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Cardiology Research and Cardiovascular Medicine

Vichairuangthum K. Cardiolog Res Cardiovasc Med 4: CRCM-148.

Case Report

DOI: 10.29011/2575-7083.000048

Pull Back Balloon Assisted Wiring Technique for Treatment of Extremely Angulated Bifurcation Lesion

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Citation: Vichairuangthum K (2019) Pull Back Balloon Assisted Wiring Technique for Treatment of Extremely Angulated Bifurcation Lesion. Cardiolog Res Cardiovasc Med 4: 148. DOI: 10.29011/2575-7083.000048

Received Date: 19 July 2019; **Accepted Date:** 30 July 2019; **Published Date:** 08 August 2019

Abstract

We describe a clinical case of 50 -year –old man with crescendo chest pain and dyspnea, who underwent coronary angiogram showed a critical stenosis of bifurcation septal branch – LAD. Unable to access LAD due to extremely angulated take-off. The last resource technique when no other options are available is the Plaque-plowing technique, pull back balloon assisted wiring to modify the angle of bifurcation. This technique may be useful in the appropriate anatomical and clinical setting.

Keywords: Bifurcation; Extremely Angulation; Plaque-Plowing Technique

Introduction

Successful wiring to approach branches is essential for a successful Percutaneous Coronary Intervention (PCI) for bifurcation lesions [1,2]. However, wiring for side branches with an extremely angulated take-off are challenging, as the wire is prone to prolapse into non targeted branches if a conventional wiring technique is used. Various techniques had been considered but no evidence based guidelines to assist the operator [3]. The choice of treatment is currently made of a case-by-case basis. We present a case of successful treatment with angle modification using a pullback balloon assisted wiring technique for the extremely angulated bifurcation lesion.

Case Report

A 50-year-old male with hypertension, dyslipidemia who presented with crescendo chest pain and progressive dyspnea for 2 months. His ECG demonstrated marked ST segment depression with inverted T at V 1-3. Echocardiogram showed hypokinesia at anterior and antero-septal wall with fair LV EF 51% and no significant valvular lesion. Other laboratory assessment revealed evidence of myocardial injury, with positive Troponin I. Coronary angiography showed a total occlusion of the Left Anterior Descending Artery (LAD) (Figure 1). Diffuse disease of the Left Circumflex Artery (LCX) and Rt. Coronary Artery (RCA). The LAD lesion was received collateral feeding flow from RCA (Figure 2). Percutaneous coronary intervention was selected as the treatment strategy according to the patient's decision. Bilateral catheterisation with concurrent contrast injection was done via both groins. The Left Main (LM) artery was engaged with 6F Launcher EBU 3.5 guiding catheter (Medtronic, Minnesota, USA) for antegrade contrast injection to target total occluded LAD artery while RCA was engaged with JR 4 6Fr diagnostic catheter (Medtronic, Minnesota, USA) for injecting contrast into the contralateral artery providing the collateral circulation.

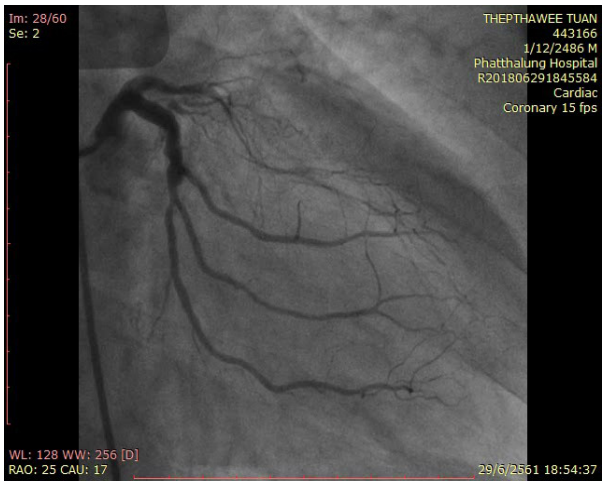

Figure 1: Initial coronary angiogram of Lt. coronary artery (Right Caudal view).

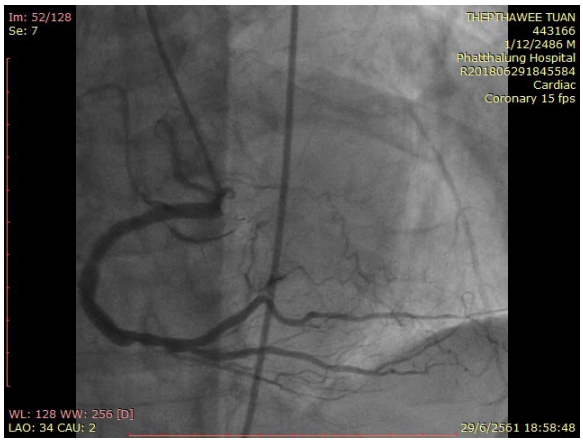

Figure 2: Initial coronary angiogram of Rt. coronary artery (Left Caudal view).

Antegrade PCI approach to LAD was performed. The proximal part of the LAD was wired with 0.014' Progress 40 wire (Abbott Vascular, SantaClara, CA, USA) with the support of Cosair PRO 135 cm micro catheter (Asahi Intecc Co.Ltd, Aichi, Japan). Concurrent bilateral contrast injection shows feeding collateral flow from RCA to proximal part of LAD at the area of bifurcation between septal branch and main LAD vessel. Due to extremely angle between septal branch and LAD bifurcation, attempts to wire in the LAD were unsuccessful after using both Progress 40 and Gaia second wire (Asahi Intecc Co.Ltd, Aichi, Japan) respectively .Wires always either jumped or prolapsed into non targeted (septal) branch despite many attempts (Figure 3). A 1.2 x 12 mm mini trek balloon (Abbott Vascular, SantaClara, CA, USA) was then inflated at 12 atm at the bifurcation of the septal in an attempt to assist wiring in the LAD, but the wire still could not have passed into the LAD. Both reverse wire (hairpin) and balloon back stop technique were attempted but unsuccessful. Unfortunately, Crusade microcatheter was not available at that time. So the same 1.2 x 12 mm balloon was inflated again at 8 atm beyond the lesion and was pulled back against the plaque towards the guiding catheter to modify the angulation between the septal branch and LAD (Figure 4). Finally, The Gaia second wire could then be passed into the LAD (Figure 5). Distal part of LAD was wired and therefore PCI of LAD was proceeded. Gusta balloons (Demax medical, Beijing, China) 2.5 x 20 mm and 2.5 x 20 mm were used to dilated LAD. The provisional stenting technique was selected for correction of the LAD lesion using BUMA Drug-Eluting Stent (DES) (Sinomed, Beijing, China) 3.0 x 30 mm in the proximal to mid part of LAD. Subsequently, Postdilating and Proximal Optimization Technique (POT) with a 3.0 x 8 mm Gusta non- complicant balloon was performed. The procedure result was excellent with TIMI (Thrombolysis in Myocardial Infarction) flow (TIMI-3) was achieved in all branches (Figure 6,7). No immediately complication was occurred.

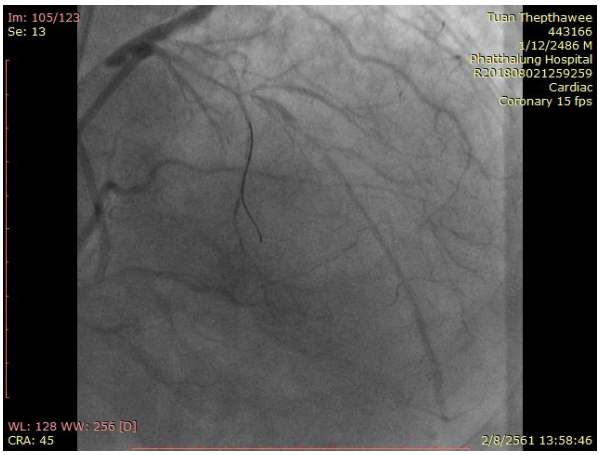

Figure 3: Concurrent bilateral contrast injection shows extremely angulation between septal branch and main LAD (Right Cranial view).

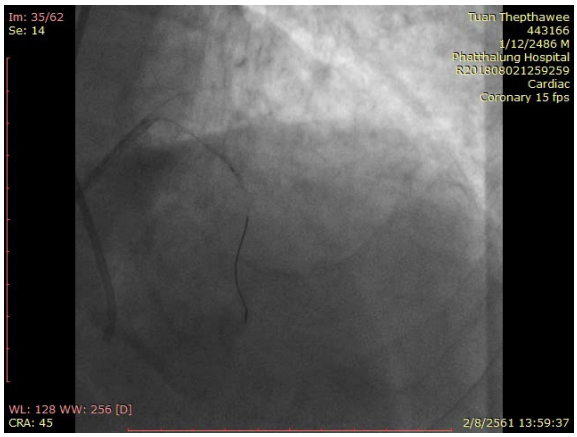

Figure 4: Balloon pull back towards a guiding catheter thus widening the angulation between septal and mid LAD (Right Cranial view).

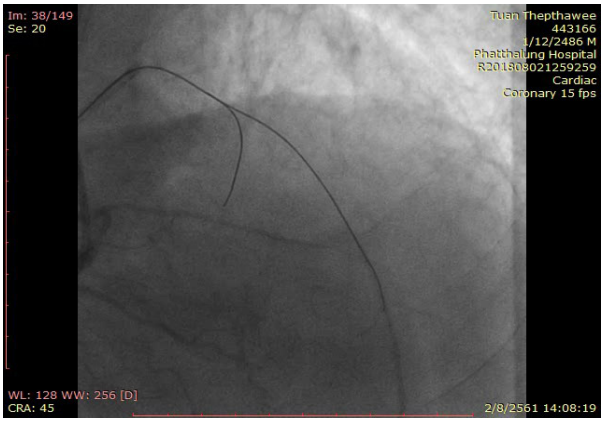

Figure 5: Wire successful pass to distal LAD (Right Cranial view).

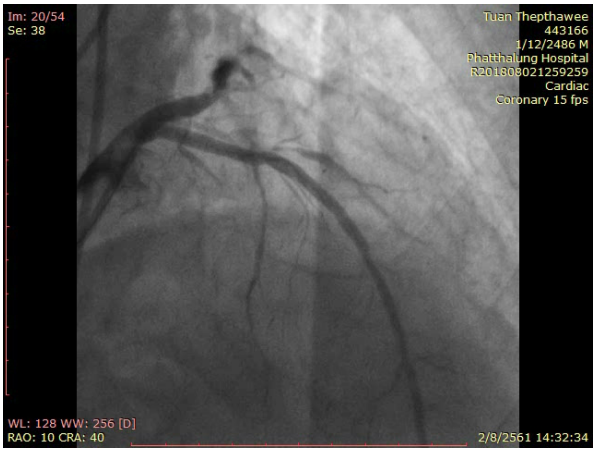

Figure 6: Good TIMI flow all branches after stenting (Right Cranial view).

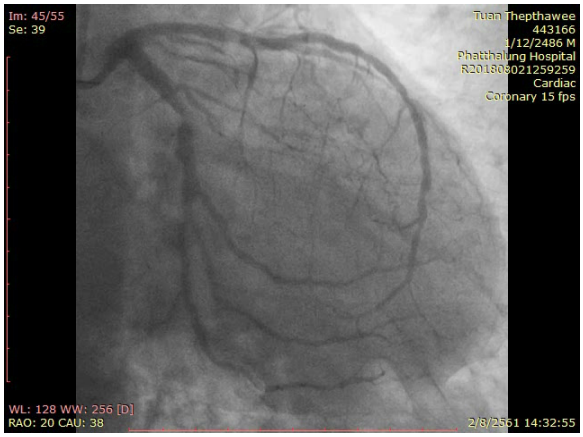

Figure 7: Good TIMI flow all branches after stenting (Right Caudal view).

Discussion

Coronary bifurcation lesions are found in approximately 15% to 20% of Percutaneous Coronary Intervention procedure (PCI) and there have been shown to be associated with lower procedural success rates compared with non-bifurcation lesions, and they have been shown PCI involves a challenge to negotiate acute-angle bifurcation and extremely angulations are a predictor of procedural failures and complications [4]. Many techniques for wiring a side branch artery with extremely angle take-off had been considered. Kawasaki et al had developed the reverse hook guidewire technique [5]. Care must be taken when making a J hook at the tip of the wire (which is done by catching and pushing against side branches or tortuous segments of the artery), because this may result in vessel injury. Also, as the J tip unhooks and prolapses into the side branch, it may spring forward and potentially injure the branch vessel. This technique may not work well in large main vessels because it would be difficult to form and maintain the hook. Crusade microcatheter (Kaneka Medix Corp., Tokyo, Japan)-facilitated reverse wire technique was also demonstrated [6,7]. The catheter can be placed in the main vessel, and the side lumen is used to preferentially deliver another wire into the side branch. However, because the side lumen does not reliably control the orientation of the wire, this technique may be of limited value in extreme angulations or severe side branch ostial stenoses. Another Balloon backstop technique was discussed by Morton J. Kern [8]. With this technique, the main vessel is wired first. A balloon is then inflated at low pressures (balloon: artery ratio 0.7:1) to avoid injury in the ongoing vessel just distal to origin of the side branch. Another wire is advanced into the side branch, with the balloon preventing prolapsed of this wire and deflecting it into the side branch. Caution should be exercised throughout this technique because balloon occlusion of any artery may result in distal ischemia. The complexity of the lesion requires precise planning of the materials and PCI technique. There is still lack of evidences for multiple steps of the procedure. In this case the former was attempted unsuccessfully earlier as mentioned. Nowadays both The Venture wire control catheter (St. Jude Medical, Inc., St. Paul, MN) and The Steer-IT Deflecting Tip guidewire (Cordis Corporation, Warren, NJ) are not available in many countries including Thailand [9,10].

In this case we used the pull-back balloon-assisted wiring technique for a bifurcation lesion with difficult angulation. This technique was originally made by Suwanich T. and named it "Plaque-plowing technique" [11]. The principle of this technique to avoid an unfavorable direction of the snowplough after balloon is inflated on an atherosclerotic plaque, especially a plaque with an overhanging edge near the bifurcation. So instead of balloon inflation directly on the plaque, a short compliance balloon (balloon: artery ratio 0.7:1) is inflated at low pressures (subnominal pressure) beyond the plaque and pulled back to move the plaque out of the side branch ostium. The balloon pulled back towards a guiding catheter resulting in the widening of the angulation between the main and side branch. After angulation was modified by this method, wire can be much easier to pass across the target branch. Although this angle modification technique is simply without any additional fantastic devices required, it may have distal embolisation and coronary artery dissection.

Side branch access can be technically challenging in extreme angulations or when there is severe side branch ostial disease. Knowledge concerning special snowplough techniques, such as these described in this article, may be useful in the appropriate anatomical and clinical setting.

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