

Mini Review

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# Procedural Review of Percutaneous Coronary Intervention against Chronic Total Occlusions in Anomalous Origin of the Right Coronary Artery from the Left Sinus of Valsalva



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## Introduction

Coronary arteries of anomalous origin are uncommon and encountered in 0.2-1.2% of patients undergoing percutaneous coronary intervention and represent a marked deviation of the normal anatomic pattern [1,2]. An anomalous origin of the right coronary artery (RCA) from the left sinus of Valsalva (LSOV) has been reported in 6-27% of patients with coronary anomalies. Moreover, the anomalous origin of the RCA from the LSOV is associated with early development of coronary artery disease and it can cause sudden cardiac death [3].

However, PCIs of anomalous right coronary artery (ARCA) from the LSOV pose considerable technical challenges to the interventionalist due to unusual location and course of this

anomaly. Still, CTO-PCIs against ARCA from the LSOV require more technical conditions for appropriate back-up support of guiding catheters to overcome problems such as anatomical anomaly and procedural approach to facilitate successful delivery of appropriate devices.

We reviewed the procedural characteristics of CTO-PCIs against ARCA from LSOV which had been undergone in our cardiac catheterization laboratory. Total 5 CTO lesions with ARCA from LSOV were underwent PCI without any complications. The origins were adjudicated with a schema (Figure 1) based on anatomical landmarks as described by Sarkar et al. [4] in LAO view. Procedural characteristics were summarized in the Figure 2.

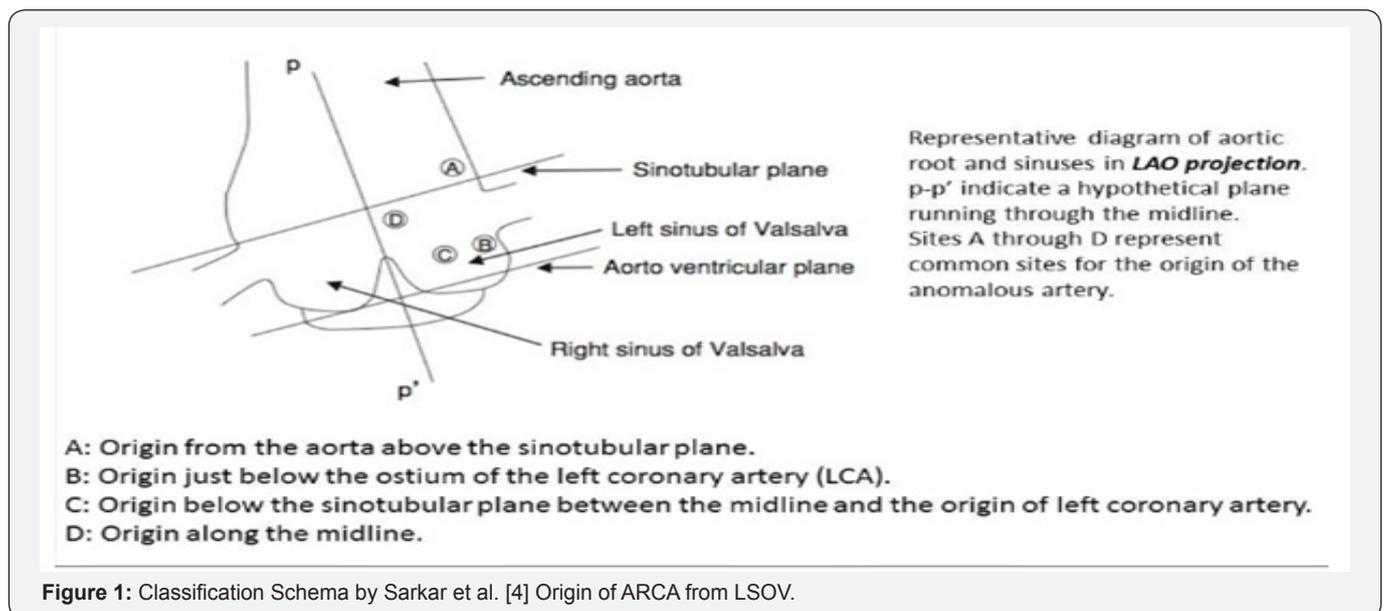


Figure 1: Classification Schema by Sarkar et al. [4] Origin of ARCA from LSOV.

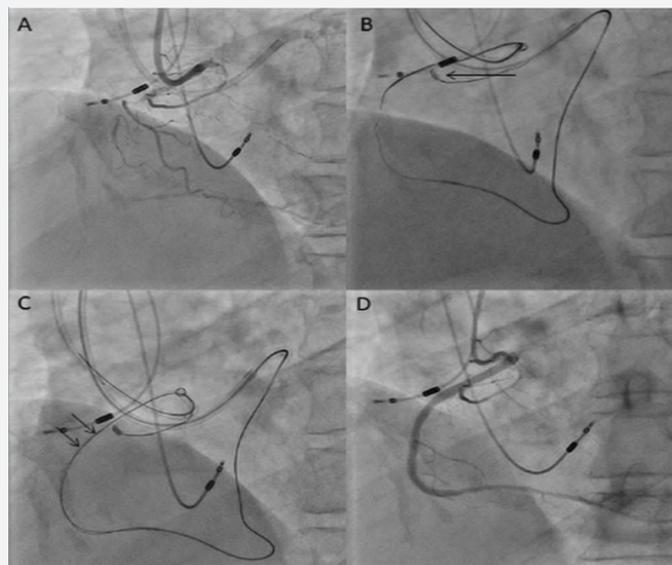
Case No.	1	2	3	4	5
Type of Take off <sup>h</sup>	C	B	D	A	D
Approach	femoral	femoral	femoral	femoral	femoral
Sequence of Catheters	JR4*AL1*	JL4.5:AL2:MP3.5	JR*:AL1	JR*:AL1*:MP4*:AL3	JR*:AL1
Successful engaging GC <sup>#</sup>	AL1	JL5	AL0.75	AL2	AL1
Size of GC (Fr)	7	6	7	7	7
Procedural success	success	unsuccess	success	success	success
Crossing wires	Sion black	x	Gaia 1st	Gaia 1st	Gaia 2nd
Retrograde approach	not performed	failed	○	○	○
Anchor balloon technique	not performed	○	○	○	○
Child-in-mother technique	not performed	○	○	○	not performed
IVUS guidance	not performed	failed	not performed	○	○
Other techniques		parallel wire <sup>※</sup>			Rotablation

<sup>h</sup>: Type of take off ( from A to D) represents by Sarkar's classification(already described).  
<sup>\*</sup>:Means use of diagnostic catheter.  
<sup>#</sup>:GC means "guiding catheter".  
<sup>※</sup>: this procedure was performed using the Finecross microcatheter.  
 JR; Judkins right, AL; Amplatz left, MP; Multipurpose

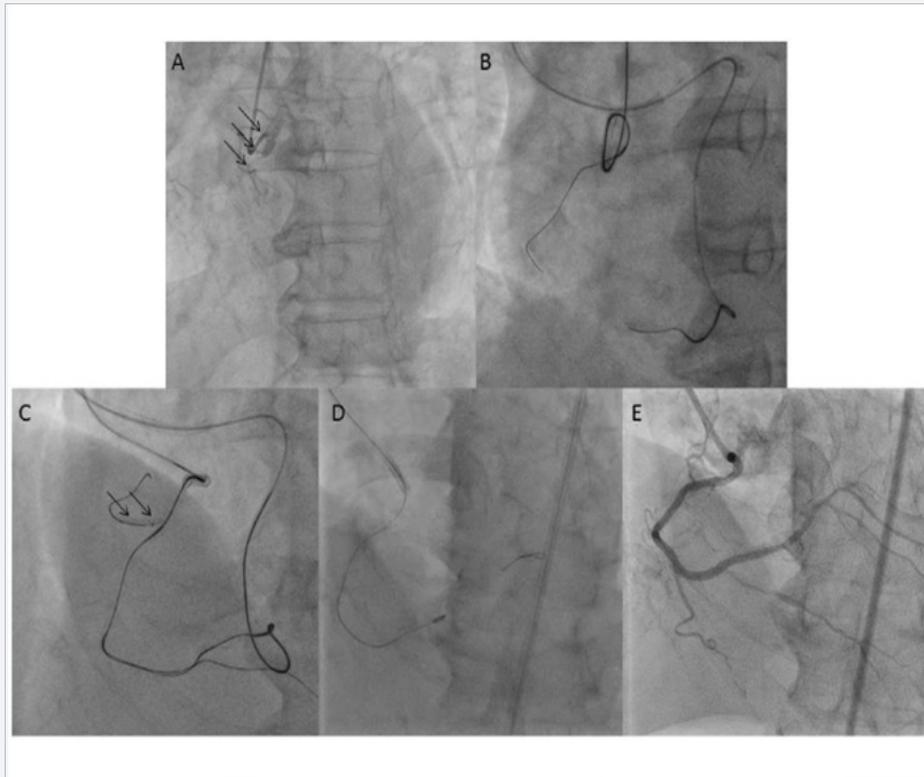
**Figure 2:** Procedural details of each five cases of CTO-PCIs to ARCA from LSOV.

One lesion had origin above the ostium of the left coronary artery (LCA) (Type A), two lesions had origin just below the ostium of the LCA (Type B), the remaining two lesions had origin along midline (Type C). All PCI procedures were performed by transfemoral approach and were successfully cannulated guide catheters using the Amplatz Left type in four cases and the Judkins left type in remaining one case. Interventional revascularization was succeed in four cases (80.0%), however

was failed in one case because of inability to pass guidewire. Regarding procedural characteristics, four cases (80.0%) were performed by bilateral approach, except one case by successfully antegrade approach by single wire manipulation. Moreover, these all four cases had utilized anchoring balloon technique as well as child-in-mother technique to overcome inadequate guide catheter support due to inability to maintain coaxial position in anatomical condition.



**Figure 3:** (A) The RCA had double CTOs at the proximal and mid portion and an anomalous orifice, which originated from the left sinus of Valsalva along the midline in left anterior oblique projection. (B) Bilateral wiring using both of the Gaia 2nd with Corsair micro catheters under anchor balloon technique with cannulating the proximal side branch (black arrow). (C) After both wire's tip crossing each other within the CTO intima, reverse CART technique was performed using a 1.5mm profiled balloon (black arrows) under anchor balloon technique. (D) Complete the CTO-PCI procedure after wire externalization in a retrograde manner and three drug-eluting stents deployment as a final procedural step



**Figure 4:** (A) In the baseline angiography, the RCA had an anomalous origin from the left coronary sinus of Valsalva, and it had a CTO at the proximal portion after branching the small branch (black arrows). (B) Considering anatomical problem, the CTO-PCI was started by retrograde approach first, before antegrade wire escalation. After that, antegrade wiring was continued using the Gaia 2nd with the Corsair microcatheter support. However, the antegrade guidewire did not work well because of poor backup guide catheter support. (C) For stabilization and increasing backup support of the antegrade guide catheter, side branch balloon anchoring technique was performed using the 2.0mm balloon dilatation (black arrows). After that, the antegrade Gaia 2nd was successful in passing through the CTO segment under kissing wire technique to the retrograde guidewire. (D) In the middle of procedural steps, rotablation using the 1.25mm burr was performed due to difficulty in “devices” passing through distal CTO segment. (E) Complete revascularization was achieved with three drug-eluting stents implantation as a final result.

There are disadvantages of prevent selective cannulation and inadequate coaxial support of guide catheters regarding CTO-PCI to ARCA from LSOV. However, development of devices or utilization of procedural means including bilateral approach, various anchoring balloon technique, and child-in-mother technique might make possible interventional revascularization to overcome these disadvantage of anatomical condition now at last (Figure 3 & 4).

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