Primary Percutaneous Coronary Intervention in an Anomalous Right Coronary Artery in a Patient with Acute ST-Segment Elevation Myocardial Infarction

WEI-SYUN HU, SHEN-CHANG LIN, KOU-GI SHYU

An anomalous right coronary artery (RCA) arising from the left sinus of Valsalva is a rare congenital coronary anomaly. Although there are reports of percutaneous coronary intervention (PCI) for atherosclerotic lesions of this unusual coronary anomaly, only four cases of acute ST-segment elevation myocardial infarction caused by thrombotic occlusion of an anomalous RCA managed with primary PCI have been documented previously. Herein, we describe a 65-year-old man who had successful PCI in an anomalous RCA in the clinical setting of acute myocardial infarction. The patient was discharged a few days later and has been well during OPD follow-up.

Key words: coronary anomaly, myocardial infarction, percutaneous coronary intervention

Introduction

Reports of an anomalous origin of a coronary artery as an infarct-related artery managed with primary percutaneous coronary intervention (PCI) are limited in the literature. Herein, we report a case of acute ST-segment elevation myocardial infarction (STEMI) caused by thrombotic occlusion of an anomalous right coronary artery (RCA) arising from the left sinus of Valsalva which was successfully reperfused with primary PCI.

Case Report

A 65-year-old man came to the emergency room because of sudden onset of chest pain of a squeezing character for half an hour. Electrocardiography revealed sinus rhythm with ST-segment elevation in leads II, III and aVF, indicative of acute ST-segment elevation myocardial infarction (STEMI) involving the inferior wall. After obtaining informed consent, emergency cardiac catheterization was performed with vascular access through the right femoral artery.

The left coronary artery was cannulated with a 6Fr Judkins left 4.0 diagnostic catheter. The angiogram showed 70% stenosis in the middle portion of the left anterior descending artery (LAD); the left main coronary artery (LMCA) and the left circumflex artery (LCX) were patent (Fig. 1A). In view of the electrocardiographic changes of an acute STEMI involving the inferior wall, suggestive of involvement of the RCA, cannulation of the RCA ostium was attempted. Catheterization was unsuccessful with 7Fr Judkins right 4.0, 7Fr Judkins left 4.0, 7 Fr Amplatz left 1 and 7 Fr XB-3.0...
guiding catheters. Finally, selective cannulation of the RCA was accomplished with a 7Fr Multi-Purpose 1 guiding catheter. Right coronary angiography demonstrated 95% stenosis in the middle portion of the anomalous RCA (Fig. 1B). Subsequently, the lesion in the infarct-related artery was crossed with a 0.014-inch BMW guidewire (Guidant Corp., Indianapolis, Indiana, USA). The lesion in the artery was predilated with a 3.0×15 mm Voyager™ balloon (Abbott Vascular, Santa Clara, California, USA) at 8 atm. A 3.0 × 23 mm R-2 stent (OrbusNeich, Fort Lauderdale, Florida, USA) was subsequently delivered to the lesion with precise positioning and deployed to 14 atm because of high-grade residual stenosis with dissection formation after balloon angioplasty (Fig. 1C). The final angiogram showed Thrombolysis In Myocardial Infarction III flow (Fig. 1D). The patient had no peri-procedural complications. The total procedure time was 45 minutes. The patient was discharged a few days later and has been well during OPD follow-up.

### Discussion

The incidence of all coronary anomalies is approximately 1%, and an anomalous RCA arising from the left sinus of Valsalva has been reported in 0.05-0.10% of patients undergoing coronary angiography(4). It is a potentially lethal anomaly leading to angina pectoris, syncope, arrhythmia, myocardial infarction and even sudden cardiac death, possibly because of the acute angle of origin of the anomalous RCA from the aorta which produces a slit-like orifice in the aortic wall and compression of the RCA between the ascending aorta and the pulmonary trunk during exercise(5).

Although PCI for atherosclerotic lesions has been reported in this unusual coronary anomaly(6,7), we are aware of only 7 reported cases of acute STEMI caused by thrombotic occlusion of an anomalous RCA arising from the left sinus of Valsalva(1-3,8,9). Four of the reported patients received primary PCI and the other 3 received elective PCI after thrombolytic therapy (Table 1). The present case

### Table 1  Review of clinical characteristics, angiographic features and procedural results of percutaneous coronary intervention in anomalous right coronary arteries arising from the left sinus of Valsalva in patients with acute ST-segment elevation myocardial infarction (including true posterior wall myocardial infarction)

<table>
<thead>
<tr>
<th>Author/year</th>
<th>Case number</th>
<th>Age/sex</th>
<th>ECG</th>
<th>Obstructive level</th>
<th>GC</th>
<th>Reperfusion methods</th>
<th>Primary PCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yip et al.¹</td>
<td>2</td>
<td>NA</td>
<td>Inferior wall</td>
<td>M</td>
<td>7Fr JL4.5</td>
<td>Stenting (NA for stent selection)</td>
<td>Y</td>
</tr>
<tr>
<td>/2001</td>
<td></td>
<td></td>
<td>Posterior wall</td>
<td>D</td>
<td>7Fr JL4.5</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Cohen et al.⁸</td>
<td>1</td>
<td>67/Female</td>
<td>Inferior wall</td>
<td>M</td>
<td>6Fr JL4.0</td>
<td>Stenting (Crossflex LC 3.0*18 mm)</td>
<td>N</td>
</tr>
<tr>
<td>/2002</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Spargias et al.⁹</td>
<td>2</td>
<td>50/Male</td>
<td>Inferior wall</td>
<td>P</td>
<td>6Fr XB4.0</td>
<td>Stenting (Zeta 3.5*23 mm)</td>
<td>N</td>
</tr>
<tr>
<td>/2006</td>
<td>76/Female</td>
<td></td>
<td>Inferior wall</td>
<td>P</td>
<td>6Fr Amplatz lef 1</td>
<td>Taxus 2.75*12 mm)</td>
<td>N</td>
</tr>
<tr>
<td>Conde-Vela et al.⁷</td>
<td>1</td>
<td>58/Male</td>
<td>Inferior wall</td>
<td>M</td>
<td>6Fr JL4.0</td>
<td>Stenting (Tecnic 3.5<em>25 mm, 4.0</em>12 mm)</td>
<td>Y</td>
</tr>
<tr>
<td>et al. /2006</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Azzarelli et al.⁷</td>
<td>1</td>
<td>75/Male</td>
<td>Inferior wall</td>
<td>P</td>
<td>7Fr XB3.0</td>
<td>Stenting (Endeavor Rx 4.0*30 mm)</td>
<td>Y</td>
</tr>
<tr>
<td>/2007</td>
<td>1</td>
<td>65/Male</td>
<td>Inferior wall</td>
<td>M</td>
<td>7Fr MP-1</td>
<td>Stenting (R-2 3.0*23 mm)</td>
<td>Y</td>
</tr>
</tbody>
</table>

D: distal; ECG: electrocardiogram; Fr: French; GC: guiding catheter; JL: Judkins left; M: middle; MP: multipurpose; NA: not available; P: proximal; PCI: percutaneous coronary intervention.
Fig. 1 A  Left coronary angiogram in the left anterior oblique projection with cranial angulation shows 70% stenosis in the middle portion of the left anterior descending artery (LAD, arrow); the left main coronary artery (LMCA) and the left circumflex artery (LCX) are patent. Note some contrast media reflux into the anomalous right coronary artery (RCA)

B  Right coronary angiogram demonstrates 95% stenosis in the middle portion of the anomalous right coronary artery (RCA) arising from the left sinus of Valsalva, separate from the left main coronary artery (LMCA)

C  Angiography after balloon angioplasty shows high-grade residual stenosis with dissection formation in the middle portion of the RCA (arrow)

D  Final angiogram after stenting the culprit lesion shows Thrombolysis In Myocardial Infarction III flow

brought to 5 the total number of reported cases successfully reperfused with primary PCI. The obstructive lesion was in the proximal segment of the anomalous RCA in 3 of the 8 patients and in the middle and distal segment in the other 5, including one patient with only distal segment involvement (Table 1). Proper choice of guiding catheter is essential to optimize cannulation of the anomalous RCA and provide better support for angiographic visualization and interventional procedures. Three authors reported successful PCI of the anomalous RCA with a Judkins left guiding catheter\(^1\rightarrow2,8\), whereas others used a 6 Fr XB 4.0, 6 Fr Amplatz left 1 or 7 Fr XB 4.0 guiding catheter\(^3,9\). In the present case, the anomalous RCA was engaged with a 7 Fr Multi-Purpose 1 guiding catheter.
Previous reports and our experience suggest that no single catheter is necessarily optimal; appropriate selection of the guiding catheter, careful manipulation and the experience of the interventional cardiologist are more important to the success of the procedure.

Primary PCI can be extremely challenging with this type of anomaly, with a high risk of peri-procedural complications, mainly because of difficulty in selective cannulation and poor back-up support of the guiding catheters to advance interventional devices. New catheters designed to cannulate an anomalous RCA coaxially may enable operators to overcome the technical difficulties\(^6\), however, more experience by other clinicians is necessary to demonstrate their practicality.

In summary, we described a case of acute STEMI caused by thrombotic occlusion of an anomalous RCA arising from the left sinus of Valsalva that was successfully reperfused with primary PCI. Although new purpose-designed catheters are in development, appropriate selection of the guiding catheter, careful manipulation and the experience of the interventional cardiologist are more essential to the success of the procedure, particularly in the clinical setting of acute STEMI.

References


於一異常右冠狀動脈引起之急性ST段上升心肌梗塞之個案施行緊急經皮冠狀動脈介入治療

胡德拉 林申昌 徐國基

源自左側主動脈竇的右冠狀動脈為一種罕見的先天性冠狀動脈異常。雖然可以查詢到對於此種異常冠狀動脈之動脈硬化病灶施行經皮介介入治療的文獻，但針對因血栓性阻塞所造成之急性ST段上升心肌梗塞施行緊急經皮介介入治療的討論目前僅有四例。此篇文章描述一位因異常右冠狀動脈所造成之急性心肌梗塞的65歲男性病人，成功地接受緊急經皮介介入治療，並在幾天後出院，目前持續於門診追蹤且情況穩定。

關鍵詞：冠狀動脈異常，心肌梗塞，經皮冠狀動脈介介入治療

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