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Case Report

Retrograde coronary intervention for chronic total occlusion of RCA ostium with anomalous origin: A case report

Ryotaro Yamada (MD, PhD)[a,*], Atsushi Hirohata (MD, PhD)[b], Teruyoshi Kume (MD, PhD, FJCC)[a], Yoji Neishi (MD, PhD)[a], Shiro Uemura (MD, PhD, FJCC)[a]

[a] Division of Cardiology, Kawasaki Medical School, Kurashiki, Japan
[b] The Sakakibara Heart Institute of Okayama, Okayama, Japan

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ABSTRACT

Chronic total coronary occlusion (CTO) remains one of the most technically challenging clinical scenarios in which to perform interventions. Although the antegrade approach is a general approach for CTO recanalization, a retrograde attempt improves the success rate and its usage has been increasingly adopted in recent years. Congenital coronary anomaly represents another technically challenging factor especially when accompanied with CTO lesions. We report the case of a 43-year-old man with no relevant cardiac history who presented for evaluation of exertional chest discomfort with palpitation. Coronary angiography revealed the existence of CTOs at just ostial of anomalously originating right coronary artery (RCA) with no angiographic ostial dimple in Valsalva sinus. Because it was not possible to engage with the antegrade guiding catheter (GC) at the inlet of the RCA, we decided to perform revascularization using the retrograde approach. Percutaneous coronary intervention (PCI) of such an anomalous RCA, which is chronically occluded, is difficult and is rarely described. Retrograde approach has been used to overcome the impossible placement of antegrade GC to RCA ostium. After successful CTO-PCI, his chest discomfort promptly disappeared.

<**Learning objective:** Percutaneous coronary intervention for chronic total coronary occlusion of anomalous origin of right coronary artery (RCA) patients is difficult and is rarely described. Retrograde approach has been used to overcome the impossible placement of antegrade guiding catheter to RCA ostium.>

Introduction

Anomalous origin of right coronary artery (AORCA) is a rare congenital anomaly [1]. The AORCA originates either from left coronary sinus or from the aortic wall above the coronary sinus, and the incidence of this anomaly reported in literature is <1%. Many of these anomalies are clinically benign, however others are associated with serious morbidity. In addition, coronary intervention for an anomalous coronary artery is a technically challenging and extremely complicated procedure, especially in cases with chronic total occlusions (CTOs) [2–5].

We describe a rare case of a CTO of ostial RCA with anomalous origin from left coronary sinus, where retrograde approach has been used to overcome the impossible placement of antegrade guiding catheter (GC) to RCA ostium.

Case report

A 43-year-old man with no relevant cardiac history presented for evaluation of exertional chest discomfort with palpitation. He exhibited coronary risk factors: hypertension, dyslipidemia, and current smoking. Electrocardiography showed sinus rhythm without any abnormal ST-T changes. Subsequent exercise treadmill study revealed horizontal ST depression in precordial lead. Screening coronary computed tomography (CT) indicated the presence of AORCA arising just above commissure level between left and right coronary cusp and running through inter-arterial course. However, obvious occlusion or stenosis in RCA ostium was not diagnosed by CT findings (Fig. 1A).

Because of the known association between this coronary anomaly and chest discomfort, the patient was started on

* Corresponding author at: Department of Cardiology, Kawasaki Medical School, 577 Matsushima, Kurashiki, 701-0192, Japan.
E-mail address: ryotaro@med.kawasaki-m.ac.jp (R. Yamada).

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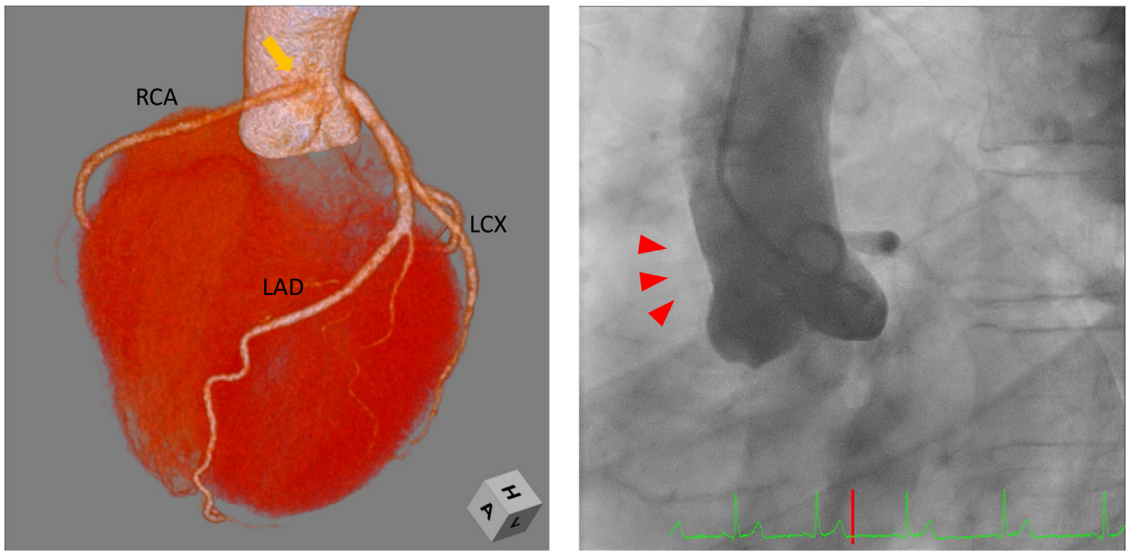


Fig. 1. (A) Screening coronary computed tomography suggested anomalous origin of right coronary artery (RCA) from ascending aorta above commissure level between left and right coronary cusp. There seemed to be no obvious stenosis in RCA running through inter-arterial course. (B) Aortography showed chronic total occlusions at just ostial of anomalous originating RCA with no angiographic ostial dimple in Valsalva sinus.

β-blocker medical therapy. However, this treatment could not resolve his chest discomfort. Subsequently, coronary angiography was carried out, and it revealed the existence of CTOs at just ostial of anomalously originating RCA with no angiographic ostial dimple in Valsalva sinus (Fig. 1B), and Rentrop Grade 3 collateral vessel from left anterior descending artery (LAD) to RCA.

After coronary angiography, the patient strongly wanted to receive complete coronary revascularization by percutaneous coronary intervention (PCI), not bypass surgery.

PCI was initiated for CTO at the inlet of the RCA using an approach via the bilateral femoral arteries. In the present case, it was not possible to engage with the antegrade GC at the inlet of the

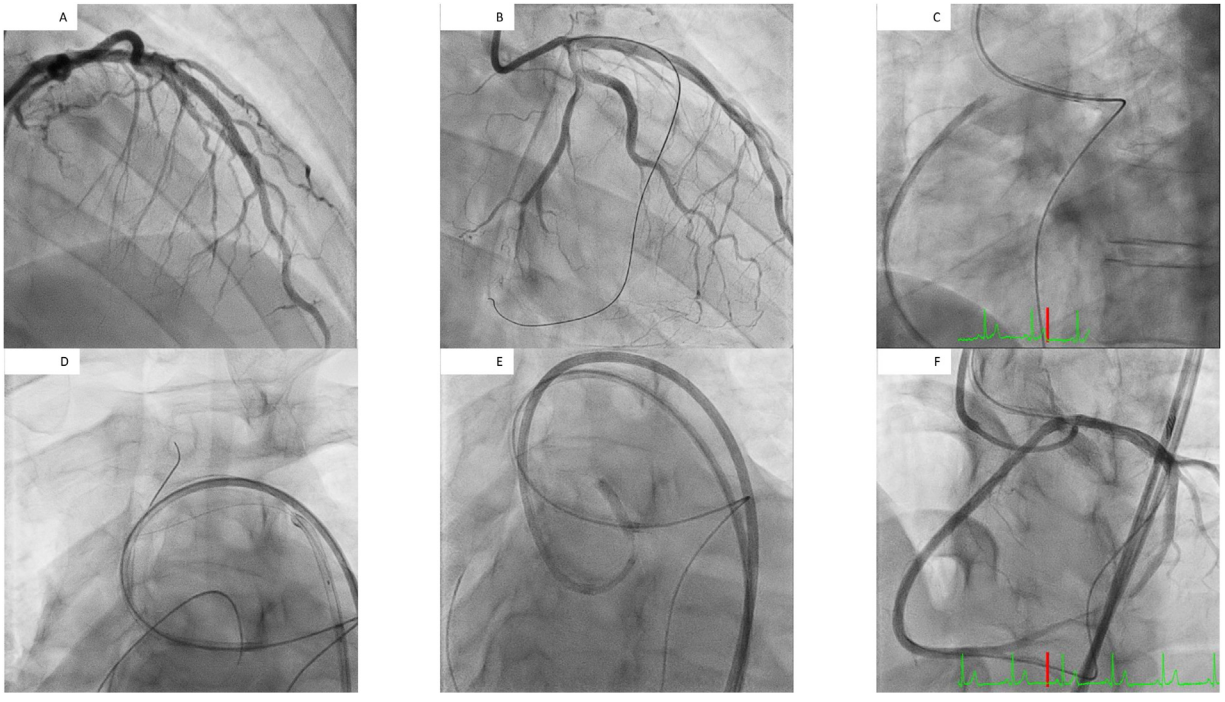
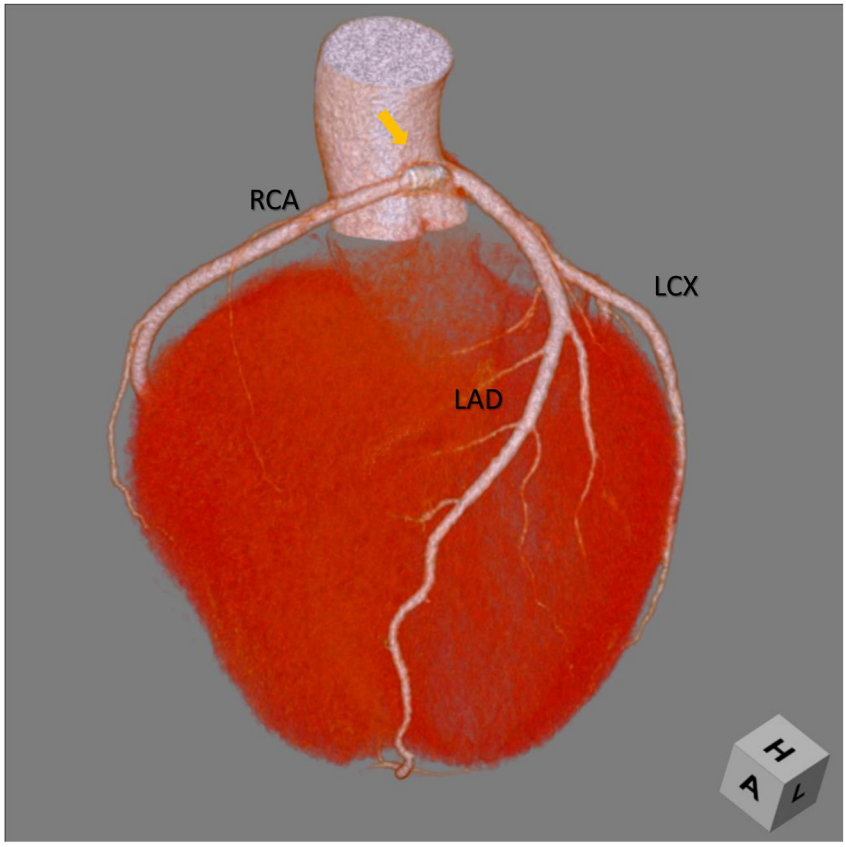


Fig. 2. (A and B) A guiding catheter was engaged in the left coronary artery and a guidewire was selected into the 2nd septal branch. (C) Selective contrasting was performed in a retrograde manner from the central portion of the right coronary artery (RCA) to confirmed chronic total occlusion at RCA ostium. (D) The retrograde guidewire with extension was captured, pulled back and forth to insert the tip into the antegrade guiding catheter by using a snare. (E) Stent was placed in proximal RCA. (F) Antegrade flow in RCA with anomalous origin from left coronary sinus was observed after stenting.

A



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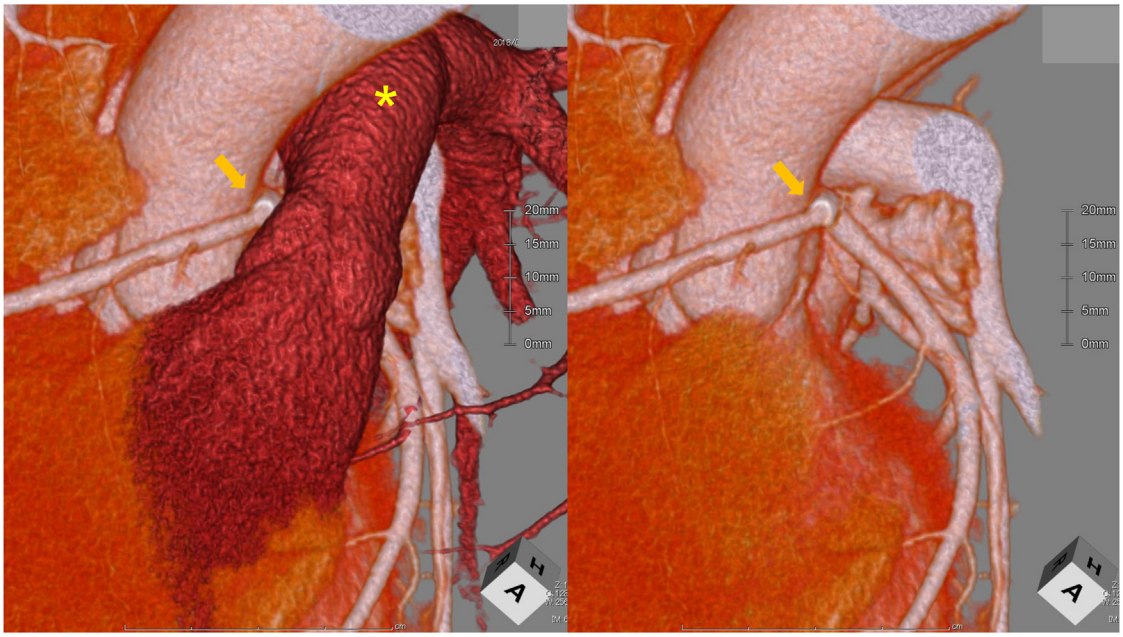

Fig. 3. (A) Follow-up coronary computed tomography revealed right coronary artery (RCA) with anomalous origin from left coronary sinus. A stent observed in ostial RCA (orange arrow). (B) A stent (orange arrow) was observed in ostial RCA between the aorta and pulmonary artery without any obvious stenosis. [Left panel: including pulmonary artery (yellow asterisks), Right panel: excluding pulmonary artery].

RCA. Therefore, the antegrade approach could not be used, and we decided to perform revascularization using the retrograde approach. A Launcher 7Fr. EBU 3.75 90 cm (Medtronic, Minneapolis MN, USA) was engaged in the left coronary artery (LCA) and a Sion guidewire (Asahi Intecc, Nagoya, Japan) was selected into the 2nd septal branch (Fig. 2A and B). Thereafter, a 135 cm Caravel (Asahi Intecc) was selected into the 2nd septal branch, and selective contrasting was performed using its tip. After confirming that the connection to the right posterior descending artery was poor, a XT-R guidewire (Asahi Intecc) was ultimately passed through and advanced to reach the distal portion of the RCA (Fig. 2B). A 150 cm Corsair microcatheter (Asahi Intecc) was also followed, and selective contrasting was performed in a retrograde manner from the central portion of the RCA to confirmed CTO at RCA ostium (Fig. 2C). The guidewire was advanced in a retrograde manner, and retrograde guidewire crossing with the Gaia Next 1st guidewire (Asahi Intecc) was achieved; the tip of the guidewire reached the inside of the ascending aorta. The Corsair microcatheter was passed through the lesion site using a retrograde approach. The retrograde guidewire with extension was captured, pulled back and forth to insert the tip into the antegrade GC (8Fr. Mach1 FR4.0SH) by using a snare (Fig. 2D). A retrograde RG3 (Asahi Intecc) was then advanced into the antegrade GC, thus completing externalization.

After successful lesion cross and balloon expanding, intravascular ultrasound identified not only mechanical compression from the pulmonary artery, but also intimal proliferation in the CTO lesion. Because the diseased segment was very short in both CTO (less than 1 mm) and compression (approximately 1 mm) lesions, we thought that the lesion could be treated with coronary stenting. (Fig. 2E & F).

After successful CTO-PCI, his chest discomfort promptly disappeared. Follow-up coronary CT revealed a stent in ostial AORCA between the aorta and pulmonary artery without any obvious stenosis (Fig. 3A & B) The actual orifice of AORCA was different from initial supposition.

Discussion

In this report we wanted to focus not only on the application of retrograde approach in CTO but also the difficulty in both diagnosis and treatment for CTO lesions occurring in inter-arterial AORCA. In this case, initial coronary CT did depict the AORCA, but it failed to diagnose the presence of CTO at ostium of AORCA possibly due to extremely short occlusion length. On the other hand, invasive aortography and coronary angiography clearly showed the ostial CTO because of no angiographic ostial dimple in Valsalva sinus and Rentrop Grade 3 collateral vessel from LAD to RCA. Hence, retrograde approach has been used to overcome the impossible placement of antegrade GC to RCA ostium.

Coronary intervention of such an AORCA, which is chronically occluded, is difficult and is rarely described [2–5]. With the popularization of the retrograde approach, the initial success rate of PCI for treating CTOs has been improved [6].

The retrograde approach in particular has enabled initial success in treating CTOs with an anomalous origin as well as those of the coronary ostium, which are difficult to treat using antegrade PCI [4].

The potential for sudden cardiac death has been largely attributed to an inter-arterial course between the aorta and pulmonary artery. Even if in CTO of AORCA, the risk of angina pectoris, heart failure, and fatal ventricular arrhythmia during exercise is still high.

To examine outcomes of interarterial AORCA cases, surgical repair offers a safe and effective option to relieve symptoms. Among large surgical cohorts including predominantly AORCA patients, Mainwaring et al. demonstrated that surgical repair appears safe and effective to relieve symptoms in up to 97% of patients during follow-up [7]. To review, the American College of Cardiology/American Heart Association 2008 guidelines for the management of adults with congenital heart disease, regardless of ischemia or symptoms, surgical repair was recommended for AORCA patients with a “course between the great arteries” in the presence of documented ischemia [8].

Limited evidence exists regarding the use of PCI in patients with interarterial anomalous origin of LCA or RCA. In a study of 42 predominantly adult patients (mean age 48 years, range 12–73 years) with interarterial AORCA undergoing PCI, the rate of in-stent restenosis was 4/30 (2 bare-metal stents, 1 Taxus stent (Boston Scientific Corp., Natick, MA), and 1 Cypher stent (Cordis Inc., Miami Lakes, FL) by serial intravascular ultrasound. In that study, 29% of patients had recurrent symptoms during a median follow-up period of 5 years [2]. Because of the mechanical compression with pulmonary artery, patients may require long-term careful follow-up even in successful PCI for CTO.

Conclusion

We experienced a rare case of a CTO of ostial RCA with anomalous origin from left coronary sinus, where retrograde approach has been used to overcome the impossible placement of antegrade GC to RCA ostium.

Conflict of interest

The authors declare that there is no conflict of interest.

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