TAVR y Enfermedad Coronaria

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CAD and AS – Similar Pathological Processes

<table>
<thead>
<tr>
<th>Aortic Stenosis</th>
<th>Atherosclerosis</th>
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<tbody>
<tr>
<td><strong>Initiating event</strong></td>
<td>Increased mechanical stress and reduced shear stress causing endothelial damage</td>
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<tr>
<td><strong>Predominant cell types</strong></td>
<td>Increased mechanical stress and reduced shear stress causing endothelial damage</td>
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<tr>
<td>Macrophages and T helper cells</td>
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<tr>
<td>Valve interstitial cells</td>
<td>Foam cells</td>
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<tr>
<td>Myofibroblasts</td>
<td>Vascular smooth muscle cells</td>
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<td>Osteoblasts</td>
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<tr>
<td><strong>Early pathology</strong></td>
<td>Oxidized lipid deposition, inflammation</td>
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<tr>
<td>Oxidized lipid deposition, inflammation</td>
<td>Oxidized lipid deposition, inflammation, foam cells</td>
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<tr>
<td><strong>Later pathology</strong></td>
<td>Lipid deposition and pools, inflammation, and calcification</td>
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<tr>
<td>Calcification and fibrosis predominate</td>
<td>Neovascularization and hemorrhage</td>
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<tr>
<td><strong>Disease progression</strong></td>
<td>Lipid deposition and pools, inflammation, plaque rupture, and thrombosis</td>
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<td>Fibrosis, calcification, and hemorrhage</td>
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<tr>
<td><strong>Mechanism of adverse events</strong></td>
<td>Plaque rupture due to lipid-rich pool, inflammatory infiltrate, and thin fibrous cap</td>
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<td>Progressive valve rigidity due to calcification and fibrosis</td>
<td>Intravascular thrombosis</td>
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<td>Decompensation of the hypertrophic response</td>
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CAD in TAVR Patients

- CoreValve US Pivotal Trial ER (n=489): 81.8%
- CoreValve US Pivotal Trial HR TAVR (n=390): 75.4%
- PARTNER A TAVR (n=348): 74.9%
- PARTNER B TAVR (n=179): 67.6%
- PARTNER IIB Sapien (n=276): 67.4%
- PARTNER IIB Sapien XT (n=284): 65.5%
- ADVANCE (n=1015): 57.6%
- Italian Registry (n=663): 48.3%
- FRANCE 2 (n=3195): 47.9%
- UK Registry (n=870): 47.6%
- SOURCE XT (n=2688): 44.3%
CAD and TAVR

• Should we intervene before?
  ▪ Does CAD impact outcomes of TAVR?
  ▪ How safe is it to perform PCI in patients with AS?
  ▪ What stents and how long interval between PCI and TAVR?
  ▪ How to manage DAP?

• Should we intervene after?
  ▪ Only if patients symptomatic after AVR?
  ▪ Technical challenges

• Never or Simultaneous
Survival of Patients after TAVR

N = 171, TF = 136, TA = 35

n = 87
n = 84
## CAD + TAVR

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Dewey (N=171)</td>
<td>CAD ↑ 30 day mortality OR 10.1 Overall mortality OR 20.3</td>
</tr>
<tr>
<td>Massen (N=136)</td>
<td>CAD no increased 30 day or 1 year mortality</td>
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<tr>
<td>Gautler (N=145)</td>
<td>CAD no increased 30 day or 1 year mortality</td>
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<tr>
<td>Wenaweser (N=256)</td>
<td>CAD no increased 30 day mortality with TAVR alone vs PCI + TAVR</td>
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<tr>
<td>Khawaja (N=164)</td>
<td>CAD ↑ 30 day and 12 month mortality OR 2.92</td>
</tr>
<tr>
<td>USSIA (N=659)</td>
<td>CAD no increased 1 year mortality</td>
</tr>
<tr>
<td>Wender (N=2,307)</td>
<td>CAD no increased risk with and without prior CABG</td>
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DMJS (Duke Myocardial Jeopardy Score) was used to “quantify” myocardium at risk

- TF = 93, TA = 46
- N = 73 (54%) with DMNJ = 0

### Table

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<tr>
<th>Overall population</th>
<th>Group A (DMJS 0, no CAD)</th>
<th>Group B (DMJS 0, CAD)</th>
<th>Group C (DMJS 2)</th>
<th>Group D (DMJS 4)</th>
<th>Group E (DMJS 6-12)</th>
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<tbody>
<tr>
<td>n = 136</td>
<td>n = 32</td>
<td>n = 41</td>
<td>n = 28</td>
<td>n = 18</td>
<td>n = 17</td>
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**Graph:**

- N = 15
- Before PCI
- After PCI
CAD and TAVR: 1 Year Mortality

CAD and TAVR: Survival Curves

Study groups

- Duke Jeopardy 0 (no CAD) 18.8%
- Duke Jeopardy 0 (CAD) 28.8%
- Duke Jeopardy 2 35.7%
- Duke Jeopardy 4 11.1%
- Duke Jeopardy >4 29.4%

Log-rank p=0.63

All cause mortality at one year
Aortic Stenosis and CAD

- Non-randomized single-center experience
- 243 high-risk patients with AS and CAD
  - STS score >10%
  - EuroScore >15%
- Group 1: SAVR + CABG (N=184)
- Group 2: PCI then TAVR within 12 months (N=59)
- Propensity score to assess 30-day mortality
Aortic Stenosis and CAD

• Group 2:
  – Older 80 vs 75 years
  – More PVD 42.4% vs 27.1%
  – More 1 VD 55.9% vs 34.8%
  – Higher STS score 16.7 vs 13.1
• BMS – 69.5%
• DES – 30.5%
Kaplan-Meier Survival Curves

- PCI within 12 mos before TA or TF TAVI

- SAVR with CABG

Log rank P=0.191

Conclusions: The present study demonstrates that transcatheter aortic valve implantation in combination with prior percutaneous coronary intervention within 12 months produces similar results in a propensity score matched high-risk patient population.
Complete Revascularization Is Not a Prerequisite for Success in Current Transcatheter Aortic Valve Implantation Practice

Nicolas M. Van Mieghem, MD,* Robert M. van der Boon, MSc,* Elhamula Faqiri, MSc,* Roberto Diletti, MD,* Carl Schultz, MD, PhD,* Robert-Jan van Geuns, MD, PhD,* Patrick W. Serruys, MD, PhD,* Arie-Pieter Kappetein, MD, PhD,† Ron T. van Domburg, PhD,* Peter P. de Jaegere, MD, PhD*

Rotterdam, the Netherlands

Objectives This study sought to assess in patients undergoing transcatheter aortic valve implantation (TAVI), the prevalence and impact of incomplete coronary revascularization defined as >50% coronary artery or graft diameter stenosis on visual assessment of the coronary angiogram.

Background TAVI is an established treatment option in elderly patients with aortic stenosis (AS) and a (very) high operative risk. Coronary artery disease (CAD) is often associated with AS.

Methods A single-center cohort of consecutive patients undergoing TAVI between November 2005 and June 2012 was evaluated for the presence of significant CAD. The decision to revascularize and pursue complete revascularization was made by heart team consensus.

Results A total of 263 consecutive patients with a mean age of 80 ± 7 years and 51% male underwent TAVI with a median follow-up duration of 16 months (interquartile range: 4.2 to 28.1 months). Significant CAD with myocardium at risk was present in 124 patients (47%), 44 of whom had a previous coronary artery bypass grafting (CABG), and the median SYNTAX score in the 81 patients without previous CABG was 9.00 (2.38 to 15.63). Staged percutaneous coronary intervention (PCI) was planned in 19 (15%) and concomitant PCI with TAVI in 20 (16%). The median post-procedural residual SYNTAX score of patients without prior CABG was 5.00 (0.13 to 9.88). Overall, 99 patients (37%) (61 with no CABG and 38 CABG patients) had incomplete revascularization after TAVI. Revascularization status did not affect clinical endpoints. Kaplan-Meier survival curves for patients with and without complete revascularization demonstrated a 1-year mortality of 79.9% versus 77.4% (p = 0.85), respectively.

Conclusions In an elderly patient population undergoing TAVI for severe AS, a judicious revascularization strategy selection by a dedicated heart team can generate favorable mid-term outcome obviating the need for complete coronary revascularization. (J Am Coll Cardiol Intv 2013;6:867–75) © 2013 by the American College of Cardiology Foundation
Role of Complete Revascularization

- Single center experience of TAVR
- 263 consecutive patients
  - 47% (124) had CAD
- PCI undertaken in 39 patients
  - Staged in 19
  - Concomitant in 20
- Assessed CR on outcome

Kaplan-Meier Survival Curves

Post-operative Status:
- Incomplete Revascularization
- Complete Revascularization

% Survival

p-value = 0.85 by Log-Rank Test

No. at Risk
Revascularization Status

Complete: 164, 141, 125, 106, 93
Incomplete: 99, 83, 73, 60, 54

Residual SYNTAX ≥ 8: 30, 25, 23, 18, 17
Residual SYNTAX < 8: 50, 40, 33, 31, 26

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CAD Severity and Outcomes after TAVR

N=445, Mean Age 82.5±5.8
Baseline CAD Syntax Score 16.5±12.5

Stefanini GG et al. EHJ 2014;35:2530–2540
CAD Severity and Outcomes after TAVR

48.4% underwent PCI before TVR

SS >22 associated with increased risk of the primary endpoint without reaching statistical significance (HR: 1.68, 95% CI: 0.94–3.02, P = 0.079).

Correlation between the baseline and residual SYNTAX-score

Stefanini GG et al. EHJ 2014;35:2530–2540
## Timing of PCI and TAVI

<table>
<thead>
<tr>
<th>PCI Prior to TAVI</th>
<th>PCI Combined with TAVI</th>
<th>PCI After TAVI</th>
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<tbody>
<tr>
<td>Pro</td>
<td>Pro</td>
<td>Pro</td>
</tr>
<tr>
<td>Con</td>
<td>Con</td>
<td>Con</td>
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### PCI Prior to TAVI
- **Pro**
  - Simplified coronary access with no prosthetic valve in place
  - Less risk of hemodynamic instability and ischemia during TAVI
  - Minimize contrast load by giving it at 2 separate times

- **Con**
  - DAPT required after PCI may impact post-TAVI bleeding
  - Risks of performing PCI in the presence of severe AS

### PCI Combined with TAVI
- **Pro**
  - Decreases the risk of mortality while waiting for TAVR
  - Reduction of vascular complications by needing one access site
  - Less risk of hemodynamic instability and ischemia during TAVI

- **Con**
  - Increased dye load (contrast nephropathy), longer procedure time

### PCI After TAVI
- **Pro**
  - Treating severe AS first may improve myocardial perfusion, decreasing need for PCI

- **Con**
  - Potential access issues, valve struts interfering with coronary cannulation
  - Catheter manipulation could move the valve
  - Higher risk of hemodynamic instability and ischemia during TAVI
Staged or Combined PCI with TAVR

- Abdel-Wahab et al: PCI before TAVR no associated with worse outcomes (2%)
- Pasic et al: Combined TAVR+PCI safe and feasible (4.3%)
- Wenaweser et al: Staged or concomitant PCI is safe in TAVR, P=0.24 (11.1%)
- Conradi et al: Staged or concomitant PCI and TAVR feasible. Higher risk of AKI with combined approach (14.3%)

30 Day Mortality (%)

(n=125) (n=419) (n=256) (n=179)

Significant CAD is present in 40% to 75% of patients undergoing TAVR. The impact of CAD on outcomes after TAVR remains understudied. Based on existing data, not all patients require revascularization before TAVR. Percutaneous coronary intervention (PCI) should be considered for severely stenotic lesions in proximal coronaries that subtend a large area of myocardium at risk. Ongoing studies randomizing patients to surgical or percutaneous management strategies for severe AS will help provide valuable data regarding the impact of CAD on TAR outcomes, the role of PCI and its timing in relation to TAVR.
Cases
- 254 patients with severe AS who underwent PCI between Jan 1998 and Dec 2008 for any indication
- Severe AS
  - AVA <1.0 cm²
  - Mean gradient > 40 mm Hg
  - Jet velocity > 4.0 m/s.

Controls
- 508 patients without AS who underwent PCI, propensity matching (1:2).

Primary end point: 30-day mortality after PCI.
Secondary end points: procedural complications including contrast nephropathy, periprocedural MI, procedural death, hemodynamic compromise during PCI.
30 day Survival

PCI can be performed in patients with severe symptomatic AS and CAD without an increased risk of short-term mortality compared with propensity-matched patients without AS.

Patients with ejection fraction 30% and STS score 10% are at a highest risk of 30-day mortality after PCI.
Consideration for Stents

• DES versus BMS
  – BMS in patients with AF, large focal lesions
  – DES in most other patients

• Stenting of LMT or ostial RCA
  – Precise placement of stent in ostium
  – ? Protection of stent during procedure

• Duration between PCI and TAVR
  – Currently 1 month for BMS and 6 month for DES (?)
DAPT and TAVR

• No consensus for TA-TAVR cases
• Risk for emergent conversion (small)
• Combination with anticoagulation in patients with AF
Individualized Management

• Can TAVR be performed safely in the setting of the patient’s coronary anatomy?

• And will the extent of CAD impact the patient’s symptoms as well as long-term survival?
Conclusions

• CAD is commonly encountered in AS patients
• Presence or absence of CAD and history of revascularization do not correlate with worse procedural outcome with TAVR
• Data on impact of CAD on long term outcome after TAVR remains understudied
• Patients should be treated with TAVR sooner rather than later after PCI
• PCI may be safely performed in patients with AS
• Choice of stents and DAPT regimen should be individualized