

Seven-year clinical and mechanical follow-up of a Tetralogy of Fallot patient with severe pulmonary regurgitation

Minderhoud, Savine C.S.; Akyildiz, Ali C.; Hirsch, Alexander; Helbing, Willem A.

DOI

[10.1093/ehjci/jeab167](https://doi.org/10.1093/ehjci/jeab167)

Publication date

2022

Document Version

Final published version

Published in

European heart journal. Cardiovascular Imaging

Citation (APA)

Minderhoud, S. C. S., Akyildiz, A. C., Hirsch, A., & Helbing, W. A. (2022). Seven-year clinical and mechanical follow-up of a Tetralogy of Fallot patient with severe pulmonary regurgitation. *European heart journal. Cardiovascular Imaging*, 23(5), E233-E233. <https://doi.org/10.1093/ehjci/jeab167>

Important note

To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy


Please contact us and provide details if you believe this document breaches copyrights.
We will remove access to the work immediately and investigate your claim.

IMAGE FOCUS

doi:10.1093/ehjci/jeab167

Online publish-ahead-of-print 30 August 2021

Seven-year clinical and mechanical follow-up of a Tetralogy of Fallot patient with severe pulmonary regurgitation

Savine C.S. Minderhoud ^{1,2*}, Ali C. Akyildiz^{1,3}, Alexander Hirsch^{1,2}, and Willem A. Helbing^{2,4,5}

¹Department of Cardiology, Erasmus MC, University Medical Center Rotterdam, Doctor Molewaterplein 40, 3015 GD, Rotterdam, The Netherlands; ²Department of Radiology and Nuclear Medicine, Erasmus MC, University Medical Center Rotterdam, Doctor Molewaterplein 40, 3015 GD, Rotterdam, The Netherlands; ³Department of Biomechanical Engineering, Delft University of Technology, Delft, the Netherlands; ⁴Division of Pediatric Cardiology, Department of Pediatrics, Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands; and ⁵Division of Pediatric Cardiology, Department of Pediatrics, Radboud University Medical Center, Nijmegen, The Netherlands

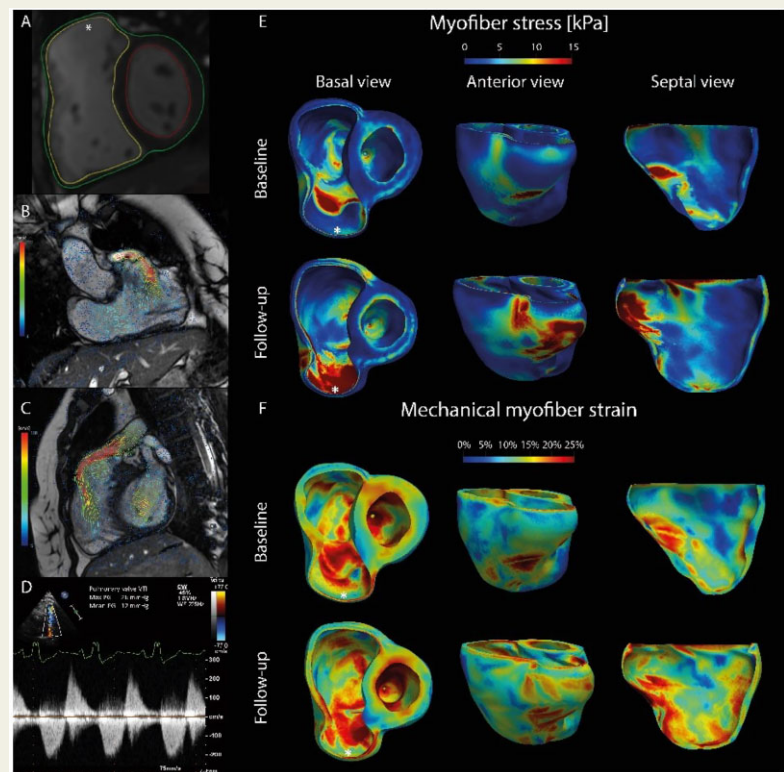
* Corresponding author. Tel: +31 10 7040704; E-mail: s.minderhoud@erasmusmc.nl

A 25-year asymptomatic female with surgically repaired Tetralogy of Fallot (TOF) and pulmonary regurgitation (PR) was followed for seven years with serial echocardiography, cardiovascular magnetic resonance, and exercise testing. During follow-up (FU), the patient remained asymptomatic. Exercise capacity was 91% and 134% of predicted load, respectively and N-terminal pro-brain natriuretic peptide was slightly elevated (baseline 29 and FU 45 pmol/L).

Left ventricle ejection fraction remained stable (59 and 65%, respectively). Right ventricular (RV) end-diastolic volume increased from 136 to 150 mL/m² (Panel A), RV ejection fraction decreased from 49% to 42%. PR was severe (baseline 42% and FU 46%) and directed to the anterior RV-free wall (Panels B and C, Supplementary data online). There was no significant pulmonary valve stenosis (Panel D) and RV diastolic pressure was low (estimated as 3 mmHg).

Using short-axis steady-state free precession images, a patient-specific geometry was created to which fibre orientation and passive material properties were assigned. After applying the RV diastolic pressure to the computer model, local mechanical wall stress and strain were calculated during passive filling (Panels E and F). During FU, average RV-free wall stress increased from 3.2 to 4.7 kPa. Baseline wall stress and increase in wall stress during FU were highest in the anterior part of the basal and mid-ventricular free wall. Average local mechanical myofibre diastolic strain of the RV-free wall increased slightly from 12% to 14%, indicating ventricular wall stretch and/or growth.

Parts of RV-free wall regions that were directly impacted by the PR are associated with higher wall stresses and strains, suggesting at least partly direct mechanical impact of PR on the ventricular wall. Whether monitoring of wall stress and strain changes over time helps clinicians to optimize the timing of pulmonary valve replacement in TOF patients, should be further studied.



© The Author(s) 2021. Published by Oxford University Press on behalf of the European Society of Cardiology.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact journals.permissions@oup.com