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

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Abstract
Iatrogenic coronary dissection is a rare but potentially catastrophic complication of percutaneous coronary intervention. The proximal left anterior descending artery (LAD) dissection may extend into distal left main bifurcation which may further engulf left circumflex artery (LCx). Here, we report a case of a 69-year-old male where dissection at proximal edge of well deployed stent led to total closure of left circumflex artery causing hemodynamic compromise. It was bailed out using T-and-protrusion (TAP) stenting where LAD and LCx were stented using 3.5x12 mm and 3x24 mm sirolimus-eluting stent (Yukon Choice, Translumina) respectively. 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

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 important causes for procedure failure associated with the risk of peri-procedural myocardial infarction, stent thrombosis, target vessel failure, arrhythmias, and death [1, 2]. In percutaneous coronary intervention (PCI) for bifurcation lesions, single stenting of the main branch is the preferred approach and stenting of the side branch is only recommended for inadequate results of the side branch [3]. Various techniques have been developed for provisional and dedicated bifurcation lesion. Among various techniques, 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 and smoker male presented with exertional angina Canadian Cardiovascular Society (CCS) — class II for past 3 years with recent worsening to class III for past 2 weeks despite guideline directed medical therapy. His treadmill test was strongly positive for exercise induced myocardial ischemia. Blood pressure on presentation was 126/72 mm Hg, in the left arm in 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 left ventricular hypertrophy, grade-I diastolic dysfunction, and normal systolic function with an ejection fraction of 68%. His coronary angiogram revealed left anterior descending artery (LAD) showing bifurcation lesion involving diagonal branch (Medina-1:1:1) while other arteries were normal (Fig.1). His percutaneous coronary intervention (PCI) of involved segment was planned after proper consent. A sirolimus-eluting stent (3x32 mm, Yukon Choice, Translumina) was successfully implanted in proximal LAD (Fig. 2A, B). When performed post dilatation by noncompliant balloon (3.5/10mm, Voyager NC, Abbott,USA) at 14 atm pressure (Fig. 2C), a retrograde dissection extended from proximal edge of the stent extending to distal left main (LM) and proximal left circumflex artery was seen (Fig. 3A). Patient started complaining of chest pain and ECG started showing ST depression. Another Yukon Choice stent (3.5x12 mm) was implanted at 12 atm pressure from distal LM to LAD to bail out dissection the dissection (Fig. 3B). Suddenly patient became hypotensive with ECG showing ST elevation in inferior leads. His blood came down to 80/60 mm Hg. On subsequent angiographic view, total occlusion of LCx was seen (Fig. 4A). LCx was wired using 0.014-inch runthrough wire (terumo, Japan) through the proximal part of the LM stent after negotiating to cross its struts. Side cell of the stent was opened with 2x10 mm semicompliant balloon (Voyager, Abbott, USA) at 10 atm pressure. Thereafter, TAP-stenting in the LM bifurcation (3x24 mm in LCx, Yukon Choice, Translumina) was performed (Fig. 4B). During stenting of LCx, stent was positioned in such a way that two struts of stent were protruding into previously deployed stent of LM. His pain started subsiding and hemodynamics started showing recovery. The LCx balloon was slightly pulled back and served along with the LM balloon (3.5x10 mm Voyager NC) for final kissing balloon inflation (FKI) approaches (Fig. 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 remain occluded (Fig. 5B, C). The patient was discharged with ticagrelor 90 mg twice daily, aspirin 75 mg,
rosuvastatin 40 mg, and metoprolol 100 mg and remained asymptomatic at 1 years of follow up.

Discussion
Iatrogenic dissection is one of the dreaded complications of PCI. Actually, sealing the entry site of dissection flap immediately by simple prolonged inflation by a balloon or stent implantation prevents the rapid development of hematoma. Therefore, one should immediately make every effort to prevent progression of dissection flap. When dissection occurs at the bifurcation, it may progress both ways which may lead to total occlusion of side branch sometime. In precarious situation of dissection involving LM bifurcation, one should choose a simple stenting technique to reduce difficulty and complexity of management. Initially, all efforts should be made to cover the dissection flap to achieve the hemodynamic instability in any. If bifurcation stenting is unavoidable as in our case, the TAP-stenting (T And small Protrusion) technique is relatively simple, as it allow full coverage of bifurcation lesions and facilitate 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 baied by TAP. This is currently the preferred approach of 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 a single-stent approach focusing on the main vessel (MV) is often preferred owing to a better long-term result, 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 if the bifurcation angle is wide enough, such issue can be easily taken care off.

Conflict of interest-

References


Figure legend

Figure 1. Antero-posterior caudal view showing bifurcation lesion of left anterior descending artery (red arrow) involving large diagonal branch (red arrowhead)
**Figure 2.** LAD was stented with 3x32 mm Yukon Choice sirolimus-eluting stent (A, B); proximal part of stent was post dilated using 3.5/10mm Voyager NC balloon (red arrow, C)

**Figure 3.** Retrograde dissection extended from proximal edge of the stent (red arrow) extending to distal left main (LM) and proximal left circumflex artery (arrowhead) was seen (A); 3.5x12mm Yukon Choice stent (red arrow) was implanted at 12 atm pressure from distal LM to LAD (B)

**Figure 4.** Total occlusion of proximal LCx was seen on subsequent angiographic view (arrowhead, A); LCx was stented using TAP technique using 3x24 mm Yukon Choice stent (B)

**Figure 5.** Final kissing balloon inflation was performed using 3.5x10 mm Voyager NC in distal LM and 3x24 mm stent balloon in LCX (A); Subsequent angiographic view showing well apposed stents with optimal result (AP caudal view — B; left anterior oblique view with caudal angulation — C)