

### Survival and outcome in pediatric myocarditis: Data of the German multicenter registry “MYKKE”

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#### Objectives

Myocarditis is a major cause of severe heart failure in childhood. “MYKKE”, a multicenter prospective registry for pediatric patients with suspected myocarditis, aims with its ongoing enrollment to gain knowledge on incidence, diagnosis, therapy and outcome.

#### Methods

Since 2013 twenty centers actively included patients. A sub-analysis on clinical data and a multivariate analysis (MANOVA) of 195 patients enrolled until 2016 was performed according to baseline data and their impact on survival. Patients with typical findings in cardiovascular magnetic resonance (CMR) and/or endomyocardial biopsy (EMB) were defined as myocarditis positive.

#### Results

Until October 2017, 280 patients were enrolled, median (range) age 13.0 (0-17) years; 66.8% male. Three age groups were defined according to clinical course and severity of disease: 0-<2 (24.3%), 2-12 (20.7%) and 13-18 years (55.0%). 11% were listed for heart transplantation (HTx); and 6.8% subsequently underwent HTx. The overall mortality was 7.5%. Patients <2 years had a higher incidence (59%) of a severely reduced left ventricular ejection fraction (EF <30%) compared with age groups 2-12y (38%) and 13-18y (7%);  $p<0.001$ . They also had the highest rate of mechanical circulatory support (MCS;  $p=0.001$ ) and death ( $p=0.003$ ). A sub-analysis revealed that in 78% ( $n=153/195$ ), EMB ( $n=44$ ), CMR ( $n=40$ ) or both ( $n=69$ ) were performed with a positive result for myocarditis in 69%. Histology showed: 15% acute, 43% subacute/chronic, 12% status post, 1% eosinophilic or granulocytic myocarditis, 5% no infection, 3% DCM, 1% HCM, 7% other. The mortality in the MCS cohort was 21% ( $n=6/28$ ). The proof of myocarditis had no impact on the possibility of weaning from MCS ( $p=0.675$ ). Non-MCS patients showed a significantly better survival (97% vs. 75%;  $p<0.001$ ). The MANOVA highlighted age ( $p=0.028$ ) and EF ( $p=0.05$ ) as dependent variables in predicting survival. Accordingly, patients <2 years and EF <30% carried the highest risk for mortality according to a fulminant course ( $p<0.001$ ).

#### Conclusions

Our data underline that myocarditis stays a life-threatening disease in the pediatric population, especially in very young children. This first prospective data analysis enabled the definition of a high-risk group. These results emphasize the utility of “MYKKE” as a registry for suspected myocarditis in children and adolescents.