Rescue Balloon Jailing Technique for Uncrossable Side Branch Occlusion During Provisional Stenting of an LAD/D1 Bifurcation Lesion

Anastasios D. Barmpas, MD, MSc
Interventional Cardiologist
University Cardiology Dpt
Medical School, Democritus University of Thrace, Alexandroupolis, Greece

Αναστάσιος Δ. Μπάρμπας, MD,MSc
Επεμβατικός Καρδιολόγος
Παν. Καρδιολογική Κλινική
Ιατρική Σχολή, Δημοκρίτειο Πανεπιστήμιο Θράκης, Αλεξανδρούπολη, Ελλάδα
Disclosures

None to be declared
Case Presentation

A 64-year-old man with a history of diabetes mellitus and dyslipidemia was referred for cardiac catheterization due to effort angina CCS II Class. The SPECT showed a large reversible anterior wall perfusion defect that indicated LAD ischemia.
Baseline Angiography
LAD/D1 Bifurcation Lesion (Medina 1,1,0)

Access: left radial artery
Sheath: Radifocus® Introductor II Standard Kit (6Fr)
Guiding catheter: 6Fr EBU 3,5
RESOLVE Score
An Angiographic Tool for Risk PrEdiction of Side Branch OccLusion in Coronary Bifurcation InterVEntion

• Plaque distribution---at the same side of SB: 1
• MV TIMI flowgrade before stenting---TIMI 3: 0
• Diameter stenosis of bifurcation core--->70%: 3
• Bifurcation angle--<70°: 0
• Diameter ratio between MV/SB---[1-1.5]: 2
• Diameter stenosis of SB ---70%-90%: 0

Total score: 6---Intermediate risk of SB occlusion
Treatment of LAD Lesion

Predilation of LAD with a 3 x 24mm semi-compliant balloon (16 Atm)
Result after Predilation
Treatment of LAD Lesion

LAD stented with a 3.5 x 26 mm Resolute Integrity DES (16 Atm)
Abrupt Occlusion of D1 after LAD Stenting caused by Plaque Shift

Angina - ST Elevation in aVL, I - Hypotension

Treatment

• Intravenous low dose catecholamine administration
• Morphine 6 mg i.v. and 10 mg Metoclopramide i.v. as a prophylactic antiemetic
• Recanalisation of the occluded D1
Abrupt Occlusion of D1 after LAD Stenting caused by Plaque Shift: What to do next?

POT and Rewiring attempts with OTW Balloon/Microcatheter support - all attempts failed

**Failed Recanalisation Attempts**

1. POT with a 3.75x 10 mm NC Balloon (18 Atm)
2. Rewiring attempt with Fielder FC Guidewire (Asahi) and PT2, Moderate Support, Guidewire (Boston Scientific)
3. Rewiring attempt with OTW Balloon/Microcatheter (Corsair) Support
“Rescue Balloon Jailing” Technique

Fig. 2. Schematic representation of the rescue balloon jailing technique. A. After main vessel (MV) stent implantation with jailed wire in the side-branch (SB), SB is occluded and rewiring attempts fail. B. The “rescue” (low-profile, small) balloon is advanced in the SB over the jailed wire. C. A balloon is advanced into the proximal MV and kept uninflated. D. SB “rescue” jailed balloon is inflated to restore flow into the SB. E. SB “rescue” jailed balloon is deflated and removed. As a consequence of jailed balloon dilation, stent struts in the proximal MV are detached from vessel wall. F. The MV balloon is dilated to re-expand the stent struts in the proximal MV.

“Rescue Balloon Jailing” Technique

- The “rescue” balloon (OTW 1.2x 20 mm) was advanced over the jailed wire and was inflated at 8 Atm.

- Previously a 3.75 x 15 mm NC balloon was advanced into the proximal part of the LAD Stent and was kept uninflated.
Angio Result after “Rescue Balloon Jailing” Technique

Restoration of patency of the occluded D1 with TIMI 3 flow grade

The Control angiography after the “Rescue Balloon Jailing” Technique showed Restoration of patency of the occluded D1, to a great extend, with TIMI 3 flow grade
Correction of the distorted LAD Stent by Balloon Post Dilatation

LAD-Stent Distortion corrected by Post Dilatation with a NC Balloon 3,75x 15 mm, at 18 Atm.
SB- Rewiring
Final Kissing Balloon Inflation

Final Kissing Balloon Inflation in LAD/D1 with 2,25 x 15 mm and 3,75 x 15 mm NC Balloon respectively
FINAL POT

POT is performed with a 3,75 x 15 mm NC Balloon at 20 Atm
Final Angiographic Result
Clinical Impact of Side Branch Occlusion during Provisional according to the COBIS II Registry

**DEATH or MI**

- **A**
  - Graph showing survival free from death or MI (%)
  - SB occlusion vs. No SB occlusion
  - Survival rates at 0, 12, 24, and 36 months
  - p = 0.01

**MACE**

- **C**
  - Graph showing survival free from MACE (%)
  - SB occlusion vs. No SB occlusion
  - Survival rates at 0, 12, 24, and 36 months
  - p = 0.03

**TLR**

- **B**
  - Graph showing survival free from TLR (%)
  - SB occlusion vs. No SB occlusion
  - Survival rates at 0, 12, 24, and 36 months
  - p = 0.41

Hahn et al. Results From the COBIS II Registry, JACC 2013
HOW CAN WE IMPROVE THE SAFETY OF PROVISIONAL?

Rooms for technical improvement

More prevention of SBs occlusion: SIDE BRANCH PROTECTION TECHNIQUES

Salvage of compromised SBs: SIDE BRANCH RESCUE TECHNIQUES
Enhanced Side Branch Protection Techniques
in coronary bifurcations with high risk of side branch Occlusion before main vessel stenting

Jailed balloon protection: a new technique to avoid acute side-branch occlusion during provisional stenting of bifurcated lesions. Bench test report and first clinical experience

Francesco Burzotta¹*, MD, PhD; Carlo Trani¹, MD; Georgios Sianos²*, MD, PhD

¹. Institute of Cardiology, Catholic University of the Sacred Heart, Rome, Italy; ². AHEPA University Hospital, Thessaloniki, Greece

Burzotta, Trani, Sianos, EuroIntervention 2010
Enhanced Side Branch Protection Techniques
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Modified jailed balloon technique for bifurcation lesions

Shigeru Saito, MD, FACC, FSCAI, FJACC © | Koki Shishido, MD |
Noriaki Moriyama, MD | Tomoki Ochiai, MD | Shingo Mizuno, MD |
Futoshi Yamanaka, MD | Kazuya Sugiyama, MD | Kazuki Tobita, MD |
Junya Matsumi, MD | Yutaka Tanaka, MD | Masato Murakami, MD

Correspondence
Shigeru Saito, MD, Department of Cardiology and Catheterization Laboratories, Shionogi Kanasaki General Hospital, Kanasaki City, Japan.

Objectives: We propose a new systematic approach to bifurcation lesions, modified jailed balloon technique (M-JBT), and report the first clinical experience.

Background: Side branch occlusion is a serious complication and occurs in more than 70% of cases during bifurcation stenting.

Methods: A jailed balloon (JB) is introduced into the side branch (SB), while a stent is placed in the main branch (MB) as crossing SB. The size of the JB is half of the MB stent size. While the proximal end of JB attaching to MB stent, both stent and JB are simultaneously inflated with same pressure. JB is removed and then guidewires are reinserted.Kissing balloon dilation (KBD) and/or T and protection (TAP) stenting are applied as needed.

Results: Between February 2015 and February 2016, 233 patients (254 bifurcation lesions including 54 left main trunk disease) underwent percutaneous coronary intervention (PCI) using this technique. Procedure success was achieved in all cases. M-JBT was performed for 163 lesions and TAP stenting was employed for 31 lesions. Occlusion of SB was not observed in any of the patients, branch test confirmed less deformity of MB stent in M-JBT compared with conventional-JBT.

Conclusions: This is the first report for clinical experiences by using modified jailed balloon technique. This novel M-JBT is safe and effective in the preservation of SB patency during bifurcation stenting.

Keywords: stenting technique, bifurcation lesion, percutaneous coronary intervention

Saito S. et al, Catheter Cardiovasc Interv. 2018
Of note, the “RBJ” technique is also suitable to help manage another complication associated with bifurcation intervention, i.e. the “jailed wire entrapment”. Indeed, when jailed wire gets entrapped by the MV stent struts, the RBJ technique has been reported to help remove the guidewire before fracture occurs.
“Rescue Balloon Jailing” Technique
Expert Consensus

Percutaneous coronary intervention for the left main stem and other bifurcation lesions: 12th consensus document from the European Bifurcation Club

Figure 5. Side branch salvage using the jailed wire technique.
“Rescue Balloon Jailing” Technique
Utilization of ultra-low-profile balloons

The “Rescue Balloon”, which is advanced in the occluded SB over the jailed wire, should have as low as possible Tip and Crossing Profile.
SB Rescue Techniques
Rescue Advancement of CTO Microcatheters
SB Rescue Techniques
Eventually Rescue Advancement of the CTO Scoring Balloon „Blimp“

TIP
- Low profile
- High penetration

BALLOON
- 0.6 x 5 (mm)
- 30 ATM rated

SHAFT
- OD ≤ 1.5F
- High push shaft
- Best in class shaft profile

EXIT MARKERS
- 95 cm
- 105 cm

SCORING DESIGN
- Short Rx section
- Guidewire used as scoring element
Key Issues

• Side-branch compromise is a reality during provisional stenting technique with jailed wire and is not fully predictable

• Even if the selected technique is the most simple (i.e., stenting the Main-Vessel only), the placement of a guidewire into the Side-branch according to the so-called “jailed wire technique” has been shown to improve the outcome of bifurcation PCI

• Operator should know several Side-branch Protection and Side-branch Rescue Techniques

• “Rescue Balloon Jailing” Technique is a safe and effective technique for flow recovery in case of uncrossable Side-branch occlusion following main-vessel stenting