3D Rotational Angiography Improves Assessment Of Coronary Arteries In Melody Valve Implantation: Introducing A Technique That May Improve Outcomes

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OBJECTIVE:

To evaluate the valve of 3DRA of the aortic root (3DRAA) in the assessment of Melody valve candidacy and to demonstrate that it may improve outcomes.
METHODS:

• Reviewed all patients who underwent cardiac catheterization for Melody valve implantation at Rady Children’s Hospital (May 2010 to June 2016)

• Those who underwent implantation with 3DRAA were compared to those implanted with out 3DRAA
TECH FOR 3DRAA

- Pulmonary angio → 3DRAA with simultaneous balloon sizing (Amplatzer sizing balloon) in the RVOT over a Lunderquest wire
- RV or Trans-esophageal pacing at 180-200/min with breath hold
- Aortogram with 16-18 cc/second for 6 seconds of a 60:40 contrast to saline mix
- Toshiba machine with rendering and post processing on a Vitrea Workstation
Total (121)

NO 3D (48)
- Not Eligible (5)
- Melody Eligible (43)

3DRAA (73)
- Not Eligible (18)
- Melody Eligible (55)

Turn down rate
No 3D
5/48 10%

Turn down rate
with 3D
18/73 24%
Total (121)

MELODY Not ELIGIBLE (18)
- Conduit (77)
- Prosthetic valve (21)
- RVOT Patch (23)

MELODY ELIGIBLE (103)
- Conduit (68)
- Prosthetic valve (21)
- RVOT Patch (14)
Melody Not Eligible (23)

Not Eligible
No 3D (5)

- CA compression (9)
- Ao root distortion (3)
- Too Large (9)
- Short MPA (2)

Not Eligible
with 3D (18)

- Not Eligible with 3D (18)
Melody Eligible (98)

MELODY ELIGIBLE
No 3D (43)

Complication
No 3D
8/43 19%

Fracture (5)
Endocarditis (2)
Pseudo Aneursm (1)
Pulm odema(1)

MELODY ELIGIBLE
with 3D (55)

Complication
with 3D
1/55 2%
CORONARY COMPRESSION?
DISTANCE TO CORONARY
CORONARY TOO CLOSE
WOULD YOU REPAIR ANOMALOUS LMCA FROM THE RIGHT WITHOUT VISIBLE COMPRESSION ON ANGIO?

1. Yes
2. No
Coronary Artery Compression Three Months After Transcatheter Pulmonary Valve Implantation

Payam Dehghani, MD, FRCPC, FACC, FSCAI, Greg Kraushaar, MD, FRCPC, and Dylan A. Taylor, MD, FRCPC, FACC, CHE

We report a case of a 29-year-old man who developed exercised-induced myocardial infarction 3 months post Melody valve implantation. We introduce the concept of ruling out dynamic coronary artery compression by simulating transcatheter pulmonary valve implant while increasing cardiac output and thus aortic dimensions in the catheterization laboratory. © 2014 Wiley Periodicals, Inc.
# Reports of Late Coronary Compression

## Table I. Reported Cases of Coronary Arterial Compression After Transcatheter Pulmonary Valve Deployment

<table>
<thead>
<tr>
<th>Reference</th>
<th>Congenital lesion and repair</th>
<th>Age (years)</th>
<th>Balloon simulation testing</th>
<th>Patient presentation</th>
<th>Time from TPV to presentation</th>
<th>Affected coronary artery</th>
<th>Intervention/findings</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eicken et al. [3]</td>
<td>TGA; Rastelli procedure</td>
<td>N/A</td>
<td>N/A</td>
<td>Cardiac arrest</td>
<td>4 hr</td>
<td>LMCA</td>
<td>Emergency surgery, direct CAC</td>
<td>Death</td>
</tr>
<tr>
<td>Kostolny et al. [6]</td>
<td>Dextrocardia, CCTGA, DORV, pulmonary stenosis, VSD; mustard procedure</td>
<td>9</td>
<td>NA</td>
<td>Cardiac arrest</td>
<td>Immediate</td>
<td>LMCA</td>
<td>Emergency surgery, direct CAC</td>
<td>Alive and well</td>
</tr>
<tr>
<td>Biermann et al. [7]</td>
<td>TGA; arterial switch procedure, RV to PA conduit</td>
<td>26</td>
<td>performed, felt to be safe</td>
<td>Acute coronary syndrome</td>
<td>4 days</td>
<td>LAD</td>
<td>Emergency surgery, direct CAC</td>
<td>Alive and well</td>
</tr>
<tr>
<td>Mauri et al. [8]</td>
<td>Bicuspid aortic valve/Ross procedure</td>
<td>14</td>
<td>performed, felt to be safe</td>
<td>Acute coronary syndrome</td>
<td>1 hr</td>
<td>LAD</td>
<td>Emergency surgery, tear of homograft with thrombus causing CAC</td>
<td>Alive and well</td>
</tr>
<tr>
<td>Divekar et al. [9]</td>
<td>Tetralogy of Fallot/</td>
<td>10</td>
<td>Not performed</td>
<td>Cardiac arrest</td>
<td>9 days</td>
<td>LMCA</td>
<td>Bail-out PCI</td>
<td>Alive and well</td>
</tr>
</tbody>
</table>

CAC, coronary artery compression; CCTGA, congenitally corrected transposition of the great arteries; DORV, double outlet right ventricle; Hr, hours; LAD, left anterior descending; LM, left main; yrs, years; N/A, not available; PCI, percutaneous coronary intervention; TGA, Transposition of the Great Arteries; TPV, trans-pulmonary valve.
CALCIUM IS OUR WORST ENEMY?
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CALCIIUM IS OUR WORST ENEMY!
HOW WOULD YOU PRE STENT A CALCIFIED STENOTIC CONDUIT?
WHAT IS SAFER WHEN DILATING A TIGHT COA?

1. Balloon dilate first, then stent

2. Balloon dilate with a bare metal stent in the lesion
HOW WOULD YOU PRE STENT A CALCIFIED STENOTIC CONDUIT?

1. Balloon dilate the conduit with a high pressure balloon at the size you want directly, then stent

2. Serial balloon dilation of the conduit with high pressure balloons until you reach the size you want, then stent

3. Stent the conduit first, then serial balloon dilate with high pressure balloon
HOW WOULD YOU PRE STENT A CALCIFIED STENOTIC CONDUIT?

1. Balloon dilate the conduit with a high pressure balloon at the size you want directly then stent

2. Serial balloon dilation of the conduit with high pressure balloons until you reach the size you want then stent

3. Stent the conduit first, then serial balloon dilate with high pressure balloon !!!!!!!! Are you crazy!!!!
TRADITIONAL:
CRACK THEN STENT!
OUR APPROACH: STENT THEN CRACK
DISTANCE TO CORONARY
STENT AND THEN CRACK!
STENT AND THEN CRACK

• Conduit tears are reported up to 1.4-2.7% of patients in other case series.*
• We believe that our approach maximizes the structural integrity of the conduit and minimizes the risk of major conduit tears/rupture
• 1/98 contained tear (no additional intervention needed)

AORTIC CUSP COMPRESSION!
AORTIC CUSP COMPRESSION!
AORTIC CUSP COMPRESSION!
AORTIC CUSP COMPRESSION!
WOULD YOU ABORT MELODY IMPLANTATION IF YOU HAVE CUSP FLATTENING WITHOUT CORONARY COMPRESSION?

1. Yes
2. No
STRUCTURAL HEART DISEASE

Aortic Root Distortion and Aortic Insufficiency During Balloon Angioplasty of the Right Ventricular Outflow Tract Prior to Transcatheter Pulmonary Valve Valve Replacement

ALEJANDRO J. TORRES, M.D.,1 DOFF B. MCELHINNEY, M.D.,2 BRET R. ANDERSON, M.D.,1 MARIE E. TURNER, M.D.,1 MATTHEW A. CRYSTAL, M.D.,1 DONNA M. TIMCHAK, M.D.,1 and JULIE A. VINCENT, M.D.1

• Aortography was performed in 18/43 pts
• Ao Distortion/A regurge noted in 6/18 (33%); (2 D-TGA, 2 TOF, 1 Truncus and 1 Ross).
• Procedure was aborted in the 2 who developed severe AD/AI.
• TPV was implanted in 3/4 patients with mild AD/AI.
Aortic Root Compression During Transcatheter Pulmonary Valve Replacement

Ian Lindsay,1,2 MD, Jamil Aboulhosn,1,2 MD, Morris Salem,3 MD, and Daniel Levi,1,2* MD

Catheterization and Cardiovascular Interventions 00:00–00 (2016)
• ARC occurred in 16/174 patients (9%) (mostly in native/TAP).
• 9/16 ARC isolated ARC, 5/16 had concomitant coronary artery compression.
• Two pts underwent successful TPVR despite ARC
• One pt required surgical valve explanation after TPVR caused severe ARC.
RESULTS?
• 98/121 were deemed eligible
• Turn down rate was higher in the 3DRAA group
  • 25% 3DRAA
  • 10% no 3DRAA
• 98/98 valve were successfully implanted
• Complication rate lower in the 3DRAA group
  • 2% 3DRAA
  • 18% no 3DRAA
• In the 55/98 cases that had 3DRAA
  • 1 contained tear (no additional intervention needed
  • 0 fractures
  • 0 endocarditis
CONCLUSION
CONCLUSION

• 3D Rotational angiography is a valuable tool for case selection among Melody Valve candidates
• May allow a higher procedural success and decreased risk of serious adverse events.
• 3D Rotational angiography allows stenting the conduit prior to dilation, which may prevent tears and possibly endocarditis.
• Further larger studies are needed to confirm our findings.