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Ectopic right coronary artery with high take-off: technical challenges during percutaneous coronary revascularisation

Ektopowe, wysokie odejście prawej tętnicy wieńcowej — problemy techniczne w trakcie przezskórnej rewaskularyzacji wieńcowej

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Abstract

Anomalies of the coronary arteries are reported in 1–2% of patients who undergo a diagnostic angiogram. An ectopic origin of the right coronary artery from the opposite sinus is one of these anomalies, and while most are benign, at times it may be malignant.

We report the case of a 43-year-old female who underwent primary percutaneous coronary intervention for acute inferior wall myocardial infarction where an ectopically arising right coronary artery (RCA) with abnormally high take-off was the culprit. We describe the various technical challenges faced during intervention, from cannulation to tracking of hardware. The RCA was cannulated using the floating wire technique and revascularised by the deployment of a 3.5 × 33 mm Xience Prime drug-eluting stent (Abbott Vascular, Santa Clara, CA, USA).

In such a scenario where a conventional technique fails and where door-to-balloon time must be kept as short as possible, a little improvisation should resolve the problem.

Key words: ectopic right coronary artery, floating wire technique, high take-off, primary percutaneous coronary intervention

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Introduction

Malformation within coronary buds on the aortic sinuses, or vascular plexuses to which they connect during foetal development, leads to coronary artery anomalies, the incidence of which varies from 0.6% to 1.5%, and which range from being totally asymptomatic to life threatening [1–3]. The incidence of ectopic right coronary artery (RCA) from the left cusp is around 0.92% and by its nature is benign and an incidental finding on coronary angiogram [3]. Sometimes, it may be complicated with atherosclerosis and may present with acute coronary syndrome. Intervening in such an artery is a different ball game and can at times be very challenging.

Case report

A 43-year-old female patient with a past history of diabetes mellitus, hypertension, and dyslipidemia presented with retrosternal chest pain and sweating of four hours' duration. Her physical examination and biochemistry were unremarkable. Echocardiography revealed mild hypokinesia in the right coronary artery territory, with ejection fraction of 51%. Electrocardiogram revealed ST elevation in II, III, and aVF,

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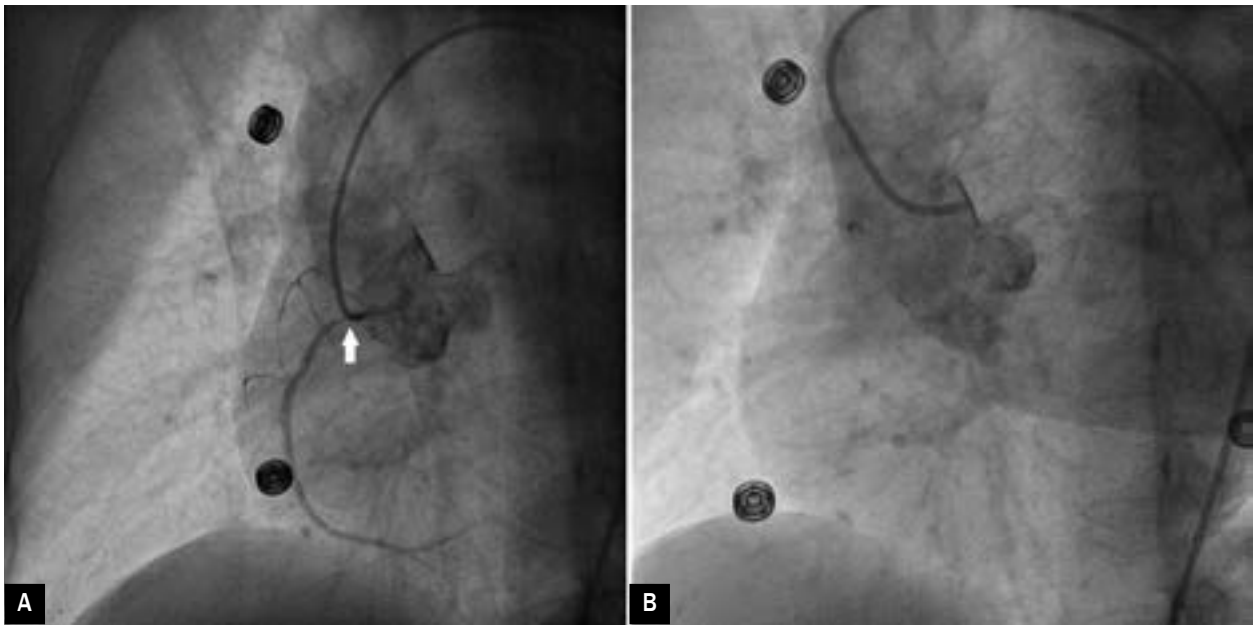

Figure 1A. Ectopic right coronary artery with abnormally high take-off showing discrete eccentric critical lesion (white arrow) in proximal segment; **B.** Failure to cannulate right coronary artery with Judkins left catheter

and reciprocal changes in I and aVL. She was selected for primary percutaneous coronary intervention through the femoral route after proper consent. She was preloaded with prasugrel — 60 mg, acetylsalicylic acid — 325 mg and atorvastatin — 80 mg. 6F JR3.5 and JL3.5 Proflo™ diagnostic catheters (Medtronic, Minneapolis, MN, USA) were used for catheterisation after administering 2,500 U of heparin. Basal angiogram revealed normal left system (left anterior descending artery and left circumflex artery) and ectopic right coronary artery (RCA) (arising posteriorly from left sinus) with abnormally high take-off showing a discrete eccentric critical lesion in the proximal segment with 90% stenosis (Figure 1A). Percutaneous intervention of the culprit artery was planned. 7,000 U of heparin was further given. Due to the aberrant origin, we tried unsuccessfully to cannulate the RCA using Judkins left (JL), Amplatz left (AL), and Amplatz right (AR) and Tiger diagnostic catheters (Terumo, Japan) (Figures 1B, 2A, 2B). A Judkins right catheter (JR) (Medtronic) was improvised by slightly straightening its tip and was kept afloat near its ostia (Figure 3A). We provided a big curve to a 0.014" runthrough wire (Terumo, Japan) and tried to cannulate the RCA by floating in the left sinus. When it entered the RCA, further movement of the wire led to backing out of the guide. We then added the support of a finecross microcatheter (Terumo) and by means of floating the wire in the left sinus entered the RCA (Figure 3B). With microcatheter support, the wire was parked distally and the microcatheter was withdrawn using Nanto's technique. The lesion was predilated with a 2.5 × 10 mm Minitrak balloon (Abbott) and stented with a 3.5 × 33 mm Xience Prime stent (Everolimus eluting stent, Abbott) deployed at 12 atm pressure. It was further post dilated with a 3.5 × 10 mm noncompliant Minitrak balloon at 20 atm pressure achieving TIMI III flow (Figures 4A, 4B, 5A). Her symptoms and ECG stabilised. Multidetector computed tomography (MDCT) coronary angiogram showed the aberrant arising RCA from the left coronary sinus (Figures 5B, 5C). The patient was discharged on the fourth day with aspirin 150 mg/day, prasugrel 10 mg/day, atorvastatin 80 mg/day, metoprolol 100 mg/day and ramipril 2.5 mg/day. The patient has been doing very well since, with regular follow-ups at our institute.

Discussion

The most common locations of ectopic RCAs are the left sinus which may be anterior or superior [4, 5] either from the left sinus or directly from the left main coronary artery [6]. Mostly they are an incidental finding diagnosed on routine angiogram or present with coronary artery disease. As far as a diagnostic angiogram is concerned, they can be cannulated selectively by conventional right diagnostic catheters (Judkins right 3.5–4, Amplatz right 1–2), unconventional Williams no-torque curves, or non-selective sinus root angiogram. In such situations, support is unnecessary.

Data regarding successful percutaneous revascularisation of ectopic RCAs from the left sinus is limited, and has appeared mostly in the form of small case series [7–9]. The selection of a guide catheter is influenced by various

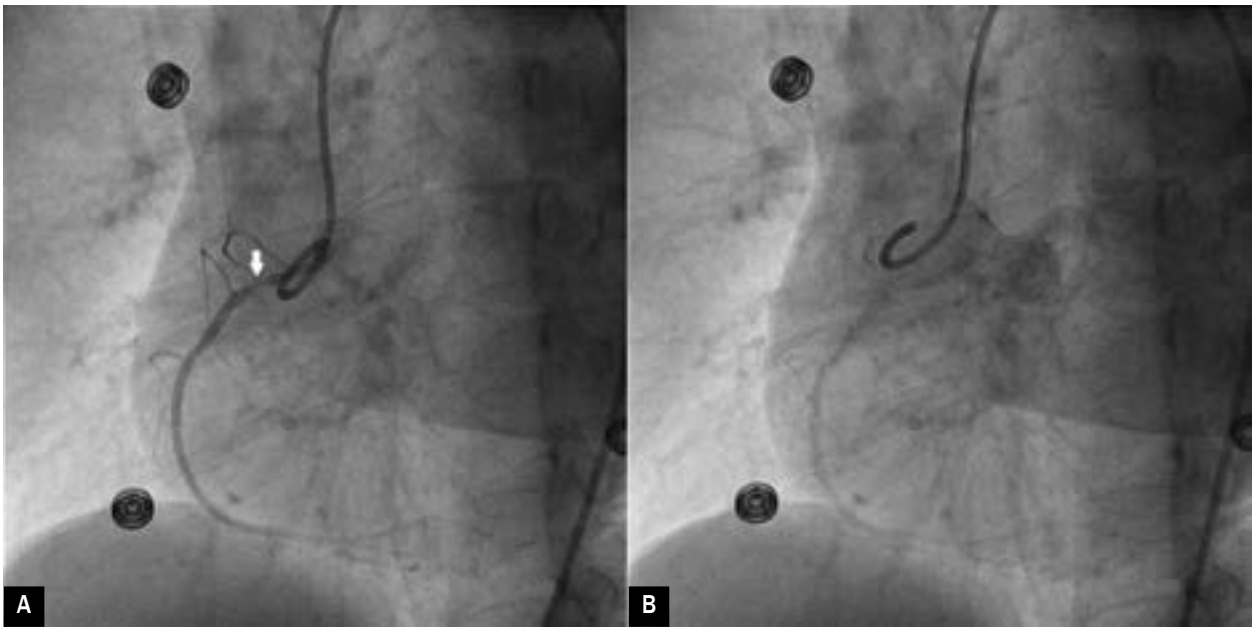

Figure 2A. Failure to cannulate right coronary artery with Amplatz right (AR) catheter; **B.** Amplatz left (AL) catheter

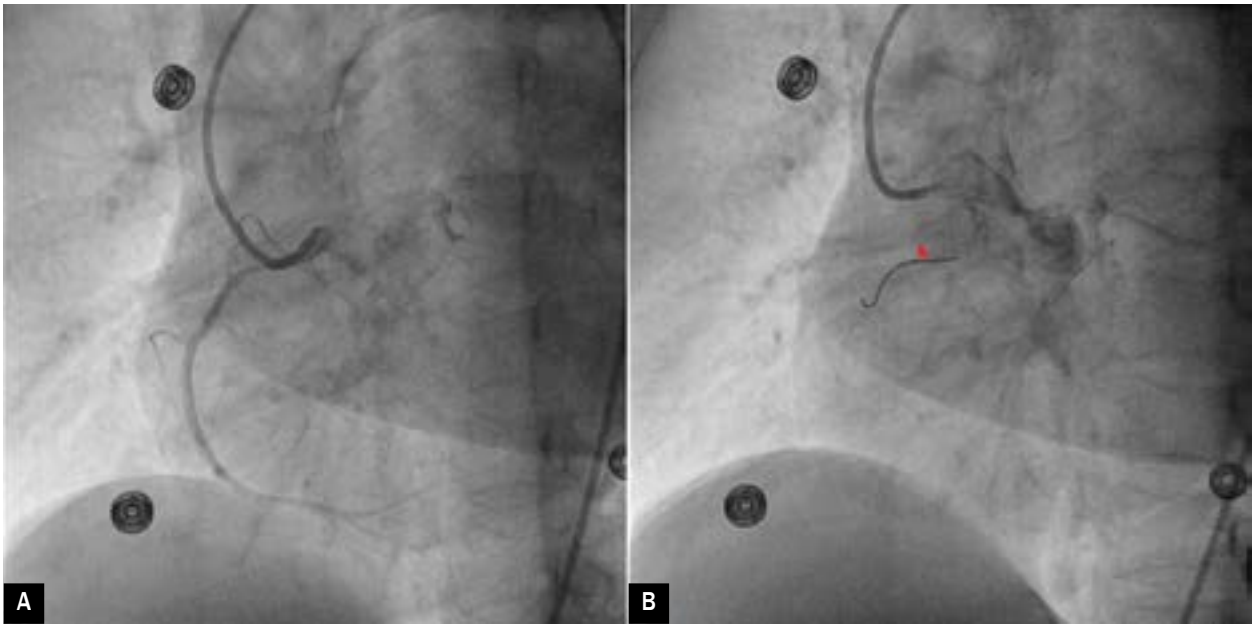

Figure 3A. Judkins right catheter was kept afloat near its ostia; **B.** Right coronary artery being cannulated with the floating wire technique (tip of finecross shown by red arrowhead)

factors such as the dimensions of the aortic root, desired level of backup support, configuration of the ostium, angle at take-off, location of the lesion, and the hardware to be used during revascularisation.

The problem with using a conventional guide such a Judkins left (JL), Amplatz left (AL1 and AL2), and Amplatz right (AR1 and AR2) is inadequate alignment of the guide catheter with the initial course of the artery. If it is not co-axial, the guide will back out, as we encountered.

This can be circumvented by adopting the floating wire technique using a Judkins right guide. Experience will drastically reduce fluoroscopy and procedure time. Since the initial entry to such an RCA needs a much bigger curve to float the wire, we recommend the support of a finecross microcatheter. This will provide additional support and later ease the distal parking into the artery because it negates the big curve. Once the wire has been distally parked, the guide can be deeply intubated with a distally

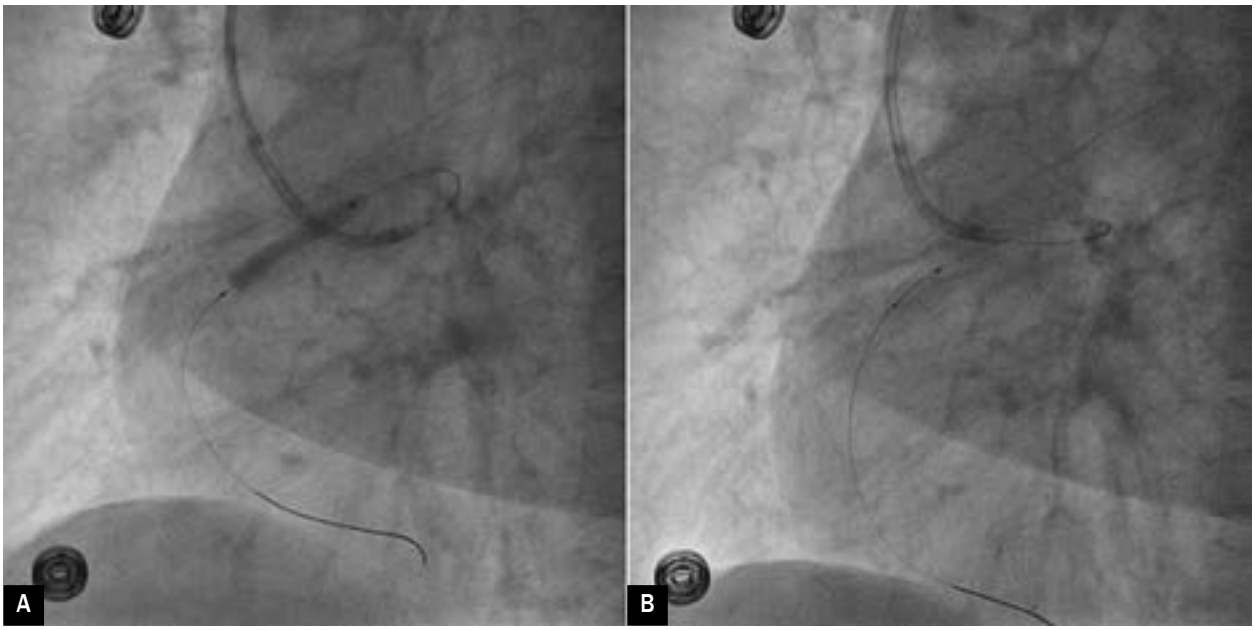

Figure 4A. Lesion being stented with a 3.5 × 33 mm Xience Prime stent at 12 atm pressure; **B.** Post dilatation with 3.5 × 10 mm noncompliant Minitrak balloon at 20 atm pressure

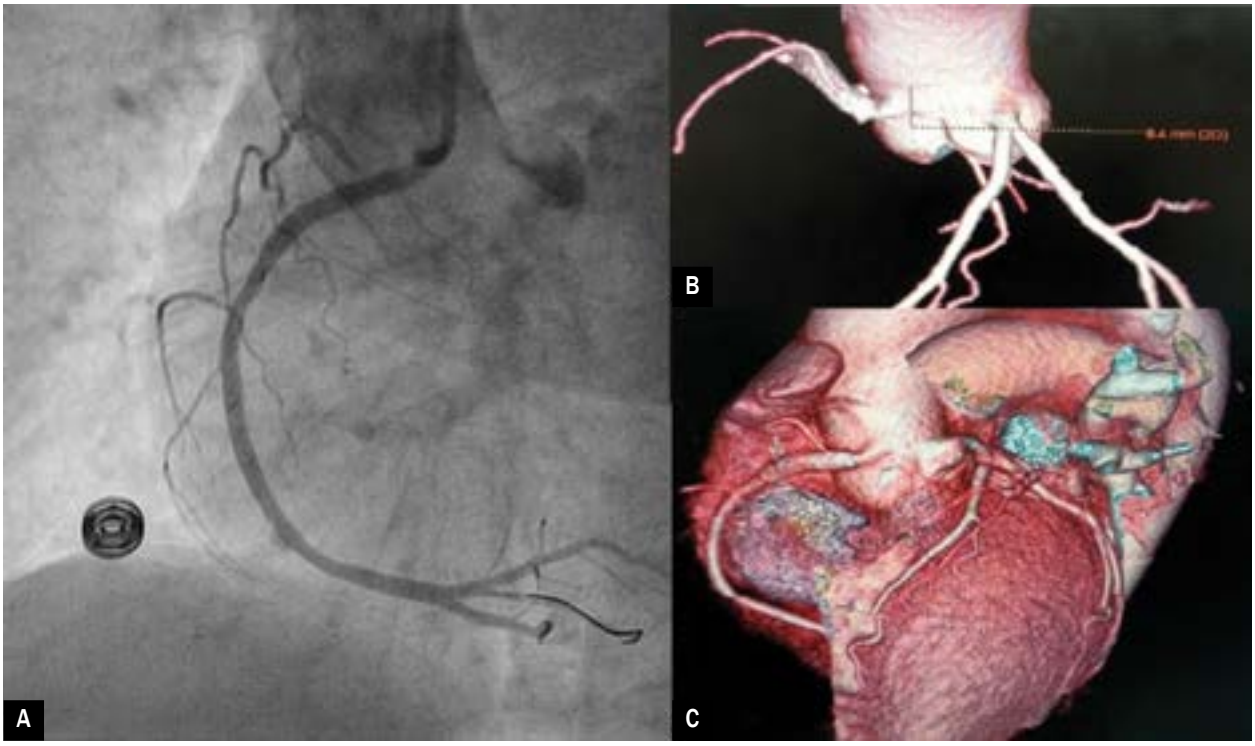

Figure 5A–C. Right coronary artery showing TIMI III flow with well deployed stent (**A**). Multidetector computed tomography (MDCT) showing ectopically arising right coronary artery (RCA) with high take-off (**B**, **C**)

inflated appropriately sized balloon acting as an anchor, although caution must be exercised if plaque is located in an osteo-proximal segment.

Conflict of interest(s)

The authors declare no conflict of interest.

Streszczenie

Anomalie tętnic wieńcowych występują u 1–2% chorych poddawanych diagnostycznej angiografii. Jedną z tych anomalii jest ektopowe odejście prawej tętnicy wieńcowej z przeciwległej zatoki. Choć większość anomalii tętnic wieńcowych jest łagodna, to niektóre z nich mogą powodować poważne następstwa.

Przedstawiono przypadek 43-letniej kobiety poddanej pierwotnej przezskórnej angioplastyce wieńcowej z powodu ostrego zawału ściany dolnej spowodowanego niedrożnością ektopowej prawej tętnicy wieńcowej (RCA) o nietypowo wysokim odejściu. Autorzy opisali różne problemy techniczne w trakcie zabiegu — od kaniulacji do wprowadzania urządzeń. Kaniulację RCA przeprowadzono techniką *floating wire*, a rewaskularyzację uzyskano przez umieszczenie stentu 3.5 × 33 mm uwalniającego lek Xience Prime (Abbott Vascular, Santa Clara, CA, Stany Zjednoczone).

W sytuacji, gdy konwencjonalna technika zawodzi, a czas od pierwszego kontaktu z personelem medycznym do rozpoczęcia zabiegu (*door-to-balloon*) musi być jak najkrótszy, w rozwiązaniu problemu pomocna jest mała improwizacja.

Słowa kluczowe: ektopowa prawa tętnica wieńcowa, technika *floating wire*, wysokie odejście, pierwotna przezskórna interwencja wieńcowa

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