Echocardiographic assessment of repaired Tetralogy of Fallot

Multimodality Imaging in ACHD and PH

Annemien van den Bosch
Erasmus MC, Thoraxcenter, Rotterdam, The Netherlands
Case: 46 year old man

**History**

Tetralogy of Fallot
Waterston shunt
1978 repair with transannular patch and VSD closure

For the first time, after 20 years

No complains, good exercise capacity
He cycles every day 10 km.

**Medication** none
Systemic-to-pulmonary shunts

- Strategies and timing of surgical repair have evolved over time

Courtesy dr. Hans Hamer
Attention for....

Pulmonary artery branch stenosis

1. Supravalvular
2. Proximal stenosis
3. Tubular hypoplasia
4. Distal stenosis

Courtesy dr. Hans Hamer
Correction with transannular patch

- Residual VSD
Late Complications

- PV regurgitation and/or stenosis
- RVOT aneurysm
- Pulmonary branch stenosis
# Long term effects in ToF

<table>
<thead>
<tr>
<th>Right heart</th>
<th>Left heart</th>
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<td>Right ventricular hypertrophy</td>
<td>Aortic regurgitation</td>
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<td>Right ventricular dilatation</td>
<td>Residual VSD</td>
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<tr>
<td>Tricuspid valve regurgitation</td>
<td>Influence of dilated RV</td>
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<td>Right atrial dilatation</td>
<td>RV and LV dysfunction</td>
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Key points to include in echo report

- Pulmonary valve function
- RV size, systolic and diastolic function
- VSD patch integrity
- Aortic root dilatation
- Estimate of pulmonary pressure
- Assess for PA branch stenosis
Start our echo investigation

RA pressure 5mmHg
Parasternal long-axis

- Flattening of IVS in diastole
RV dilatation and function

RV function
- TAPSE 17 mm
- TDI 7.6
- RV FAC 40%
Severe pulmonary regurgitation

PSSAX
### Hoe meet ik ernst van PI?

**Grading of Pulmonary Regurgitation Severity**

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<th>Parameter</th>
<th>Mild</th>
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<td>Jet size by color Doppler</td>
<td>Thin (usually &lt; 10 mm in length) with a narrow origin</td>
<td>Intermediate</td>
<td>Usually large, with a wide origin; may be brief in duration</td>
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<td>Jet density and deceleration rate CW³</td>
<td>Soft; slow deceleration</td>
<td>Dense; variable deceleration</td>
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<td>Pulmonic systolic flow compared to systemic flow - PW</td>
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1. Unless there are other reasons for RV enlargement.  
2. Exception: acute PR.  
3. Steep deceleration is not specific for severe PR. CW = continuous wave Doppler; PR = pulmonic regurgitation; PW = pulsed wave Doppler; RV = right ventricle.
# How to assess severity of PR?

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![Echocardiogram images](image1.png) ![Echocardiogram images](image2.png)
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Grade of PR: echo vs CMR

Mild PR | Moderate PR | Severe PR

Easy and reliable parameters

PHT

Backflow in pulmonary branches

Van Berendoncks A et al Congenital Heart Dis, minor revision 2019
Which view do I need?

Pulmonary artery branches

Supra sternal notch – long axis

Textbook Snider; 1990
Which view do I need?

Pulmonary artery branches

Supra sternal notch – long axis

- Left PA size
- PA branch stenosis
- Holo diastolic backflow

Textbook Snider; 1990
Which view do I need?

Pulmonary artery branches

Supra sternale notch – short axis

- Right PA size
- PA branch stenosis
- Holo diastolic backflow
48 year old man, repaired tetralogy of Fallot

- No symptoms

**Echocardiogram (main findings)**

- Severe PR
- No PV stenosis or PA branch stenosis
- Severely dilated RV with moderate RV function
- Moderate TR, no elevated RV pressures
- Normal LV function
- Small residual VSD
Conclusion

MRI:
- RVED volume 466ml, 210 ml/m2. RV ejection fraction 38%
- Severe PR (40%)
- Moderate TR (31%)

Heartteam:
Indication for pulmonary valve replacement and tricuspid valve plastic to prevent further deterioration of RV function

04-03-2018: Pulmonary homograft implantation and repair of the tricuspid valve
Post op echo: 07-03-2018

Vmax 2.6m/s
PG 28mmHg
Mean 16mmHg
1\textsuperscript{e} Postoperative echo: 07-03-2016

Vmax 3.2m/s
PG 40mmHg
2 months after operation

- Distal stenosis of pulmonary homograft
- Severe stenose Vmax 4.0 m/s

23-05-18 re-operation PV homograft
Follow-up echo: 08-07-18

PW: RVOT

CW: Pulmonary Homograft
Follow-up echo: 08-07-16

Vmax TR 4.1m/s
PG 67mmHg

RA pressure = 10mmHg

RV pressure = 77mmHg
Follow-up echo: 11-07-16

Follow-up echo: 08-07-16

Follow-up echo: 11-07-16

Vmax PA - 4.4m/s
6 weeks after 2nd operation
Follow-up echo: 14-07-16

Severe stenosis of distal PV homograft
External compression (scar tissue)
Fast progression

Vmax TR 4.5m/s
PG 81mmHg
RA pressure = 10mmHg
RV pressure = 91mmHg
Follow-up echo: 25-08-16

After Melody implantation
Summary

- Assessment of physiology and hemodynamic parameters that influence outcome
  - RV and LV function, PR and PS, TR

- Assessment of anatomic criteria of unknown significance on outcome
  - RVOT aneurysm, DCRV, aortic dilatation and AR

- Assessment of suitability of RVOT morphology for PPVI
Thank you for your attention