

# Trans-femoral percutaneous coronary intervention in an anomalous right coronary artery using a 5 F TIG diagnostic catheter

Przezskórna interwencja wieńcowa z dostępu przez tętnicę udową  
w obrębie nieprawidłowej prawej tętnicy wieńcowej  
przeprowadzona za pomocą cewnika diagnostycznego 5 F TIG

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## Abstract

Anomalous coronary arteries, especially when they are right with a high take-off, are challenging substrates for percutaneous coronary intervention (PCI). Here, we report the case of a 63 year-old female who had a critical lesion in proximal anomalous right coronary artery having an abnormal take-off, where the ostium failed to get cannulated using multiple guiding catheters. Successful PCI was done using a 5 F TIG diagnostic catheter (Optitorque, Terumo, Japan) through the transfemoral route. The unique shape of the TIG diagnostic catheter allowed coaxial engagement of anomalous right coronary artery, with adequate lesion assessment and stent delivery.

Key words: anomalous right coronary artery, TIG catheter, transfemoral percutaneous coronary intervention, high take-off

Folia Cardiologica 2019; 14, 2: 174–178

## Introduction

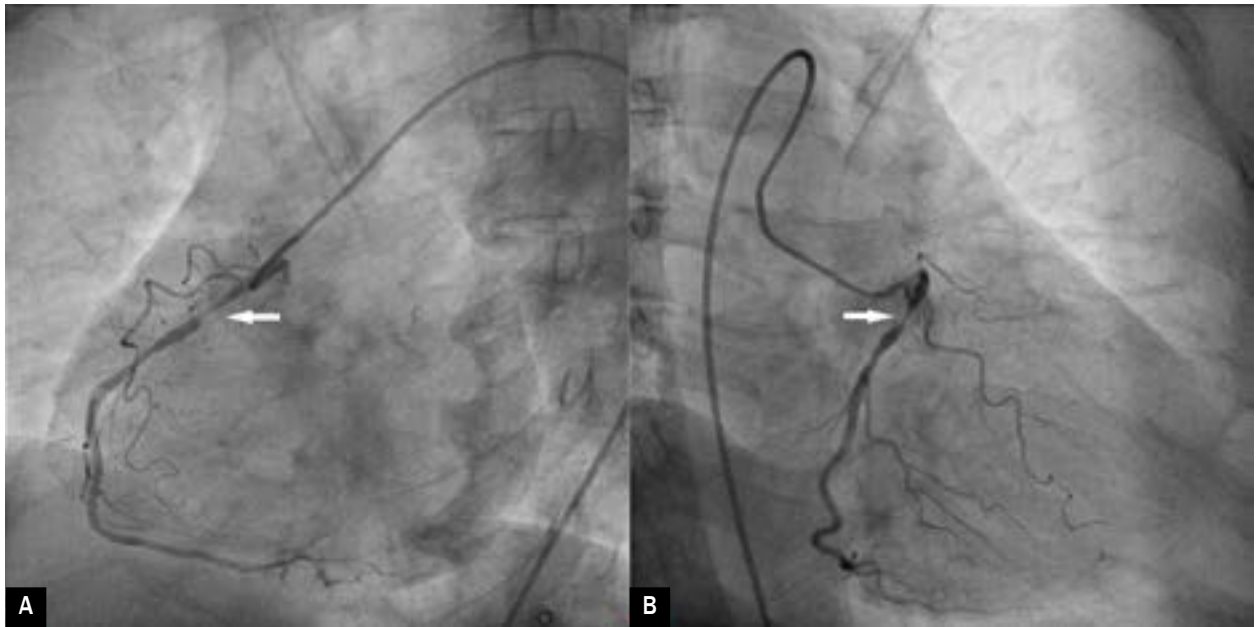
Coronary artery anomalies are found in 0.6–1.5% of coronary angiograms, and are usually incidental findings [1]. Anomalous origin of coronary arteries is reported to be 0.6–1.2% in patients among the various angiographic series [2]. Percutaneous coronary intervention (PCI) of congenitally anomalous coronary arteries poses unique challenges, and needs special consideration regarding their site of origin, orifice configuration, take-off angle, site and type of lesion, and the route the artery traverses [3]. Guiding catheter selection is the most important step

for any PCI, but even more so for an anomalous coronary because the coaxial alignment and stent delivery on the wire are the keys to success.

## Case report

A 63 year-old female presented with exertional angina of three years' duration which had worsened in the last three weeks. Smoking, diabetes, and dyslipidemia were her risk factors. Her treadmill test was strongly positive for reversible ischaemia. Her physical examinations and biochemistry were all unremarkable. Electrocardiogram

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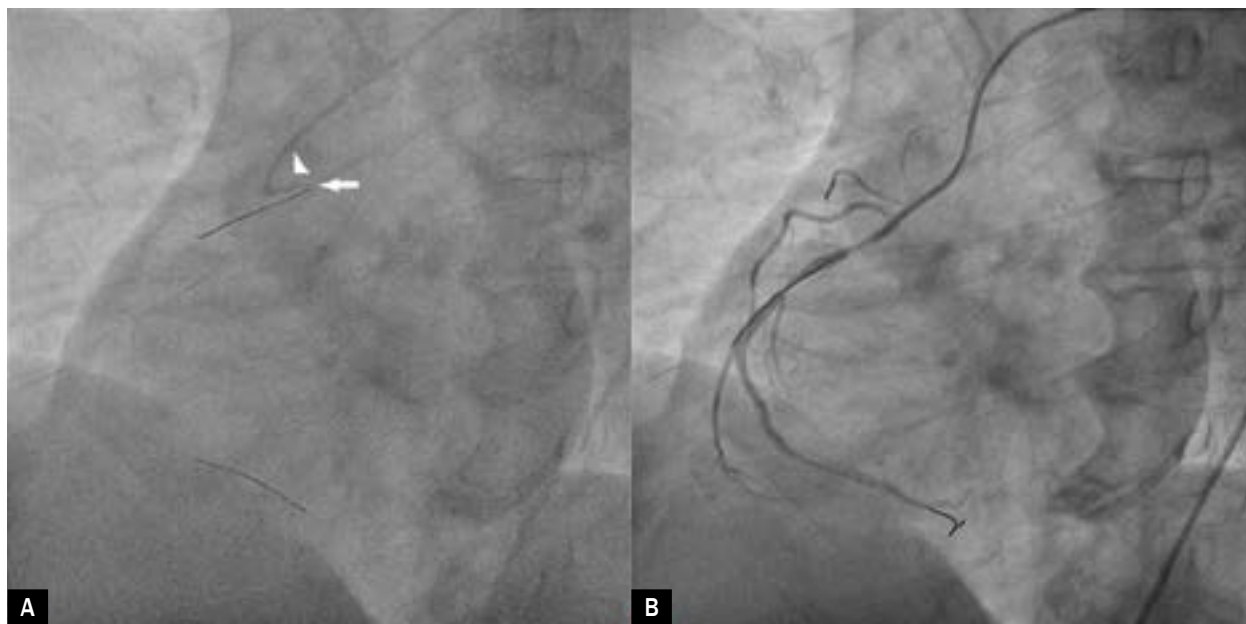
**Figure 1A, B.** Right coronary artery having an anomalous origin with a high take-off (white arrow showing the lesion in proximal part)

revealed nonspecific ST-T changes in precordial leads. Echocardiography revealed mild concentric hypertrophy, mild mitral leak, and normal ejection fraction. Trans-femoral catheterisation was planned after proper consent. The left main artery was cannulated in the usual fashion using a Judkins left diagnostic catheter which revealed normal left main, left anterior descending artery, and left circumflex artery. Right coronary artery (RCA) could not be selectively hooked with a Judkins right diagnostic catheter, but non-selective injection showed its anomalous origin with a high take-off. RCA had tubular lesion with critical stenosis in its proximal segment. Percutaneous coronary RCA was planned and 7,000 U of heparin was given further. Cannulation was attempted with a Judkins right guiding catheter, but it failed. It subsequently failed to be hooked with other catheters including an Amplatz right and left (AR, AL), multipurpose (MP), hickey stick (HS), Voda catheter, and Judkins left (JL). Finally, a 5F TIG diagnostic catheter (Optitorque; Terumo, Japan) was chosen for the job. RCA was hooked although it was not co-axial (Figure 1). As alignment was not co-axial, RCA was wired using the floating wire technique with a runthrough wire (Asahi, Japan) and parked distally. As it was difficult to manoeuvre the catheter over the wire because of anomalous origin and high take-off, another runthrough wire was parked as a buddy wire into the RCA (Figure 2A). With this improved support, the catheter was engaged selectively and the buddy wire was withdrawn (Figure 2B). The lesion was pre-dilated with a  $2 \times 10$  mm, and a  $2.5 \times 10$  mm Minitrak balloon (Abbott, USA) inflated to 12 atm (Figure 3A). It was

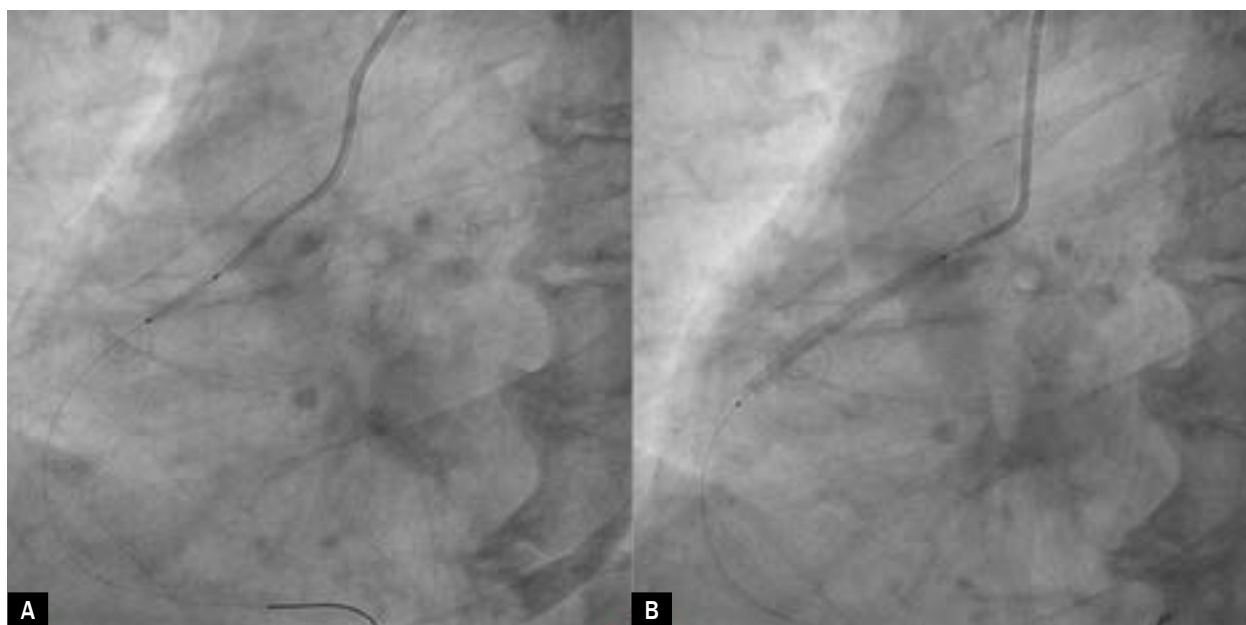
stented by deploying a  $2.75 \times 28$  mm Xience Prime stent (everolimus-eluting stent, Abbott, USA) up to 13 atm pressure and further post dilated by a  $2.75 \times 10$  mm Minitrak non-compliant balloon up to 20 atm pressure achieving TIMI 3 flow (Figures 3B, 4). She was discharged on the third day with acetylsalicylic acid 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 fine since then, with regular follow-ups at our institute.

## Discussion

Anomalous RCA with high anterior take-off, although rare, is a technically challenging and time-consuming substrate. Selection of a guide catheter should be based on configuration of the ostium, dimensions of the aortic root, location of the origin, and the type of lesion. The origin of RCA based on the angulation can be divided into four types: type I –  $90^\circ$  angle from aorta; type II – below  $90^\circ$  angle from aorta; type III – above  $90^\circ$  angle from aorta; and type IV – anomalous or ectopic origin wherein it is subdivided into three types based on the height of origin: normal take-off *i.e.* 1–1.5 cm from aortic valve; high take-off *i.e.*  $> 1.5$  cm from aortic valve; and low take-off *i.e.*  $< 1$  cm from aortic valve [4]. Coaxial engagement and adequate back-up support from a guide catheter are the keys to successful PCI. Anomalous right coronary artery can be cannulated using Amplatz, El Gamal, Voda, and multipurpose catheters, oversized left Judkins catheters, thrombus aspiration catheters, and rarely GuideLiner catheters [5].



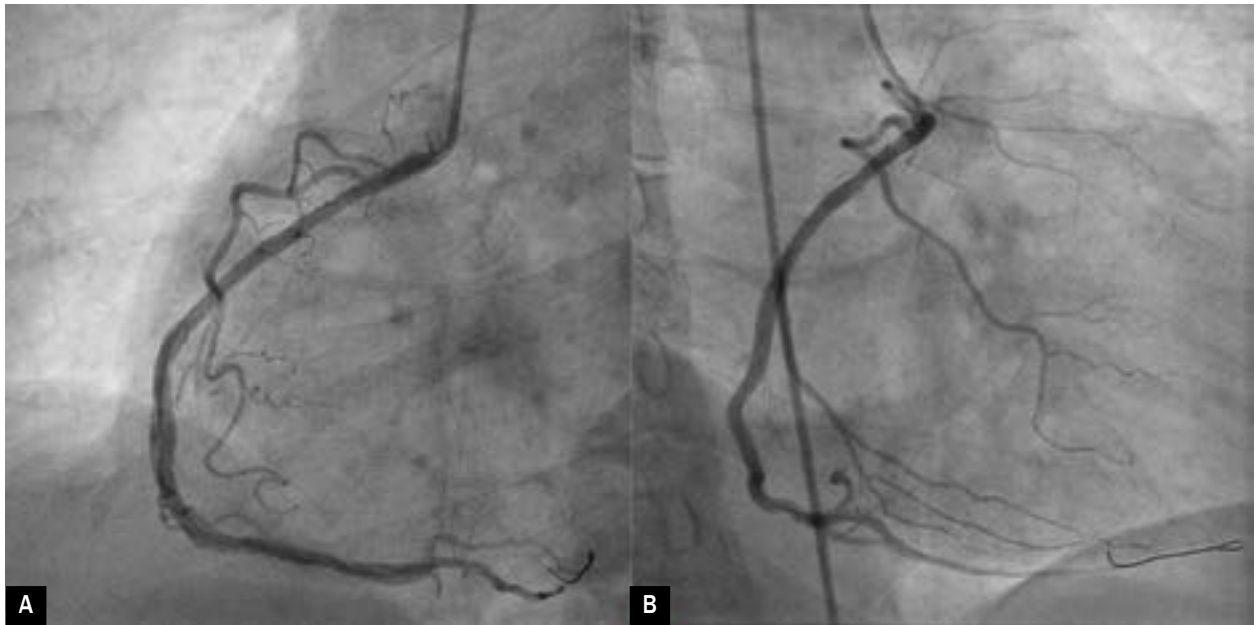
**Figure 2.** Right coronary artery (RCA) was wired using floating wire technique as alignment was not co-axial (arrowhead – tip of catheter, arrow – ostium of RCA; **A**); another runthrough wire was parked as a buddy wire into the RCA to facilitate the coaxial alignment (**B**)



**Figure 3.** The lesion was pre-dilated using Minitrak balloon (**A**); it was stented by deploying 2.75×28 mm Xience Prime stent up to 13 atm pressure (**B**)

A 5 F TIG catheter is a diagnostic catheter which is used for transradial interventions. It has a unique shape with three loops. The first loop compensates for unfavourable angle between innominate artery and ascending aorta. The flat portion between the second and third loops rests against the opposite side of aortic wall and provides

back up support. The catheter has a long tip and it points upwards. In a case of anomalous RCA with high anterior take-off, short tipped right catheters don't reach the ostium, while left catheters don't provide adequate back-up as they tend to maintain their original configuration to the right side of ascending aorta. However, a TIG catheter,



**Figure 4.** Right coronary artery showing TIMI III flow after post dilatation with non-compliant balloon (A – left anterior oblique view; B – right anterior oblique view)

due to its versatile design, rests against the posterior wall of ascending aorta and the long tip easily reaches the ostium. Another advantage of this catheter is that it can take different shapes by means of push, pull, torque, and rotation. Furthermore, there is less chance of dissection because its tip is very soft. As it is a 5 French catheter, it can be seated deep in the RCA, and can cause damping of pressure.

Since the use of a 5 F diagnostic catheter for PCI was first reported by Salinger et al [6], it has become increasingly popular due to the trend toward using a slender catheter for a transradial approach. It has also been seen that guiding catheters sometimes may not be able to selectively engage the coronary ostium even though its diagnostic counterpart may be able to cannulate the coronary ostium successfully because of the differences in shape between the two catheters in the form of a shorter tip and a lack of tip tapering for the guiding catheter. This can result in multiple guide selection attempts [7].

The disadvantages are the unsatisfactory vessel opacification because of small calibre, the need for deep

engagement which may be associated with coronary dissections, and the poor support for complex interventions. Nonetheless, a type-A lesion can easily be treated by a 5 F diagnostic catheters. As the contrast volume injected through a 5 F catheter is comparably less, it has the potential to reduce the nephrotoxicity, especially in patients with renal dysfunction. We had adequate vessel opacification at all times, enabling us to accurately position and implant the stent without increasing the total radiation time or dye consumption. Sufficient support was achieved without the need for deep catheter intubation, with easy positioning of the stent across the stenotic lesion.

In conclusion, PCI via a 5 F TIG diagnostic catheter is technically safe and feasible, and allows for significant resource savings. This may be an attractive technical alternative in selected cases when all other catheters have failed.

### **Conflict(s) of interest**

The authors declare no conflict of interest.

## Streszczenie

Anomalie dotyczące tętnic wieńcowych, zwłaszcza wysokie odejście prawej tętnicy wieńcowej (RCA), wiążą się z trudnościami w trakcie przeszłórnej interwencji wieńcowej (PCI). W niniejszym artykule przedstawiono przypadek 63-letniej kobiety, u której stwierdzono krytyczne zwężenie w bliższym odcinku RCA o nieprawidłowym odejściu. U chorej próby kaniulacji ujścia tętnicy kończyły się niepowodzeniem mimo użycia wielu cewników prowadzących. Zabieg PCI udało się skutecznie wykonać za pomocą cewnika diagnostycznego 5 F TIG (Optitorque, Terumo, Japonia) z dostępu przezudowego. Unikatowy kształt cewnika diagnostycznego TIG umożliwił jego współosiowe wprowadzenie do nieprawidłowej RCA i dokonanie odpowiedniej oceny zwężenia oraz umieszczenie stentu.

Słowa kluczowe: nieprawidłowa prawa tętnica wieńcowa, cewnik TIG, przeszłórna interwencja wieńcowa z dostępu przezudowego, wysokie odejście

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