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DOI: 10.5603/FC.a2019.0087

Article type: Case Reports

Submitted: 2019-04-19

Accepted: 2019-05-01

Published online: 2019-07-02

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Trifurcation Stenting of left anterior descending artery by “Kurdistan” Technique using Two Guide Catheters

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Abstract
Percutaneous coronary intervention of trifurcating lesion is a challenging and complex procedure. This has been reported for left main trifurcation disease but little is known about such substrate in left anterior descending artery. We herein report a case of 68-year-old male with chronic stable angina who was successfully treated with percutaneous coronary stent implantation for trifurcation lesion of left anterior descending artery. Bifurcation lesion was treated using culottes’ technique with 6F guide catheter. Balloon angioplasty of third side branch of the trifurcation lesion was performed with another 6F guide catheter. Here, first 6F catheter was pulled to dehook the left main when left main was being hooked with second 6F catheter. Fine tuning of both guide catheters needs to be exercised to make them stable, and to avoid injury of left main artery. This is the first case report to highlight the feasibility and efficacy of dual guiding catheter to treat a trifurcation lesion of left anterior descending artery by "Kurdistan” Technique.

Key words: Trifurcation lesion; Left anterior descending artery; Kurdistan” Technique

Introduction
Lesions involving either bifurcation or trifurcation are special substrate in percutaneous coronary intervention (PCI). Any intervention involving a side branch (SB), they are at risk of occlusion when its ostium is diseased, the lesion in the main vessel is very close to ostium of SB leading to either plaque or carina shift, and when its take-off angle is shallow (45°). Therefore, any side branch > 2mm should be preserved. Furthermore, there are multiple factors which may not be present at the time of basal angiography which may contribute to its angiographic, procedural, or clinical success, thereby making it a complex. During the procedure in either branch, carina or plaque shift may cause new lesion where at the end, stent metal accumulation may result in higher residual stenosis at the ostium of SB and distortion at the proximal portion of main vessel stent. Therefore, optimal approach to
coronary trifurcation lesions is lacking. Simultaneous triple angioplasty for trifurcation lesions usually require 8–9 French (Fr) guide catheters which is not frequently available on a routine basis, increases access site bleeding, and risk of haematoma [1]. When strategically planned, many of them can be done by using two 6F guide catheter, thereby negating side effect of bigger guide catheter.

**Case report**

A 76-year old male smoker and hypertensive presented with exertional angina- Canadian Cardiovascular System (CCS) class III for past four years with recent worsening despite guideline directed medical treatment. He was receiving aspirin 75 mg, metoprolol 200 mg, atorvastatin 20 mg, and ramipril 5 mg daily. His physical examination and biochemistry were all unremarkable. Electrocardiogram revealed evidence of left ventricular hypertrophy with secondary ST-T changes in precordial leads. Echocardiography revealed mild concentric hypertrophy of left ventricle, grade-II diastolic dysfunction with normal ejection fraction (EF = 55%). His treadmill test was strongly positive for reversible ischaemia. After proper consent, coronary angiography was performed which revealed a true bifurcation lesion (90% stenosis) of proximal left anterior descending artery (LAD) involving large diagonal branch (Medina class 1:1:1) (Fig. 1). Since the patient had LAD bifurcation stenosis, a two stent strategy was chosen and because the bifurcation angle was > 70° and both branches (LAD and D1) were of equal calibre, culottes’ technique was preferred. Left main artery was engaged using 6F EBU (Extra back-up, Medtronic corp.; USA) 3.5 guide. Both LAD and D1 were wired with runthrough wire (Terumo; Japan) and simultaneous KBI (kissing balloon inflation) was performed using 2.5x10 mm Traveller semicompliant balloon (Abott vascular; USA) at 12 atm pressures in each vessel (Fig. 2A). Diagonal branch (D1) was stented by deploying 3x32 mm everolimus eluting stent (Xience Prime; Abott vascular, USA) at 14 atm pressure (Fig. 2B). Proximal part of stent was post dilated by using 3.5x10 mm Traveller NC (non-compliant) balloon at 12 atm pressure as a part of proximal optimization technique (POT) after removing the jailed wire. LAD was recrossed through the distal most struts at the carina with another runthrough wire and LAD ostium was predilated with a 2x12 sprinter legend SC balloon at 10 atm. It was stented with 3x32 mm Xience Prime at 12 atm pressure by keeping its proximal edge at the proximal edge of diagonal stent (Fig. 3A, B). D1 was recrossed using runthrough wire. 3x10 mm Traveller NC balloons were placed in both the LAD and D1 and were inflated individually up to 16 atm followed by simultaneous inflation of both balloons to 12 atm for 20 sec as a part of simultaneous KBI (Fig. 3C, 4A). After KBI,
patient complained of mild chest pain with dynamic changes in his ECG. Angiogram revealed significant narrowing of side branch of D1 (Fig. 4B). Left main was cannulated with another 6F EBU guiding catheter through left transfemoral route. During cannulation, previous catheter was little pulled out while it was cannulated with another guide catheter (Fig. 4C). Side branch of D1 was wired using runthrough wire through the strut of D1 stent. Simultaneous trifurcation kissing balloon dilatation was performed using 3x10 mm Traveller NC each in LAD and D1, and 2.5x10 mm Traveller NC in side branch of D1 at 12 atm pressure (Fig. 5A). The final result showed a TIMI 3 flow with well deployed stents at LAD and D1, with patent side branch of D1 with no residual stenosis (Fig. 5B). He was discharged on the third day with aspirin — 75 mg/day, ticagrelor- 90 mg twice daily, rosuvastatin — 40 mg/day, metoprolol — 200 mg/day and ramipril- 5 mg/day. Patient is doing excellent since then with regular follow-up at our institute.

**Discussion**

Trifurcating coronary artery disease is a complex atherosclerotic process involving the origin of one or more of three side branches arising from a main trunk. PCI of such lesions remains challenging substrate as it is associated with high risk of side branch occlusion because of plaque or carina shift and target lesion revascularization [2, 3]. Shammas et al have proposed its classification based on whether the main trunk is involved (Type A) or not (Type B), as well as management strategy [4]. However, the crucial factor is requirement of 9 Fr guide catheters for all intervention strategies as described by them [5, 6]. But with passing time, the intervention is entering into age of slender PCI where single lesion can easily be dealt with 4 -5F guide as it reduce bleeding complications. All bifurcation lesions can be easily dealt with 6F guide catheter except when one requires delivering two-stent shafts simultaneously classical or mini crush, V stenting, and SKS). But delivering the three balloons for final kissing approach always requires 8 or 9 F guide. Furthermore, a “ménage a` trios”, or simultaneous triple kissing has been described in a few case reports as the solution to achieve ostial scaffolding and stent apposition [1]. Here, in our case this difficulty was circumvented by using two simultaneous access sites and dual 6F guide catheters. One requires fine tuning while engaging the left main as to pull and park the first guide catheter while engaging with second catheter and therefore successfully completing the procedure making it “ménage a` trios”.

Side branch occlusion or side branch narrowing after main vessel stenting sometimes occurs because of plaque or carina shift, even when a protective guide wire is inserted into
the side branch prior to stent implantation [7, 8]. Impaired blood flow of the side branch may result into serious myocardial ischemia along with chest pain and sometimes hemodynamic instability. In such situation, it needs to be salvaged initially with balloon dilatation and sometimes with stenting if impaired flow persists. Therefore, efforts to reduce the risk of temporary or chronic side branch occlusion during PCI are crucial. Till now, intervention of all trifurcation lesions have been described only in scenario of left main bifurcation. This is the first ever case report of trifurcation lesion of LAD which indicates that the basic treatment concepts for most coronary bifurcation lesions can be applied to trifurcation lesions. A dedicated two stent strategy along with balloon dilatation of third branch with final trifurcation kissing balloon may be a standard method. In "Kurdistan” Technique as described by Mirza et al [6], similar method was employed but it was described among the patients with unprotected left main coronary artery (ULMCA) disease. In our case, it was LAD with significant side branch. In their series, single large bore guide catheter (9F) was used while our case was performed using dual routine guide (6F).

Conflict of interest
None

References


Figure legend

**Figure 1.** Coronary angiogram showing a true bifurcation lesion of proximal LAD involving large diagonal branch (Medina class 1:1:1)

**Figure 2.** Simultaneous KBI (kissing balloon inflation) was performed using 2.5x10 mm Traveller semicompliant balloon after LAD and D1 were wired with runthrough wire (A); D1 was stented by deploying 3x32 mm Xience Prime stent at 14 atm pressure

**Figure 3.** LAD was stented with 3x32 mm Xience Prime at 12 atm pressure by keeping its proximal edge at the proximal edge of diagonal stent (A, B); Simultaneous KBI was performed using 3x10 mm Traveller NC balloons in both the LAD and D1 (C)

**Figure 4.** After KBI (A), angiogram revealed significant narrowing of side branch of D1 (white arrow; B); Left main was cannulated with another 6F catheter (C)

**Figure 5.** Simultaneous trifurcation KBI was performed using 3x10 mm Traveller NC each in LAD and D1, and 2.5x10 mm Traveller NC in side branch of D1 at 12 atm pressure (A); The final result showed a TIMI 3 flow with well deployed stents at LAD and D1, with patent side branch of D1 with no residual stenosis