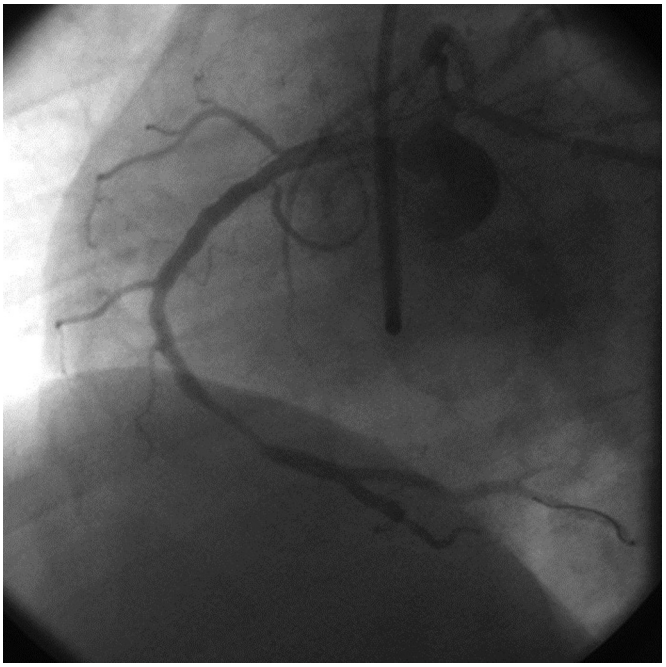

Fig. 3. CAG showed RCA anomalously arising from left aortic sinus and distal RCA has significant stenosis.

reason for the selection of Amplatz left catheter in this case was the abnormal origin of the vessel from the left sinus for which routinely an Amplatz catheter has been recommended in order to obtain good catheter support for the procedure although we were careful in taking precautions to avoid dissecting the vessel. In this case only a single guide wire was used after selective engagement of guiding catheter. Injection of UFH 5000 units was given during procedure and ACT immediately after procedure was 275 s. Injection of GP IIb/IIIa inhibitor was not used. Patient had TIMI III flow after PCI with stenting (Fig. 4). He was asymptomatic since his last follow up even after 2 years. The oral premedication and the medications prescribed at the time of discharge were based on the standard practice and were similar to that used for the previous case discussed.

2.3. Case 3

A 45-year-old smoker and dyslipidemic, non-diabetic, non-hypertensive male, presented with a chest pain since 3 days with an evolved IWMI (STEMI) and was neither lysed nor taken for a primary PCI due to his presentation and being asymptomatic at the time of presentation. The ECG showed an evolved Q-wave MI pattern and the biomarkers were positive. On admission his LVEF was 52% and was in Killip class I. CAG performed the same day, demonstrated diffuse disease of RCA and significant stenosis (90%) of LCX which was arising from a separate ostium in right aortic sinus (Fig. 5). After having confirmed the anatomical significance of the lesions by QCA, we performed PCI with stenting of the lesion in the anomalously originating LCX was done. We used Judkin's Right guiding catheter (JR, 3.5, 6 F), floppy wire (0.014′), Voyager balloon (2.5 × 15 mm) for pre-dilatation and Coroflex (2.5 × 24 mm) stent for stenting across the lesion. The reason for selection of the JR catheter in this case was the same as that in the first case as the vessel origin and angle was similar to the first case. In this case two guide wires were used by an anchoring wire technique to stabilize the guiding catheter and to get support before the delivery of the stent. Injection of UFH 5000 units was given during procedure and ACT immediately after procedure was 270 s. Injection of GP IIb/IIIa inhibitor was not used. Patient had TIMI III flow after the procedure

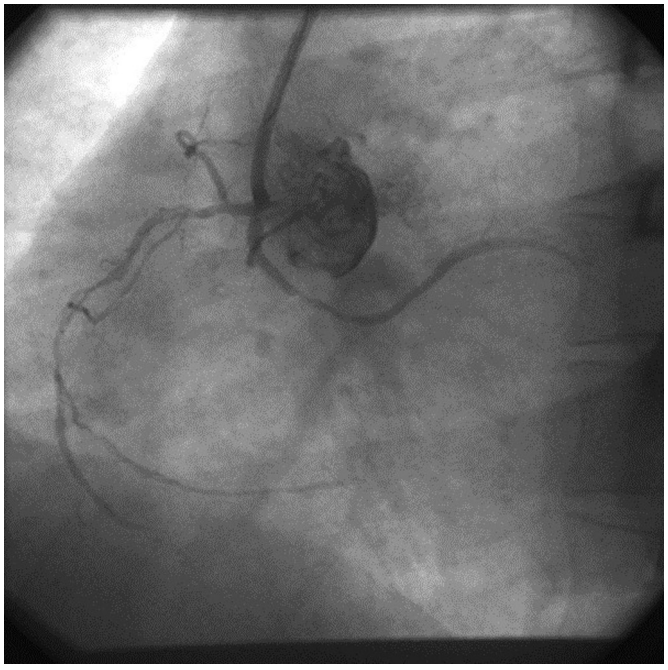

Fig. 5. CAG showing anomalous LCX arising from right aortic sinus and having a significant lesion.

(Fig. 6). The premedication and discharge medication protocols were based on standard practice and was similar to the previous cases. He has been asymptomatic since his discharge at 6 months of follow up.

3. Discussion

Among the coronary artery anomalies, the aberrant origin of the LCX is the most common as reported in the previous series which

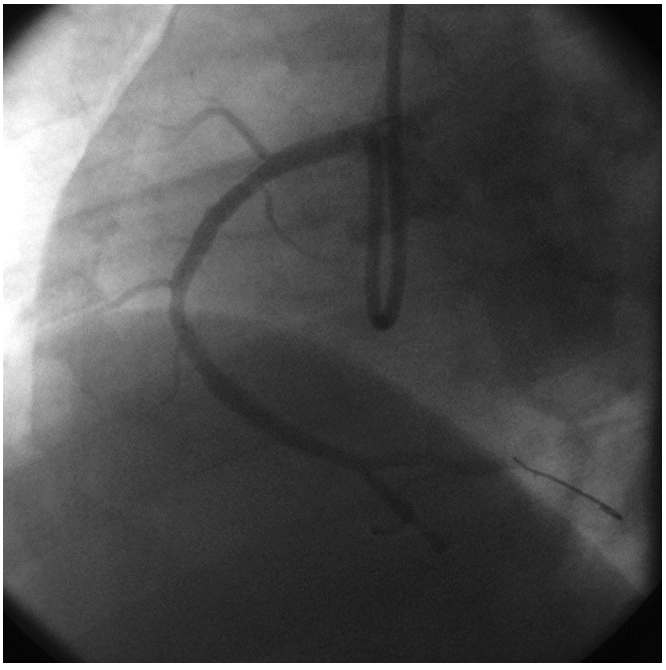

Fig. 4. Post angioplasty coronary angiogram showed TIMI III flow.

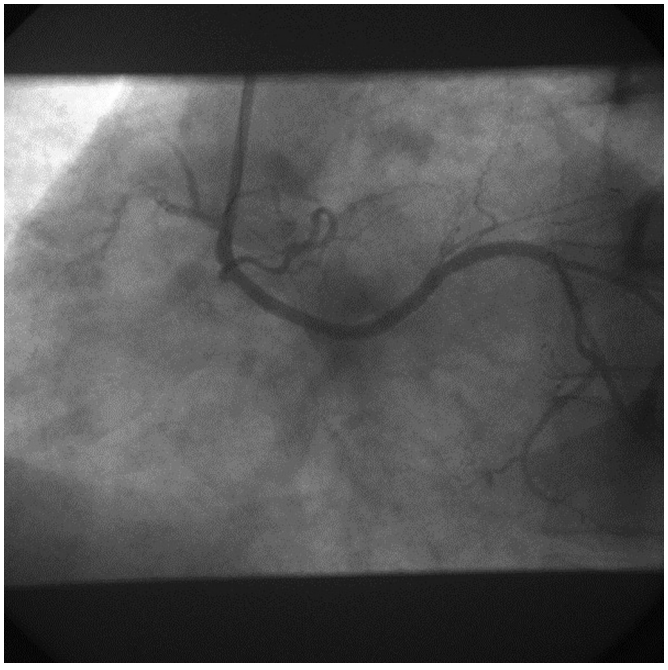

Fig. 6. Post PCI coronary angiogram showed TIMI grade III flow.

was also similar to that in our study.[5] Anomalous origin of coronary arteries, especially the retro aortic course of LCX is selectively predisposed to atherosclerotic disease.[6] Anomalous origin of coronary arteries is a rare anatomical defect and its association with acute myocardial infarction is unusual with only few cases having been reported in the literature.[7] We also found only three cases within the last two years who presented with ACS and IWMI due to a lesion in the anomalous coronary artery.

Though there are a few studies which have demonstrated the feasibility of PCI in anomalous coronary artery but these aberrant vessels pose technical challenges in coronary intervention.[8] The technical difficulties associated with PCI in anomalous coronaries are improper visualization during CAG, inability to obtain a co-axial engagement of catheter during angioplasty, requirement of significant curve in the guide wire and difficulty in the advancement of the balloon or the stent delivery system.[9] For successful PCI in anomalous coronaries, adequate knowledge about anatomical course of these aberrant vessels is required.[8]

Summary of the cases.

Sr no.	Age/Sex	Presentation	Risk factors	Ejection fraction	CAG	PCI + stenting	Procedural complication
Case 1	47 years/Male	Acute IWMI	Smoker, diabetes	47%	LAD (proximal-90% lesion); LCX – from right aortic sinus (80% stenosis)	Angioplasty of both LAD & LCX done	None
Case 2	50 years/Male	Evolved IWMI	Smoker	50%	RCA – distally 80% stenosis, arising from left aortic sinus.	Angioplasty of RCA done	None
Case 3	45 years/Male	Evolved IWMI	Smoker	52%	LCX – had 90% stenosis & arising from right aortic sinus	Angioplasty of LCX done.	None

Choosing appropriate guiding catheter is equally important in doing angioplasty in the anomalous coronary artery. These vessels owing to their abrupt origin and abnormal take off often make it difficult to obtain adequate support from the guide catheter and also the tortuous course of these vessels makes wiring a difficult task thereby increasing the risk of perforation. The choice of catheter is usually based upon the angle and the take off of the anomalous vessel and the operator preference and there is no standard or consensus based practice and neither can there be one because each case has a different anatomy form the other and the choice of catheter has to be individualized. The decision to balance between good catheter support and the risk of perforation has to be counterbalanced by the operator and the choice should not be dogmatic and the operator should be ready to switch over to another catheter if the primary approach does not provide adequate results. Some studies have reported that Amplatz right catheter should be used in cases of anomalous LCX arising from right aortic sinus or proximal RCA and Judkin's right catheter should be used when LCX arises anomalously from distal RCA.[10] But in our case series, we have used Judkin's right catheter for both the cases with anomalous LCX with success despite the fact that they were arising from the right aortic sinus. For anomalous origin of the RCA from left the aortic sinus, Amplatz left guiding catheter needs to be used as has been done in our case also.[11]

Similar consideration applies to the choice of wires as well. It is always better to start off with a floppy or a soft tipped wire to decrease the risk of perforation unless the course of the artery is extremely tortuous where a hydrophilic wire could be preferred. If one guide wire doesn't give adequate support then two wire anchoring technique can be used.[12] In one of our cases, we have used double wire technique for good anchoring and support for the guiding catheter.[12] But, we should use this "two-wire, two-vessel" technique less frequently to lessen the chances of injury to the native vessel. Though there are few reported cases of serious complications in the literature like intramural hematoma,[11] coronary dissection or aorto-ostial dissection[12] but in our series, there was no occurrence of such complication seen. Good procedure outcome was obtained in all the patients and all of them were asymptomatic during their follow-up.

4. Conclusion

Though there are a lesser number of patients with anomalous coronary artery presenting with an ACS and acute myocardial infarction, but PCI with stenting is feasible and viable option in these case although difficult at times owing to their abnormal origin and tortuous course. Appropriate anatomical knowledge about the course of aberrant vessels, selecting appropriate hardware, selective engagement of anomalous artery and sometimes use of "two wires-two vessel" angioplasty technique are important keys for successful intervention in these cases.

Contributors

SK, SP, NA KSR & CNM were involved in the management of patients. SP reviewed the literature and drafted the manuscript. All authors approved the final version of the manuscript.

Conflicts of interest

All authors have none to declare.

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