

**Reduced aortic elasticity and ventricular dysfunction late after pediatric meningococcal septic shock: a precursor of atherosclerosis?**

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Background: Septic shock is one of the major causes of death in children and is characterized by a massive inflammatory response. To present date, no studies have been performed to assess the impact of such an 'inflammatory hit' on aortic wall structure and myocardial performance. Given the strong similarities in inflammatory pathways between septic shock and atherosclerosis, aortic wall abnormalities and associated ventricular sequelae may be expected. The objectives of the current study were therefore to prospectively assess aortic elasticity and biventricular function in a group of pediatric meningococcal septic shock (MSS) survivors by using MRI.

Methods: Eighteen MSS survivors (8 male; mean age $\pm$ standard deviation 14.5years $\pm$ 3.9; imaging performed 8.2years $\pm$ 2.4 after MSS) treated with at least 2 inotropic and vasoconstrictive agents for 48 hours or longer and 18 for age and gender matched controls were studied. Routine MRI was used to assess aortic pulse wave velocity (PWV) and systolic and diastolic biventricular function. Independent-samples-t-test and Pearson-correlation-coefficient were used for statistical analysis.

Results: MSS patients showed reduced aortic elasticity vs. controls (PWV in aortic arch: 4.1m/s $\pm$ 0.3 vs. 3.3m/s $\pm$ 0.5,  $P<0.01$ ; PWV in descending aorta: 3.9m/s $\pm$ 0.9 vs. 3.2m/s $\pm$ 0.4,  $P<0.01$ ). Systolic biventricular function was preserved (LV ejection fraction 57% $\pm$ 8 vs. 56% $\pm$ 6,  $P=0.74$ ; RV ejection fraction 56% $\pm$ 8 vs. 52% $\pm$ 6,  $P<0.01$ ), whereas biventricular mass was increased (LV 52.1gram/m<sup>2</sup> $\pm$ 8.4 vs. 36.0gram/m<sup>2</sup> $\pm$ 9.9,  $P<0.01$ ; RV 26.8gram/m<sup>2</sup> $\pm$ 6.5 vs. 10.4gram/m<sup>2</sup> $\pm$ 5.0,  $P<0.01$ ). Also, delayed biventricular relaxation was found after MSS: peak filling rates corrected for end-diastolic-volume (PFREDV) across the mitral and tricuspid valve were significantly reduced (mitral: PFREDV of E wave 2.54 $\pm$ 0.56 vs. 3.08 $\pm$ 0.63,  $P=0.01$ ; PFREDV of A wave 1.10 $\pm$ 0.26 vs. 1.31 $\pm$ 0.30,  $P=0.03$ ; tricuspid: PFREDV of E wave 1.81 $\pm$ 0.44 vs. 2.09 $\pm$ 0.29,  $P=0.04$ ; PFREDV of A wave 1.11 $\pm$ 0.22 vs. 1.42 $\pm$ 0.39,  $P<0.01$ ). Increased PWV in aortic arch and descending aorta were associated with increased LV mass ( $r=0.62$ ,  $P<0.01$ , and  $r=0.51$ ,  $P<0.01$ , respectively) and delayed LV relaxation parameters.

Conclusions: Despite adequately preserved systolic biventricular function, reduced aortic elasticity in pediatric patients after MSS may indicate aortic wall pathology, being associated with biventricular hypertrophy and concomitant delayed biventricular relaxation. Long-term prognosis after MSS may therefore be adversely affected considering the cumulative effects of cardiovascular disease during a lifetime.