Francesco Burzotta

TAP: T And Protrusion

European Bifurcation Club

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Rome - Italy
Rationale for refinements of the T-stenting technique

In bifurcated lesions, a single stent strategy is at least not inferior to any double stent technique.

If a provisional T-stenting strategy is adopted, a subgroup of 10-35% of the patients is known to require side-branch (SB) stenting (usually implanted according to the standard T-stenting technique).

Recognized LIMITATIONS of the standard T-stenting technique are:

1. the risk of incomplete SB ostium coverage

2. the risk of SB stent protrusion within the main vessel (MV) causing obstruction of main branch
TAP BENCH TEST: angio

Step 1: stenting on MV with jailed guidewire on SB
Step 2: Kissing on MV and SB after rewiring of the SB (according to Provisional T-stenting strategy)
Step 3: Stent placement on the SB with uninflated balloon on MV ready for final kissing balloons

SB stent positioning is adjusted to ensure full coverage of the ostium by placing the proximal stent edge at the level of the proximal ostium border
TAP BENCH TEST: angio

Step 4: Stent inflation on the SB with uninflated balloon on MV ready for final kissing balloons

The stent of the SB protrudes within the MV lumen only at the distal edge of SB ostium
TAP BENCH TEST: angio

Step 5: The SB stent balloon is slightly pulled within the MV to perform kissing balloons inflation.

The stent of the SB protrudes within the MV only at the distal edge of SB ostium.
Step 6: Final kissing balloons of the bifurcation with the SB stent balloon and the MV balloon
Kissing balloons modify the angulation of SB stent struts protruding into the MV to create a small, single layer, neocarina.
BENCH TEST: external view of TAP-stenting

Optimal coverage of the upper part of SB with minimal overlap of stent struts

The small neocarina
BENCH TEST: internal view of TAP-stenting

Distal MV

Perfect patency of MV lumen (proximal view)

Prox MV

The small neocarina
TAP-stenting sequence in a patient with complex, occlusive LAD-D1 lesion

- Female, 69 yrs
- Hypertension, Familial history of IHD
- Typical effort angina in the last 2 months
First steps: wiring Main Vessel (MV) and Side-branch (SB) -> MV stenting -> Kissing balloons

- Choice PT graphix (LAD)
- Intermediate (D1)
- Predilation
- TAXUS 3x32 mm (LAD)

Severe D1 lesion after Kissing balloon

-kissing balloons (3x15 mm LAD, 2.5x15 mm D1)
SB stent is placed with minimal protrusion into the MV with uninflated MV balloon ready for final kissing.

- 3x15 mm balloon uninflated in the LAD
- TAXUS 2.5x12 mm positioned in D1
- TAXUS 2.5x12 mm inflated in D1 with uninflated LAD balloon ready for final kissing
After SB stent deployment, the stent balloon is slightly pulled into the MV and final kissing is performed.

- Final Kissing with SB
  Taxus 2.5x12 mm balloon
  and the MV 3x15 mm balloon

Final Angio
(Pt asymptomatic at 6 mo. FU)
TAP-stenting: 3D reconstruction

Endeavor 3.5x24 mm (CX)
Endeavor 3.5x18 mm (OM)

10-month follow-up
Modified T-Stenting With Intentional Protrusion of the Side-Branch Stent Within the Main Vessel Stent to Ensure Ostial Coverage and Facilitate Final Kissing Balloon: The T-Stenting and Small Protrusion Technique (TAP-Stenting). Report of Bench Testing and First Clinical Italian-Korean Two-Centre Experience

Francesco Burzotta,1* MD, PhD, Hyeon-Cheol Gwon,2* MD, Joo-Yong Hahn,2 MD, Enrico Romagnoli,1 MD, PhD, Jin-Ho Choi,2 MD, Carlo Trani,1 MD, and Antonio Colombo,3 MD

Objectives: To describe a novel modification of the T-stenting technique and to report the bench test as well as the first clinical results obtained. Background: The best technique to treat bifurcated coronary lesions has not been defined. Methods: This novel modification of the T-stenting technique is based on stenting of the main vessel (MV) and kissing balloon, on the intentional minimal protrusion of the side-branch (SB) stent within the MV. Final kissing balloon is performed using the balloon kept uninflated into the MV before SB stenting. The technique was tested in vitro and applied in two independent series of patients undergoing elective drug-eluting stent implantation on one bifurcated lesion. Bifurcated lesions were classified according to the Medina classification. Patients' outcome up to 9 month was prospectively assessed. Results: The bench test showed perfect coverage of the bifurcation with minimal stent's struts overlap at the proximal part of SB ostium and a small, single layer stent struts, neo-culina not affecting the MV patency. Seventy-three complex patients (67% of Medina 1, 1% lesions; 44% of unprotected distal left main lesions) were treated with sirolimus-, paclitaxel-, or zotarolimus-eluting stents using the TAP technique. Procedural success was achieved in all cases and the clinical outcome up to 9 month was characterized by a low rate of clinically-driven target vessel revascularization (6.8%). Conclusions: The TAP-stenting is a modification of the T-stenting technique which allows full coverage of bifurcated lesions and facilitates final kissing balloon. The first clinical experience suggests that this technique may be practical, thus calling for further evaluations of the technique.

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## TAP-stenting: first clinical results (Rome updated)

<table>
<thead>
<tr>
<th></th>
<th>Rome’s Study Population (n=17)</th>
<th>Seoul’s Study Population (n=61)</th>
<th>POOLED RESULTS (n=78)</th>
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</thead>
<tbody>
<tr>
<td><strong>UP TO 30 DAY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>1 (1.6%)</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Nonfatal Myocardial Infarction</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Target Lesion Revascularization</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Any MACE</td>
<td>0</td>
<td>1 (1.6%)</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td><strong>&gt;30 DAY - 9 MONTH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>1 (5.8%) (after CABG*)</td>
<td>1 (1.6%)</td>
<td>2 (2.6%)</td>
</tr>
<tr>
<td>Nonfatal Myocardial Infarction</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Target Lesion Revascularization</td>
<td>2 (11.8%)</td>
<td>3 (4.9%)</td>
<td>5 (6.4%)</td>
</tr>
<tr>
<td>- repeated PCI</td>
<td>1 (5.8%)</td>
<td>3 (4.9%)</td>
<td>4 (5.1%)</td>
</tr>
<tr>
<td>- CABG</td>
<td>1 (5.8%)</td>
<td>0</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Any MACE</td>
<td>2 (11.8%)</td>
<td>4 (6.6%)</td>
<td>6 (7.7%)</td>
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<tr>
<td><strong>OVERALL, UP TO 9-MONTH</strong></td>
<td></td>
<td></td>
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<tr>
<td>Documented stent thrombosis</td>
<td>0</td>
<td>1 (1.6%)</td>
<td>1 (1.3%)</td>
</tr>
<tr>
<td>Target Lesion Revascularization</td>
<td>2 (11.8%)</td>
<td>3 (4.9%)</td>
<td>5 (6.4%)</td>
</tr>
<tr>
<td>Patients without MACE</td>
<td>15 (88.2%)</td>
<td>56 (91.8%)</td>
<td>71 (91.0%)</td>
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</table>
# MADS Classification of Bifurcation Treatment

## Provisional Techniques for Side Branch Stenting

<table>
<thead>
<tr>
<th>M</th>
<th>A</th>
<th>D</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main prox. first</strong></td>
<td><strong>Main across side first</strong></td>
<td><strong>Distal first</strong></td>
<td><strong>Side branch first</strong></td>
</tr>
<tr>
<td>1st stent</td>
<td>PM stenting</td>
<td>MB stenting across SB</td>
<td>DM stenting ½ SKS</td>
</tr>
<tr>
<td>After balloon</td>
<td>Skirt</td>
<td>MB stenting + SB balloon</td>
<td>MB stenting + kissime</td>
</tr>
<tr>
<td>2 stents</td>
<td>Skirt + DM</td>
<td>Elective stenting</td>
<td>V stenting</td>
</tr>
<tr>
<td></td>
<td>Skirt + SB</td>
<td>Internal crush</td>
<td>SKS</td>
</tr>
<tr>
<td>3 stents</td>
<td>Extended V</td>
<td>Culotte</td>
<td>Syst T stenting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TAP</td>
<td></td>
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</table>
MADS CLASSIFICATION OF BIFURCATION TREATMENT

PROVISIONAL TECHNIQUES FOR SIDE BRANCH STENTING
<table>
<thead>
<tr>
<th>Technical Complexity</th>
<th>Need to Recross Twice a Single Layer of Stent Struts</th>
<th>Need to Recross Once a Single Layer of Stent Struts</th>
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</thead>
<tbody>
<tr>
<td>T-stenting</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Internal crush</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Culotte</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>TAP</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
AMOUNT OF METAL LAYERS

- Double layer
- Single layer

T stenting, Internal crush, Culotte, TAP
AMOUNT OF METAL LAYERS

- Internal crush
- Culotte
- TAP
AMOUNT OF METAL LAYERS

- **Triple layer**
  - Internal crush: ++
  - Culotte: -
  - TAP: -

- **Double layer**
  - Internal crush: -
  - Culotte: ++++
  - TAP: +

- **Single layer**
AMOUNT OF METAL LAYERS

- **Triple layer**
  - T stenting: ++
  - Internal crush: +
  - Culotte: -
  - TAP: -

- **Double layer**
  - T stenting: -
  - Internal crush: ++++
  - Culotte: +
  - TAP: +

- **Single layer**
Animal study, Morton et al, CCI 2007

30 days after SKS

90 days after SKS
NEOCARINA: CLINICAL SAFETY

- Male, 75 yrs
- Recent diagnosis of Laringeal Carcinoma needing urgent surgery
- Previous inferior MI, Unstable angina

Skylor 3.5x35mm on IVA, Bail-out TAP with Skylor 2.5x20mm on D1

UNCOMPLICATED SURGERY AFTER 4 WEEKS

6-MONTH FU
PROVISIONAL TAP: Impact on double stenting use

Aug '05  |  Apr '06  |  Nov '06  |  Aug '07
---|---|---|---
9 months  |  9 months  |  | 

Provisional-T, Crush or SKS according to anatomy

Sistematic Provisional-TAP

PERCENTAGE OF PATIENTS FINALLY TREATED WITH TWO STENTS

129 bifurcations

12% All Bifurc  |  31% True Bifurc

201 bifurcations

9% All Bifurc  |  21% True Bifurc

-30%  |  -32%
CONCLUSIONS

IF YOU WANT TO USE A STRATEGY OF ROUTINE MV STENTING WITH PROVISIONAL SB STENTING...

...AND YOU WANT TO BE SURE TO COVER THE SB OSTIUM...

...BUT YOU WANT TO AVOID LARGE AREAS OF OVERLAPPING DOUBLE OR TRIPLE STENT STRUTS...

IF YOU ARE CONFIDENT TO OBTAIN PERFECT POSITIONING OF THE SB STENT: USE PROVISIONAL T-STENTING ...

IF YOU ARE NOT SO CONFIDENT: WHY NOT TO USE PROVISIONAL TAP-STENTING ?!