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Assessment of myocardial mechanics after Pediatric Cardiac Surgery by Speckle Tracking Echocardiography Strain Analysis

Fondazione Monasterio
la ricerca che cura

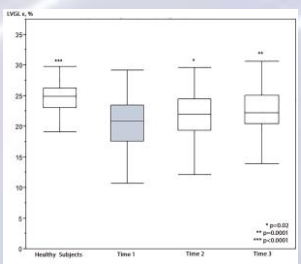
Massimiliano Cantinotti M.D,[1,2], Pietro Marchese M.D.[1,3], Marco Scalese M.S.[2], Paola Medino M.D.[1], Raffaele Giordano M.D.[4], Vivek Jani, MD, [5] Eliana Franchi M.D.[1], Giulia Corana M.D.[1], Pak Vitali M.D.1, Giuseppe Santoro M.D1, Cecilia Viacava M.D.[1], Nadia Assanta M.D.[1], Shelby Kutty M.D.[5], Martin Koestenberger M.D.[6]

[1] Fondazione G. Monasterio CNR-Regione Toscana, Massa and Pisa, Italy
[2] Institute of clinical Physiology, IFC, National Research Institute (CNR), Pisa
[3] Department of Pediatrics, University of Pisa, Italy
[4] Advanced Biomedical Sciences, Adult and Pediatric Cardiac Surgery, University of Naples Federico II, Naples, Italy
[5] The Helen B. Taussig Heart Center, The Johns Hopkins Hospital and Johns Hopkins University, Baltimore, USA,
[6] Division of Pediatric Cardiology, Department of Pediatrics, Medical University Graz, Austria

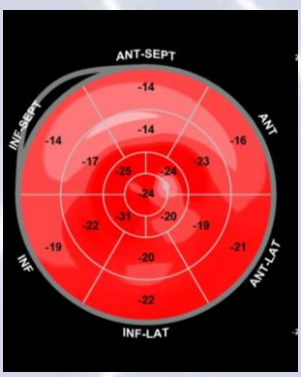
Background. Speckle-tracking echocardiography (STE) evaluates myocardial deformation by tracking natural acoustic reflections and artifacts within an ultrasonic window. Since its sensibility in identifying myocardial disfunction, STE gained increasing value in the evaluation of congenital heart diseases (CHD) even though its use, in pediatric cardiac surgery, is still partial.

Aim: to evaluate global and left ventricular (LV) systolic impairment after pediatric cardiac surgery by STE strain (ε) analysis.

Methods: We prospectively enrolled 117 children undergoing cardiac surgery for CHD. Echocardiography was performed at four different times: pre-operatively, 12-36 hours (Time-1), 3-5 days (Time-2), 6-8 days (Time-3). Images were obtained in the 4-2- and 3 apical chamber's views to derive LV global and regional (basal/mid/apical) ε values.



Median and interquartile range of global ventricular ε values and segmental ventricular ε values over time in the overall population



Bullseye plot of the left ventricle in a patient after 18h post-surgery. Septal segments show an impairment in systolic function.

Results: We collected data from 320 examinations in 117 children (mean age: 2.35±3.94, range: 0-16 years) at different post-operative times. 120 age-matched healthy children (3.1±4.2 years) served as controls. All global, basal, and mid LVε values decreased after surgery; the lowest values were at Time-1 ($p<0.0001$) but increased thereafter. At discharge, all global, basal, and mid LVε values remained lower than pre-operatively and healthy children ($p<0.05$). Instead, apical segments (lowest at baseline), increased after surgery ($p<0.0001$), but remained lower compared to controls. LV ejection fraction (LVEF) decreased at Time-1 ($p=0.0004$) but promptly recovered to Time-2, to normalize at Time-3

Conclusions: Although the LVEF normalized by the discharge, STE ε analysis revealed a significant LV systolic impairment after surgery with amelioration thereafter but uncomplete normalization at discharge. Regional STE differences disclosed a discrepancy base-apex: apical segments, contrary to all the other regions, showed hypercontractility after surgery. The slower recovery of LVε values compared to LVEF, suggests that STE ε analysis may be more accurate for the follow-up of mild LV post-surgical impairment.