### Complications of TAVI

Depending on valve model, approach, and definition used (VARC?)

<table>
<thead>
<tr>
<th>Complication</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vascular complications</td>
<td>3 to 22%</td>
</tr>
<tr>
<td>Stroke</td>
<td>0 to 7%</td>
</tr>
<tr>
<td>AMI</td>
<td>&lt;2%</td>
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<tr>
<td>Tamponade</td>
<td>&lt;2.5%</td>
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<tr>
<td>Bleeding</td>
<td>3 to 25%</td>
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<tr>
<td>Paravalvular AR &gt; 2</td>
<td>&lt;4%</td>
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<tr>
<td>PM</td>
<td>3 to 30%</td>
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<tr>
<td>THV embolization</td>
<td>1 to 2%</td>
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<tr>
<td>Aortic rupture/dissection</td>
<td>&lt;2%</td>
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</tbody>
</table>

- Most complications can be avoided by a **careful pre-procedural screening** and can be **prevented during the procedural phase** (learning curve)
- Early detection of complications during the procedure **request an urgent and adapted management**
Prevention of complications

1) Screening phase
Patient selection

*Clinical indications & Relative contra-indications*

- Life expectancy compromised (comorbidities)
- Low LVEF with no contractility reserve
- Bulging septum intraventricular gradient
- Supra-valvular calcified stenosis
- Severely calcified bicuspid valve
- Low LM insertion and no dilated sinus
- Bulky calcified leaflets
- Specific contra-indications to TA approach

All bad candidates for AVR are not good candidates for TAVI
Prevention of THV embolization, paravalvular AR or aortic rupture

Valve sizing

SAPIEN and SAPIEN XT

<table>
<thead>
<tr>
<th>Annulus diameter</th>
<th>16mm</th>
<th>17mm</th>
<th>18mm</th>
<th>19mm</th>
<th>20mm</th>
<th>21mm</th>
<th>22mm</th>
<th>23mm</th>
<th>24mm</th>
<th>25mm</th>
<th>26mm</th>
<th>27mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAPIEN</td>
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</table>

- 18-21mm       THV 23mm
- 21-25mm       THV 26mm
- > 25mm        THV 29mm

23 or 26mm ?

26 or 29mm ?
Any progress in annulus sizing?

No gold standard technique

Severity and distribution of calcium on the annulus circumference are not taken into account.
Dynamic sizing by aortography per-BAV

Aortogram during **23mm** balloon inflation

Balloon size = annulus size, no AR

*23mm THV confirmed*

Balloon size < annulus size

AR +

*26mm THV confirmed*
Prevention of THV embolization paravalvular AR or aortic rupture

Valve anatomy calcium distribution, calcific nodules: TTE, TEE, CT

Bulky leaflets may be a contra-indication to TAVI

Tricuspid or bicuspid valve?
Prevention of coronary occlusion

CT-Scan

- Distance Ostium-Annulus
- Dilated or not dilated sinus?

Ostia-LM should be > 10mm

RCA

LM
Prevention of coronary occlusion

Aortogram during pre-dilatation
#### BASIC GUIDELINES NOVAFLEX

**Minimal arterial sizes**

<table>
<thead>
<tr>
<th>Calcifications</th>
<th>18F</th>
<th>19F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 0</td>
<td>6mm</td>
<td>6.5mm</td>
</tr>
<tr>
<td>Grade 1</td>
<td>6.5mm</td>
<td>7mm</td>
</tr>
<tr>
<td>Grade 2</td>
<td>7mm</td>
<td>7.5mm</td>
</tr>
<tr>
<td>Grade 3 (circonf)</td>
<td>7.5mm</td>
<td>8mm</td>
</tr>
</tbody>
</table>

**Prevention of vascular complications**

- Use non-contrast imaging to better assess calcification
- Measure the actual internal vessel diameters

**CT Scan**

Minimal internal diameters
Prevention of complications

2) Per-procedure
Prevention of THV migration

Mid-part of the RV posterior wall

200 or 220 bpm, 180 bpm acceptable
150 bpm in case of severe LV depression

Loss of Capture

2/1 Capture

RVP
Prevention of THV migration

Aortography: reference view

Do aortogram during RVP

50 to 60% in LV

LAO 10° Cranial 20°

LAO 10° Caudal 10°
Valve delivery

• Sheath at the level of the double marker on novaflex (stability)
• Holding the balloon fully inflated 5 sec decreases recoil and paravalvular AR
• The full quantity of contrast must be administered
• Final valve size is volume dependent!
Management of Complications

Vascular complications

- Never remove the sheath without contra-lateral contrast injection

- Have all type/sizes of occlusion balloons, covered and non-covered stent available

- Consider femoral repair

Critical to be prepared to deal with femoro-iliac complications
Iliac/femoral rupture after sheath removal (same patient)
COVERED STENT
Iliac/femoral rupture after sheath removal (Rouen)

Super Arrow-Flex sheath 10F from LFA

Vascular Stent Graft Fluency Plus 13.5 / 40m (BARD)
Complications

Rupture of the annulus

- Higher risk in case of porcelain aorta and angulated aorta

- Almost always related to balloon or valve oversizing:

*Prefer smaller size in heavily calcific valve, porcelain aorta, extremely old patients*
Rupture of the annulus by valve oversizing

Annulus 20.5mm on TTE: 25 mm THV, 90y-old woman

Rupture of the annulus at the low border of the stent
+ Pericardial tamponade
Rupture of the annulus
Annulus 21.5 on TTE, 25 mm THV
90y-old woman: VALVE-IN-VALVE
Rupture of the annulus
Annulus 21.5 on TTE, 25 mm THV
90y-old woman
Complications

Valve embolization

TECHNICAL ERROR

~ THV positioned too high
~ Valve not inflated fully
~ Pacing stopped prematurely or lack of capture
~ Under THV sizing or annulus too large
~ THV positioned too ventricular

BULGING SEPTUM
Explanation: loss of capture during RVP
THV Deployed In Distal Aorta
Bulging septum: Transapical case
Bulging septum: Transapical case
Bulging septum: Transapical case
- Aortogram post reveals severe AI secondary to valve being too low
- Valve embolized into LV
Complications

Valve malpositioning
Valve in Valve for Malpositioning

- During deployment, valve migrated cranially
- Valve is clearly above annulus and not in stable position
Valve in Valve for Malpositioning

- Second valve positioned inferiorly and deployed to secure the first valve and correct paravalvular leak
Valve in Valve for malpositioning
Complications

Left main occlusion
Preventive wiring of the LAD for urgent post-THV delivery stenting has been done but LM stenting can be successfully achieved in only 50% of the cases.

Never hesitate to decline TAVI!
Conclusions

- In spite of optimal training and proctoring programs, the learning curve for TF-TVAI is permanent, on a case after case basis.

- The success and safety of the procedures rely on the respect of protocols and recommendations. 

  *Each step is a succession of “important details”. Each omission may be life threatening.*

- An optimal partnership within the team is crucial for both patient selection and procedure.