TiNOX bio-active technology and its use with respect of current guidelines

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☑ I have the following potential conflicts of interest to report:

Receipt of grants / research supports: Hexacath International
Receipt of honoraria or consultation fees: Abbott
TITANIUM-NO BIO ACTIVE COATING

TiN + O \rightarrow \text{TiNO}
TiNOX Bio Active Stent strut processing
Only BAS has NO particles

S. Windecker and al. EuroIntervention, Vol 2, Number 2, 2006
Only BAS is re-endothelialized at 14 days

ORIGINAL ARTICLE

Excellent very early neointimal coverage of bioactive stents by optical coherence tomography

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Heart Center, Satakunta Central Hospital, Pori, Finland

Abstract

Objectives. In a prospective study, we explored the extent of neointimal coverage of stent struts by optical coherence tomography 14 days following the implantation of bioactive stents in an unselected cohort. Design. We enrolled 15 consecutive patients who underwent bioactive stent implantation. Optical coherence tomography images were obtained at 14-day follow-up. Morphometric analysis, strut coverage, strut apposition, neointimal hyperplasia, and possible thrombosis were evaluated at 1-mm intervals. Binary stent strut coverage was defined as the percentage of covered struts of all analyzed struts. Results. Patients underwent optical coherence tomography examination at an average of 14.5 ± 2.3 days following stent implantation. Mean age was 62 ± 11 years; 86.7% were males; 26.7% diabetic. Three-hundred eighteen cross-sections were analyzed, including 2935 struts, an average of 9.2 ± 3 struts per cross-section. Binary stent strut coverage was 96.3%; the prevalence of malapposed struts 1.8%. No thrombi were detected. Mean neointimal hyperplasia thickness was 71.5 ± 53.7 μm. Conclusions. In the current evaluation by optical coherence tomography at 14-day follow-up after bioactive stent implantation in an unselected cohort, binary stent strut coverage was fairly adequate, and the prevalence of malapposed struts was low.

Key words: bioactive stents, neointimal coverage, optical coherence tomography, titanium
ABSENCE OF PLATELET AGGREGATION ON THE SURFACE

ABSENCE OF PLATELET AGGREGATION ON THE SURFACE

PRESENCE OF PLATELETS FOUND ON THE SURFACE OF THE CONTROL GROUP

TITANIUM-NO MECHANISMS OF ACTION

INHIBITS PLATELETS AGGREGATION

COATED GROUP

UNCOATED GROUP
Mechanisms important in ACS patients

- Inhibits Platelet Aggregation
- Minimizes Fibrin Growth
- Minimizes Thrombus Formation
- Reduces Inflammation
- Promotes Endothelial Healing

Windecker et al. Circulation 2001
TINOX Trial (BAS vs BMS)
MACE @ 1, 2 & 5 years

Moschovitis et al, Eurointervention 2010
STEMI: What do the guidelines say?

• 2017 ESC Guideline, AMI with ST-elevation (Eur Heart J 39:119-177, 2018)

  – ”In primary PCI, drug-eluting stents (DES) reduce the risk of repeated target vessel revascularization compared with BMS”
  – ”New-generation DES have shown superior safety and preserved or even improved efficacy compared with first-generation DES, in particular with lower risks of stent thrombosis and recurrent MI”
<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Class</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRA strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary PCI of the IRA is indicated.</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>New coronary angiography with PCI if indicated is recommended in patients with</td>
<td>I</td>
<td>C</td>
</tr>
<tr>
<td>symptoms or signs of recurrent or remaining ischaemia after primary PCI.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IRA technique</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stenting is recommended (over balloon angioplasty) for primary PCI.</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>Stenting with new-generation DES is recommended over BMS for primary PCI.</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>Radial access is recommended over femoral access if performed by an experienced</td>
<td>I</td>
<td>A</td>
</tr>
<tr>
<td>radial operator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routine use of thrombus aspiration is not recommended.</td>
<td>III</td>
<td>A</td>
</tr>
<tr>
<td>Routine use of deferred stenting is not recommended.</td>
<td>III</td>
<td>B</td>
</tr>
</tbody>
</table>
NSTE-ACS: What do the guidelines say?

  
  – ”Based on at least comparable safety and superior efficacy (i.e. prevention of restenosis and need for repeat revascularization), new-generation DESs are recommended over BMSs in NSTE-ACS.”
EFFICACY and SAFETY

- Efficacy: prevention of restenosis and need for repeat revascularization

- Safety:
  - Risk of MI
  - Risk of stent thrombosis
Titan vs. Taxus (TITAX)

N = 425

<table>
<thead>
<tr>
<th></th>
<th>1 year*</th>
<th>P</th>
<th>5 years**</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>MACE</td>
<td>10.3 vs 12.8</td>
<td>NI</td>
<td>16.4 vs 25.1</td>
<td>0.03</td>
</tr>
<tr>
<td>C. Death</td>
<td>0.5 vs 1.9</td>
<td>0.2</td>
<td>1.9 vs 5.7</td>
<td>0.04</td>
</tr>
<tr>
<td>AMI</td>
<td>4.2 vs 8.1</td>
<td>0.1</td>
<td>8.4 vs 18</td>
<td>0.004</td>
</tr>
<tr>
<td>Def. ST</td>
<td>0.4 vs 3.3</td>
<td>0.031</td>
<td>0.9 vs 7.1</td>
<td>0.001</td>
</tr>
<tr>
<td>TLR</td>
<td>9.3 vs 7.1</td>
<td>0.5</td>
<td>11.2 vs 10.9</td>
<td>0.92</td>
</tr>
</tbody>
</table>

*EuroIntervention 2008;4:234-241
**Int J Cardiol 2013 Sep 30; 168(2) 1214-9 doi
BASE-ACS
MACE at 12 months

Titan-2 BAS (n=417)
Xience-V EES (n=410)

3.9% 6.8% 9.0%
2.6% 7.2% 9.6%

%*

Days after Index PCI

Log-Rank P = 0.82

P = 0.81
HR (95% CI) = 0.94 (0.59-1.50)

P = 0.89

P = 0.33

0.6%

Karjalainen, EuroIntervention, 2012
MACE Components
5 years cumulative events

Titan-2 BAS (n=417)  Xience-V EES (n=410)

Myocardial Infarction: 8.5%  4.8%
P = 0.02
Cardiac Death: 2.6%  2.9%
P = 0.80
Ischemia-driven TLR: 7.9%  9.0%
P = 0.57
MACE: 16.6%  13.9%
P = 0.29
ST: 1.0%  3.2%
P = 0.02

BASE-ACS
TIDES-ACS

Co-primary (superiority) endpoint at 18 months

OPTIMAX-BAS (n=989)

SYNERGY (n=502)

%* Cumulative incidence of events (%)

Log-Rank P = 0.60

P = 0.001

Δ - 4.1%

* Cumulative incidence of events (%)
TIDES-ACS
MACE components at 18 months

Event rate (%)

- **OPTIMAX-BAS (989)**
- **SYNERGY-EES (502)**

<table>
<thead>
<tr>
<th>Event</th>
<th>OPTIMAX-BAS</th>
<th>SYNERGY-EES</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac death</td>
<td>0.6%</td>
<td>2.6%</td>
<td>0.002</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>2.2%</td>
<td>5.0%</td>
<td>0.004</td>
</tr>
<tr>
<td>Ischemia-driven TLR</td>
<td>5.8%</td>
<td>4.4%</td>
<td>0.26</td>
</tr>
<tr>
<td>MACE</td>
<td>7.2%</td>
<td>8.8%</td>
<td>0.28</td>
</tr>
</tbody>
</table>

HR (95% CI) = 1.12 (0.73-1.72)

Definite Stent Thrombosis: **1.0% for BAS** and **2.2% for EES** (p=0.15)
TiNOX stent, efficacy and safety

• As discussed in guidelines
• RCT:s, TiNOX vs. Taxus, Xience-V and Synergy

• Efficacy: prevention of restenosis and need for repeat revascularization ✓

• Safety:
  – Risk of MI ✓
  – Risk of stent thrombosis ✓
ACS patient

How to treat?
Future guidelines?

• TiNOX stents: several landmark RCTs with positive results in ACS patients

• A I recommendation

• In patients with NSTE-ACS and STEMI, TiNOX stent (Optimax) should be considered as the primary choice to get an effective and safe long-term result
Thank you