O7-2

Patient-Specific Computer Heart Model in Children with Dilated Cardiomyopathy as a Useful Tool to Guide Beta-Blocker Therapy in Pediatric Heart Failure: Preliminary Findings from the MD-Paedigree Study.

Chinali M.(1), Itu L.M. (2), Rinelli G. (1), Heimann T. (3), Neumann D. (3), Secinaro A. (1), Zaccagnini D. (4), Lisignoli V. (1), Ecabert O. (3), Drago F. (1)
Bambino Gesù Children Hospital, Rome, Italy (1); Transilvania University, Brasov, Romania (2); Siemens Healthcare GmbH, Erlangen, Germany (3); Lynkeus srl, Rome, Italy (4)

BACKGROUND: Betablockers (BB) are an essential part of standard therapy in adult congestive heart failure (HF). However, no specific recommendation on the use of BB in children is present in consensus statements, suggesting that further studies are urgently needed. Our aim here was to predict the effect on cardiac function of heart rate-change caused by BB therapy in children with HF, using patient-specific mechanical heart models .
METHODS: 60 children with DCM-heart failure underwent comprehensive imaging evaluation including 3DEchocardiography and Cardiac Magnetic Resonance. Clinical and imaging data were used to build patient-specific heart models. The model includes anatomical features, dynamic and biomechanical features, as well as electrophysiological characteristics. Integrating these patient-specific heart features, the model builds a whole-body-circulation model and is offerse a prediction on the effect of changes in mean heart and/or cuff pressure on cardiac geometry, function and contractile efficiency, by providing expected changes in LV volumes, ejection fraction and generating pressure-volume LV curves.
RESULTS: Study included 7 boys and 5 girls (age 11±5years,range 1-17) in which BB therapy was either initiated or changed from baseline. Mean left ventricular ejection fraction at baseline was 40.3±5.6% and mean heart ranged from 77 to 125bpm'. At study baseline beta-blocker therapy was already present in 10 patients. In all cases beta-blocker of choice was carvedilol at a dose range of 6.25mg to 37mg per day. At follow-up beta-blocker therapy was present in all cases, except one in which therapy was withdrawn due to low compliance. Dose increase was reported in 8 patients, reduction in 3 and withdrawn in one. Mean dose change between baseline and follow-up was +15.8mg/day. Mean change in heart rate ranged between -35 to +31bpm'. Mean left ventricular ejection fraction change ranged from -11 to +13%. The computational model was able to predict well the ejection fraction at follow-up, with a correlation of 0.87 and a mean absolute difference of 4.58%.

CONCLUSIONS: Our preliminary findings supports the hypothesis that our patient-specific heart model might be of clinical aim to define 'optimal' mean heart rate target, at which BB therapy for each patient should be targeted.