My best and worst TAVR case of the year.

The single most important lesson learned
Evolute R Valve design

Self-Expanding Nitinol Frame
Supra Annular Valve Design
Porcine Pericardial Tissue
**Evolute R Valve design**

- **Accurate Positioning**: 1:1 response with the ability to recapture and reposition the valve.
- **More Consistent Radial Force**:
- **Atraumatic Inflow**: Redesigned inflow to reduce force applied by the inflow tip.
## Evolute R 34mm

### Patient Evaluation Criteria

<table>
<thead>
<tr>
<th>Valve Size Selection</th>
<th>CoreValve® Evolut® R</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
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</table>

<table>
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<tr>
<th>Size</th>
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<tbody>
<tr>
<td>Annulus Diameter</td>
<td>18-20 mm</td>
<td>20-23 mm</td>
<td>23-26 mm</td>
<td>26-30 mm</td>
</tr>
<tr>
<td>Annulus Perimeter†</td>
<td>56.5-62.8 mm</td>
<td>62.8-72.3 mm</td>
<td>72.3-81.7 mm</td>
<td>81.7-94.2 mm</td>
</tr>
<tr>
<td>Sinus of Valsalva Diameter (Mean)</td>
<td>≥ 25 mm</td>
<td>≥ 27 mm</td>
<td>≥ 29 mm</td>
<td>≥ 31 mm</td>
</tr>
<tr>
<td>Sinus of Valsalva Height (Mean)</td>
<td>≥ 15 mm</td>
<td>≥ 15 mm</td>
<td>≥ 15 mm</td>
<td>≥ 16 mm</td>
</tr>
</tbody>
</table>

†Annulus Perimeter = Annulus Diameter × π
Bad news
Case presentation

45 yrs old male suffering from shortness of breath (NYHA II-III) exacerbating the last year.

Past medical history:

• Partial left pneumonectomy due to thymoma and radiotherapy (2003)

• Myasthenia Gravis

• CAD (PCI LM and LAD 2006 and 2015)

• Familiar Hyperlipidemia

Physical examination and labs:

• audible systolic murmur
Case presentation

TTE:

Severe Aortic stenosis
AoV: MeanGrad=43mmHg, Peak Grad=80mmHg, Vmax=4.5m/s, AVA=0.85cm²
EF=55%

Chest X-Ray:
Case presentation

• Heart Team ➔ TAVI

Inoperable patient due to...

➢ Myasthenia Gravis

➢ Left pneumonectomy
Case presentation

Screening coronary angiography
Case presentation

Preprocedural MSCT screening

**MEDTRONIC ANALYSIS**

- Max Ascending Aorta Diameter (mm): 34.0
- Sinotubular Junction Diameter (mm): 28.6
  - Min: 31.2
  - Max: 31.2
- ANNUlus
  - Diameter (mm): 23.4
    - Min: 31.8
    - Max: 27.6
    - Mean: 27.6
  - Perimeter (mm): 87.4
  - Derived Diameter: 27.3
- Area: 584.6 mm²
- Derived Diameter

**Sinus of Valsalva Diameter (mm)**
- LCC: 34.4
- RCC: 31.9
- NCC: 32.8

**Sinus of Valsalva Height (mm)**
- LCC: 22.8
- RCC: 24.9
- NCC: 24.0

**Coronary Ostia Height (mm)**
- Left: 15.7
- Right: 19.7

**LVOT Diameter (mm)**
- Min: 23.3
- Max: 37.0

**Subclavian Min Diameter (mm)**

Calcium: Mild □ Moderate □ Severe □

Please review images for direct aortic evaluation.
Evolut R Expanded Size Range

Evolut R 23 mm, 26 mm, 29 mm

CE and FDA Approved

18–20 mm
20–23 mm
23–26 mm

Patient Annulus Diameter Range (mm)

26–30 mm

Evolut R 34 mm
FDA Approved

First in Greece Evolute R 34mm

Evolut R 1 Year TCT2016
Case presentation

Procedure - Aortography and BAV
Case presentation

Procedure - 1st implantation attempt
Case presentation

Procedure - 1st implantation attempt and pop-out
Case presentation

Recapture, 2\textsuperscript{nd} implantation attempt and pop-out
Case presentation

3rd implantation attempt under rapid ventricular pacing (180bpm)
Case presentation

Final result
Most important lesson

- TAVI implantations in aortic valves with large annular dimensions may predispose to malpositioning even when we use the highest size bioprosthesis.

- Absence of calcifications and extraventricular systole during deployment contribute to ‘pop out’

- Rapid ventricular pacing (up to 180 beats per min with accompanied pressure drop of less than 50 mm Hg), may be applied temporarily during valve release in order to avoid valve displacement
Case presentation

78 yrs old female suffering from shortness of breath gradually worsening the last 12 months (NYHA III)

Medical History:

- Aortic Valve Replacement (8 years ago)
  Bioprosthetic Edwards Magna Ease 21 mm

- Hypertension
Case presentation

Physical examination:

• Bilateral edema of lower limbs
• Systolic murmur

Labs:

• Without abnormal findings
Case presentation

TTE revealed:

- Stenotic degeneration of bioprosthetic aortic valve
  Meaning Gradient: $42 \text{mmHg}$ (early post surgery Meaning Gradient: $20 \text{mmHg}$)

- Left ventricular ejection fraction of 50-55%.

- Pulmonary artery systolic pressure of 60-65mmHg.
Logistic Euro SCORE = 30.70%

Heart Team → TAVI
**Pre interventional screening (MSCT)**

Adequate femoral diameter
Pre interventional concerns

✓ Type of valve selection

✓ Size selection

✓ Access site selection

✓ Coronary ostium protection (bioprosthetic valve)
Magna Ease Valve

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>ID</th>
<th>OD</th>
<th>Profile Height</th>
<th>Labeled Size</th>
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<tbody>
<tr>
<td>Magna Ease Valve</td>
<td>20</td>
<td>26</td>
<td>0.77</td>
<td>14</td>
</tr>
<tr>
<td>Magna Valve</td>
<td>20</td>
<td>26</td>
<td>0.77</td>
<td>15</td>
</tr>
<tr>
<td>PERIMOUNT Valve</td>
<td>20</td>
<td>28</td>
<td>0.71</td>
<td>15</td>
</tr>
<tr>
<td>Mosaic / Hancock II</td>
<td>18.5</td>
<td>27</td>
<td>0.69</td>
<td>15</td>
</tr>
<tr>
<td>Mosaic Ultra / Hancock II Ultra</td>
<td>18.5</td>
<td>26</td>
<td>0.71</td>
<td>15</td>
</tr>
<tr>
<td>Epic / SJM Biocor</td>
<td>19</td>
<td>25</td>
<td>0.76</td>
<td>14</td>
</tr>
<tr>
<td>Epic Supra / SJM Biocor Supra</td>
<td>21</td>
<td>28</td>
<td>0.75</td>
<td>15</td>
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</table>
Prosthetic valves assessment
Concerns regarding annulus dimensions

Initial 20mm internal diameter degenerated to 15mm!!!
Concerns regarding coronary protection

SINUS HEIGHT

LCC

RCC

NCC
Concerns regarding coronary protection

Stented design of Magna Ease
Which device to implant...???
## Device selection

**CoreValve** (Evolute-R)

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**Out of range annulus dimensions**
Device selection

**Edwards (Sapien)**

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<td>18-22 mm</td>
<td>21-25 mm</td>
<td>24-28 mm</td>
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<tr>
<td><strong>Native annulus area</strong></td>
<td>338-430 mm²</td>
<td>430-546 mm²</td>
<td>540-683 mm²</td>
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<tr>
<td><strong>Area-derived diameter</strong></td>
<td>20.7-23.4 mm</td>
<td>23.4-26.4 mm</td>
<td>26.2-29.5 mm</td>
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Out of range annulus dimensions
Device selection

Lotus (Boston)

Out of range annulus dimensions
CoreValve Evolute-R selected

- Increased experience
- Hourglass Shape
- Supra – annular design

![Diagram of CoreValve Evolute-R models](image)

- Evolut R 23 mm
- Evolut R 26 mm
- Evolut R 29 mm

- Outflow Diameter (Max): 34 mm, 32 mm, 34 mm
- Waist Diameter (Min): 20 mm, 22 mm, 23 mm
- Target Implant Diameter (3 mm): 23 mm, 26 mm, 29 mm

Frame Height (without paddles): 45 mm; Skirt Height: 13 mm
Case presentation

*Pre interventional coronary angiography*
Case presentation

Procedure
Case presentation

Procedure

1st implantation attempt
under ventricular pacing (100-110bpm)

Device dives into the LV with severe AR due to strait residual annulus
Case presentation

Procedure

2\textsuperscript{nd} implantation attempt

Device retrieved into the sheath and repositioned along annulus with the same ‘LV dive’ result
Case presentation

Procedure

✓ 3\textsuperscript{rd} Deployment applying continuous attraction force targeting high implantation and simultaneous control of coronary perfusion.
Case presentation

Final angiographic result

- No residual aortic regurgitation
- No coronary ostium obstruction
Algorithm for valve-in-valve TAVI

1. Severe aortic bioprosthetic stenosis
   - Cusp mobility
     - Normal
     - Impaired
       - Obtain information post-primary AVR
         - No impairment, already elevated pressure gradients after primary AVR
           - PPM likely
             - Conventional surgery
         - Impaired functional status, low primary gradient
           - VIV TAVI procedure
Most important lesson

✓ TAVI with Evolute R valve is feasible through excessively degenerated bioprostheses, even if true internal aortic bioprostheses dimensions are smaller from the recommended lower range.

✓ Excessive pre-interventional assessment is required.

✓ Post surgery Echo valve gradient are useful in estimations of valve stenosis mechanism.
Thank you!