Reduced handgrip strength is associated with lower health related physical fitness in children with congenital heart disease

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Introduction: Technical development in surgery and an enhancement in cardiology care have led to a decrease of the mortality rate in children with congenital heart disease (CHD). At the same time, functional outcomes like health-related physical fitness (HRPF) did not improve as well. Handgrip strength as a simple and effective method to identify adults at higher risk of cardiovascular mortality could be a useful tool to identify young CHD patients at risk for reduced HRPF. This study aimed to assess handgrip strength and HRPF in CHD and compare their results to a healthy control group (CG).

Methods: Starting in May 2014 until October 2018 handgrip strength and HRPF were assessed in 304 patients (12.5 ± 3.4 years; 117 girls) with various CHD (69 simple; 89 moderate and 146 complex severity). Results were compared to 1560 children from a CG (11.5 ± 2.7 years; 925 girls) recruited in a school project in 2016. Handgrip strength was calculated for the dominant hand (maximum value from 3 repetitions of the right and 3 of the left hand). HRPF was tested by five FITNESSGRAM® motor tasks of the and converted into standard deviation scores (SDS) according to the values of CG.

Results: After adjusting for sex and age patients with CHD showed significantly lower handgrip strength in comparison to the CG (CHD: 19.6 ± 5.6 kg; CG: 24.4 ± 5.6 kg; p<.001) and significant lower HRPF (SDS: -0.56± 0.82; p<.001). Children with complex CHD had lower values in handgrip strength compared to children with moderate (complex: 17.7 ± 5.7 kg; moderate: 19.0 ± 5.6 kg; p<.001) and simple (complex: 17.7 ± 5.7 kg; 23.7 ± 5.6 kg; p<.001) severity. Patients with total cavopulmonary connection had the lowest values (16.6 ± 5.6 kg). There was a significant relationship between handgrip strength and HRPF (r=.316; p<.001).

Conclusions: Children with CHD have considerable lower handgrip strength and HRPF compared to healthy children. The positive relation between both parameters highlight the potential of the handgrip measurement as a useful screening tool in the clinical context.