SCAAR: Lower late and very late stent thrombosis rates with new generation drug eluting stents compared to bare metal stents

Christoph Varenhorst, Giovanna Sarno, Göran Olivecrona, Per Tornvall, Johan Nilsson, Jörg Carlsson, Stefan James, Bo Lagerqvist

Christoph Varenhorst M.D Ph.D
Uppsala Clinical Research Center, Uppsala, Sweden
DECLARATION OF INTEREST

- Research contracts
- Member of Speakers' Bureau, Member of Advisory Board
Background and Aim

- Old-generation drug eluting coronary stents (o-DES) have despite being safe and effective been associated with an increased risk of late stent thrombosis (ST)\textsuperscript{1,2}

- New-generation DES (n-DES) have been developed with new alloys, delivery systems, improved and bioresorbable polymers and new antiproliferative agents

- Most of the n-DES have received CE mark approval based on results from non-inferiority trials compared with first generation drug-eluting stents\textsuperscript{3,4}. These trials have limited power to detect differences in stent thrombosis and rarely a follow-up beyond 1 year

- Our aim was to evaluate ST rates in these stent groups

---

Methodology

- Prospective observational cohort study using data from SCAAR (Swedish Coronary Angiography and Angioplasty Register), a part of the SWEDHEART registry

- We analyzed all implantations with BMS, o-DES (Cypher (Cordis), Taxus Liberté (Boston Scientific) and Endeavor (Medtronic)) and n-DES (Endeavor Resolute, Resolute Integrity (Medtronic Inc.), XienceV, Xience Prime/Xpedition (Abbott Laboratories), Promus, Promus Element/Plus (Boston Scientific Corporation), Nobori (Terumo), Biomatrix (Biosensors) and Orsiro (Biotronik)) between 1 January 2007 and 8 January 2014 (N= 177488)

- The primary objective was to evaluate occurrence of definite ST in BMS, n-DES and o-DES. The secondary objective was to evaluate the occurrence of definite ST in the different DES according to antiproliferative stent drug. The statistical analysis for ST was performed per stent (not per patient).

- To compensate for the non-randomized design of this study, multivariate adjustment was performed. The adjusted cumulative risk of ST was calculated using the Cox proportional hazards method.
### Background characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>BMS (n=84266)</th>
<th>o-DES (n=18577)</th>
<th>n-DES (n=74645)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women</td>
<td>22936 (27%)</td>
<td>4888 (26%)</td>
<td>18381 (25%)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>68.0 ± 11.3</td>
<td>66.0 ± 10.4</td>
<td>66.9 ± 10.6</td>
</tr>
</tbody>
</table>

**Indication for PCI**

<table>
<thead>
<tr>
<th>Indication</th>
<th>BMS</th>
<th>o-DES</th>
<th>n-DES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable coronary artery disease</td>
<td>15490 (18%)</td>
<td>6524 (35%)</td>
<td>21820 (29%)</td>
</tr>
<tr>
<td>Unstable coronary artery disease</td>
<td>38479 (46%)</td>
<td>9615 (52%)</td>
<td>37805 (51%)</td>
</tr>
<tr>
<td>ST-elevation myocardial infarction</td>
<td>27927 (33%)</td>
<td>2067 (11%)</td>
<td>13026 (18%)</td>
</tr>
</tbody>
</table>

**Medical history**

<table>
<thead>
<tr>
<th>Condition</th>
<th>BMS (n=84266)</th>
<th>o-DES (n=18577)</th>
<th>n-DES (n=74645)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>45236 (54%)</td>
<td>11537 (62%)</td>
<td>48454 (65%)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>13626 (16%)</td>
<td>5199 (28%)</td>
<td>17446 (23%)</td>
</tr>
<tr>
<td>Hypercholesterolemia</td>
<td>39109 (46%)</td>
<td>12262 (66%)</td>
<td>43912 (59%)</td>
</tr>
<tr>
<td>Current smoker</td>
<td>17885 (21%)</td>
<td>2738 (15%)</td>
<td>13282 (18%)</td>
</tr>
<tr>
<td>Previous MI</td>
<td>19873 (24%)</td>
<td>7178 (39%)</td>
<td>23444 (31%)</td>
</tr>
<tr>
<td>Previous CABG</td>
<td>7156 (9%)</td>
<td>2827 (15%)</td>
<td>8254 (11%)</td>
</tr>
</tbody>
</table>

BMS = bare metal stent, o-DES = old-generation drug eluting stent, n-DES = new-generation DES, PCI = percutaneous coronary intervention, MI = myocardial infarction, CABG = coronary artery bypass grafting
Cumulative rate of stent thrombosis in bare metal and drug eluting stents

The overall rate of ST was lower in DES compared with BMS up to one year. Beyond one year DES were associated with higher rate of ST than BMS.
Lower risk of ST in n-DES and o-DES compared with BMS up to one year

o-DES=old generation drug eluting stents, n-DES=new generation drug eluting stents, BMS=bare metal stents, RR=risk ratio
Cumulative risk of stent thrombosis in bare metal, new- and old generation stents: one year and onward

Similar low risk of ST in n-DES compared to BMS from one year and onward but higher risk in o-DES compared to BMS

n-DES vs BMS: adjusted RR 1.17 (0.88-1.56), p=ns
n-DES vs BMS: unadjusted RR 1.14 (0.91-1.42), p=ns

o-DES vs BMS: adjusted RR 1.81 (1.44-2.28), p<0.001
o-DES vs BMS: unadjusted RR 2.22 (1.84-2.67), p<0.001
Cumulative risk of stent thrombosis in bare metal stents and DES with different stent drugs

All stent drugs were associated with lower ST rates up to one year compared to BMS. From one year and onward the comparison with BMS was only significant for paclitaxel (RR: 1.54 (1.14-2.08)) and sirolimus (RR: 2.00 (1.41-2.83))

DES=drug eluting stent, ST=stent thrombosis, BMS=bare metal stent, RR=risk ratio
Conclusions

- In a large cohort of unselected consecutive patients treated with coronary stents at all interventional centers in Sweden, new generation DES were associated lower ST rates during the first year after implantation.

- Importantly, in contrast to old generation DES, new generation DES were associated with as low rates of very late ST (> 1 year) as BMS. After one year, the possible confounding effect of different dual antiplatelet treatment strategies, different indications for the procedure and procedural success is likely smaller.

- The lower risk of ST with new generation DES compared to old generation DES, seemed to be maintained during the follow-up period of up to 5 years.

- This non-randomized comparison between the stent types was adjusted for all available confounders but there is always a possibility of bias because of unknown confounders. Nonetheless, the reliability of our results are strengthened by a complete angiographic long-term follow up, registry source-data verification and the use of definite, angiographically proven ST as only endpoint measure.
Backup Slide