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TAP-stenting as bail-out strategy for iatrogenic dissection of left main bifurcation

Stentowanie techniką TAP jako metoda ratunkowa w jatrogennym rozwarstwieniu lewej tętnicy wieńcowej w miejscu jej rozwidlenia

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Abstract

Iatrogenic coronary dissection is a rare but potentially catastrophic complication of percutaneous coronary intervention A proximal left anterior descending (LAD) artery dissection may extend into distal left main bifurcation which may further engulf left circumflex artery (LCx). Here, we report the case of a 69 year-old male where dissection at the proximal edge of a well deployed stent led to total closure of left circumflex artery, causing haemodynamic compromise. This was bailed out using T-and-protrusion (TAP) stenting where LAD and LCx were stented using a 3.5 × 12 mm and a 3 × 24 mm sirolimus-eluting stent (Yukon Choice, Translumina Therapeutics, India) respectively. The TAP technique is a feasible and reasonable management strategy for immediate bail-out stenting for this lethal complication.

Key words: iatrogenic coronary dissection, left main bifurcation, TAP stenting, left anterior descending artery

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Introduction

Iatrogenic dissection is a rare but potentially disastrous complication of percutaneous coronary intervention (PCI). It can progress antegrade and/or retrograde, leading to abrupt vessel closure. The dissection of proximal left anterior descending artery (LAD) may extend to left main (LM) dissection, which may further engulf the left circumflex artery as well. It is one of the leading causes of procedure failure that is associated with the risk of peri-procedural myocardial infarction, stent thrombosis, target vessel failure, arrhythmias, and death [1, 2]. In PCI for bifurcation lesions, single stenting of the main branch is the preferred approach; stenting of the side branch is only recommended when there are inadequate results of the side branch [3]. Various techniques have been developed for provisional and dedicated bifurcation lesion. Of these, T-and-protrusion (TAP) stenting is the one which may be used as a bail-out strategy, especially in distal left main artery involvement [4, 5].

Case report

A 69 year-old hypertensive male smoker presented with exertional angina Canadian Cardiovascular Society (CCS) class II of three years' duration which had worsened to class III in the past two weeks despite guideline-directed medical therapy. His treadmill test was strongly positive for exercise induced myocardial ischaemia. Blood pressure on presentation was 126/72 mm Hg. in the left arm in a supine position. Pulse rate was 68/min, regular in rhythm, normal in volume and character with no radio-radial or radio-femoral delay, with all pulses palpable. Other physical examinations were normal. An electrocardiogram showed ST-T changes suggestive of left ventricular hypertrophy. Echocardiography revealed mild concentric

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Figure 1. Antero-posterior caudal view showing bifurcation lesion of left anterior descending artery (red arrow) involving large diagonal branch (red arrowhead)

left ventricular hypertrophy, grade-I diastolic dysfunction, and normal systolic function, with an ejection fraction of 68%. His coronary angiogram revealed LAD artery showing bifurcation lesion involving diagonal branch (Medina 1,1,1) while other arteries were normal (Figure 1). After proper consent, he was planned for PCI of the involved segment. A sirolimus-eluting stent (3 × 32 mm, Yukon Choice, Translumina, India) was successfully implanted in proximal LAD (Figure 2A, B). When performed post dilatation by noncompliant balloon (3.5/10 mm, Voyager NC, Abbott, USA) at 14 atm pressure (Figure 2C), a retrograde dissection was seen that extended from the proximal edge of the stent to distal LM and proximal left circumflex artery (Figure 3A). The patient started complaining of chest pain and the ECG started showing ST depression. Another Yukon Choice stent (3.5 × 12 mm) was implanted at 12 atm pressure from distal LM to LAD to bail out the dissection (Figure 3B). Suddenly, the patient became hypotensive with ECG showing ST elevation in inferior leads. His blood pressure came down to 80/60 mm Hg. On subsequent angiographic view, total occlusion of LCx was seen (Figure 4A). LCx was wired using a 0.014-inch runthrough wire (Terumo, Japan) through the proximal part of the LM stent after negotiating across its struts. Side cell of the stent was opened with a 2 × 10 mm semicompliant balloon (Voyager, Abbott) at 10 atm pressure. Thereafter, TAP-stenting in the LM bifurcation (3 × 24 mm in LCx, Yukon Choice, Translumina) was performed (Figure 4B). During stenting of LCx, the stent was positioned in such a way that two of its struts were protruding into the previously deployed stent of LM. His pain started to subside and haemodynamics started showing recovery. The LCx balloon was slightly pulled back and served along with the LM balloon (3.5 × 10 mm Voyager NC) for final kissing balloon inflation (FKI) approaches (Figure 5A).

The angiographic result was optimal, with no residual stenosis or dissection at the bifurcation, well deployed stents in both LM and LCx, and a TIMI-3 flow throughout the LAD and LCx, although ramus intermedius remained occluded (Figure 5B, C). The patient was discharged with ticagrelor — 90 mg twice daily, acetylsalicylic acid — 75 mg, rosuvastatin — 40 mg, and metoprolol — 100 mg, and remained asymptomatic at one year follow-up.

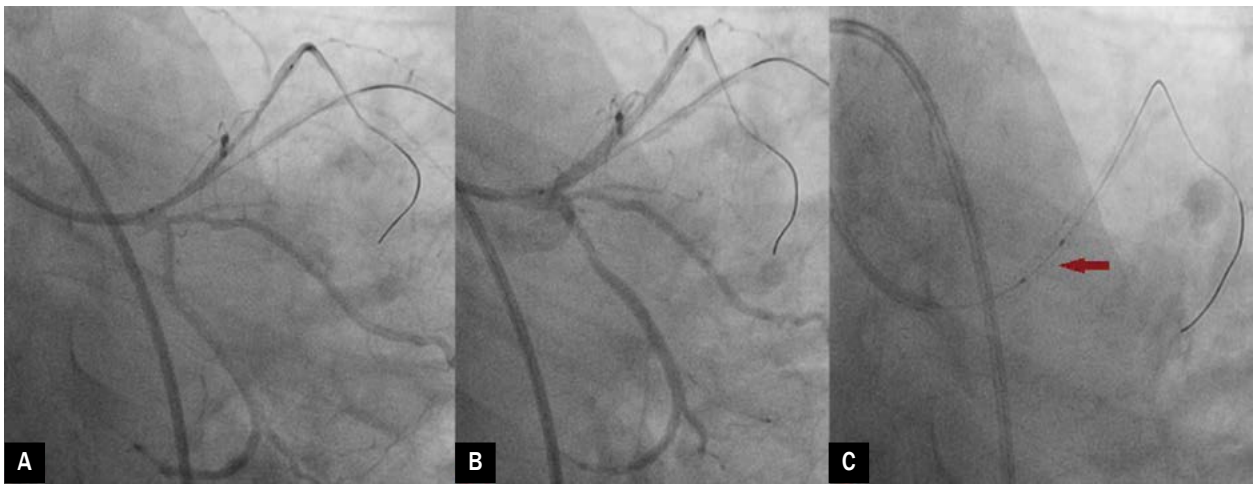

Figure 2. Left anterior descending (LAD) artery was stented with 3 × 32 mm Yukon Choice sirolimus-eluting stent (**A, B**); proximal part of stent was post dilated using 3.5/10 mm Voyager NC balloon (red arrow; **C**)

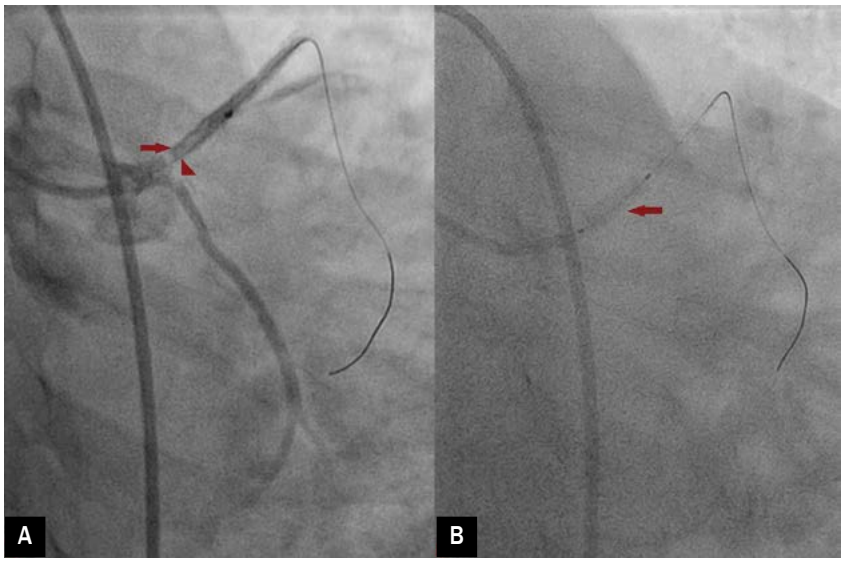

Figure 3A. Retrograde dissection was seen that extended from proximal edge of the stent (red arrow) to distal left main (LM) and proximal left circumflex artery (red arrowhead); **B.** 3.5 × 12 mm Yukon Choice stent (red arrow) was implanted at 12 atm pressure from distal LM to left anterior descending (LAD) artery

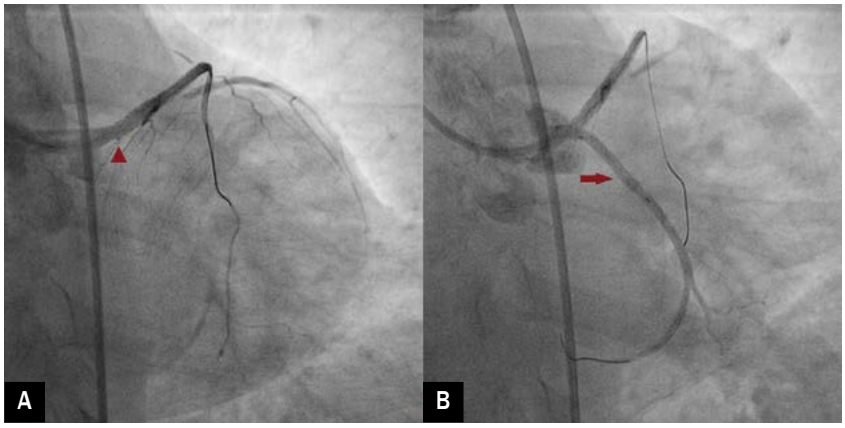

Figure 4A. Total occlusion of proximal left circumflex artery (LCx) was seen on subsequent angiographic view (arrowhead); **B.** LCx was stented using TAP (T And small Protrusion) technique using 3 × 24 mm Yukon Choice stent

Discussion

Iatrogenic dissection is one of the dreaded complications of PCI. In fact, sealing the entry site of dissection flap immediately by a simple prolonged inflation of a balloon or by stent implantation prevents the rapid development of a haematoma. Therefore, one should immediately make every effort to prevent progression of dissection flap. When dissection occurs at the bifurcation, it may progress in both directions, which can sometimes lead to total occlusion of a side branch. In the delicate situation of a dissection involving LM bifurcation, one should choose a simple stenting technique to reduce the difficulty and complexity of management. Initially, all efforts should be made to cover any dissection flap to achieve haemodynamic stability. If bifurcation stenting is unavoidable, as in our case, the TAP-stenting (T And small Protrusion) technique is relatively simple, as it allows full coverage of bifurcation lesions and facilitates the final kissing balloon [6]. In our case, high pressure post dilatation was responsible for iatrogenic left main distal dissection. Once circumflex branch was occluded, it was bailed by TAP. This is currently the preferred approach to side-branch stenting with the recommended strategy of provisional bifurcation stenting.

A provisional stenting strategy is recommended for the majority of coronary bifurcation lesions [3]. Although

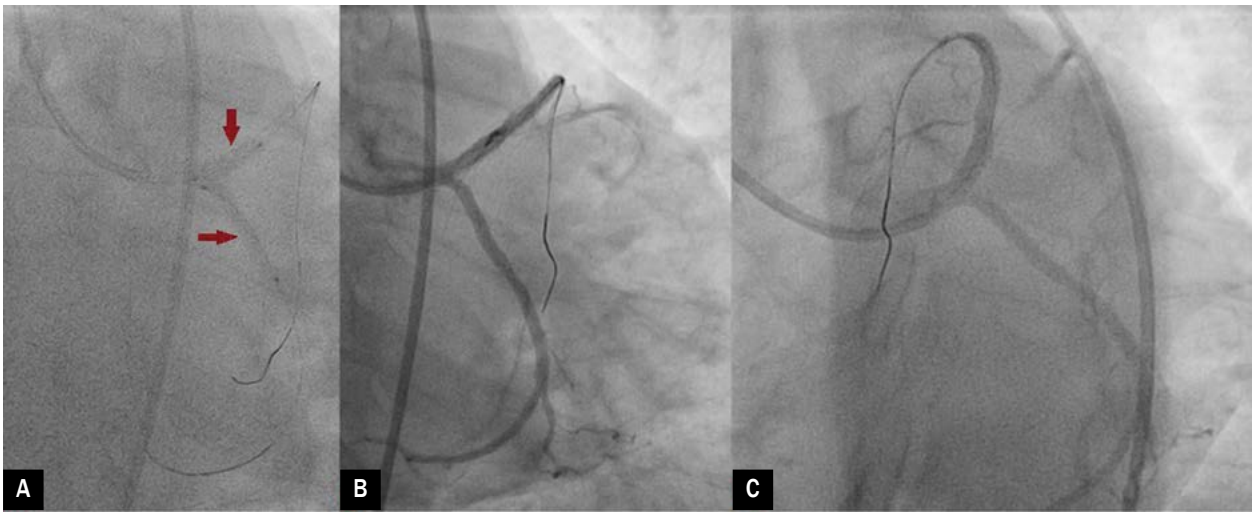

Figure 5. Final kissing balloon inflation was performed using 3.5 × 10 mm Voyager NC in distal left main (LM) and 3 × 24 mm stent balloon in left circumflex artery (LCx) (**A**); subsequent angiographic view showed well apposed stents with optimal result (antero-posterior caudal view — **B**; left anterior oblique view with caudal angulation — **C**)

a single-stent approach focusing on the main vessel (MV) is often preferred owing to improved long-term results, a two--stent technique targeting the MV and the side branch (SB) is sometimes required when a large SB is in jeopardy. This technique is associated with reasonable clinical outcomes [7]. It provides a full SB ostial coverage while avoiding the deployment of excessive hardware. The end result is achieved by creating a neocarina composed of a layer of single-stent struts due to the intentional minimal protrusion of the SB stent within the MV stent [5].

The conversion from one-stent strategy to TAP could be achieved smoothly and often leads to good results. Technically, optimal positioning of the SB stent to achieve the required protrusion into the lumen of the MV remains a challenge, but such issues can be addressed by ensuring the bifurcation angle is wide enough.

Conflict(s) of interest

The authors report no conflict of interest.

Streszczenie

Jatrogenne rozwarstwienie tętnicy wieńcowej to rzadkie, ale potencjalnie katastrofalne w skutkach powikłanie przezskórnej interwencji wieńcowej. Rozwarstwienie w proksymalnym odcinku gałęzi przedniej zstępującej lewej tętnicy wieńcowej (LAD) może się rozszerzyć na rozwidlenie lewej tętnicy wieńcowej, a następnie objąć również gałąź okalającą (LCx). W niniejszej pracy opisano przypadek 69-letniego mężczyzny, u którego rozwarstwienie tętnicy przy bliższym końcu skutecznie zaimplantowanego stentu doprowadziło do całkowitej niedrożności gałęzi okalającej powodującej zaburzenia hemodynamiczne. W ramach działań interwencyjnych wykonano zabieg z zastosowaniem techniki stentowania TAP (*T-and-protrusion*), w którym do LAD i LCx wprowadzono stenty uwalniające sirolimus (Yukon Choice, Translumina) o wymiarach odpowiednio 3.5 × 12 mm i 3 × 24 mm. Technika TAP jest dostępną i skuteczną metodą stentowania ratunkowego w ramach leczenia tego zagrażającego życiu powikłania.

Słowa kluczowe: jatrogenne rozwarstwienie tętnicy wieńcowej, rozwidlenie lewej tętnicy wieńcowej, stenowanie techniką TAP, gałąź przednia zstępująca lewej tętnicy wieńcowej

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