Evaluation of heart function in children with intestinal failure on long-term parenteral nutrition

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Objectives: Children with intestinal failure receiving long-term parenteral nutrition have several risk factors potentially deteriorating heart function, such as volume overload, the presence of permanent central catheter with the tip in right atrium, recurrent anemia, carnitine deficiency, and often, catheter-related sepsis in medical history.

Methods: The aim of this cross-sectional study was to evaluate heart function in children on long-term parenteral nutrition with the use of biochemical parameter – NTproBNP value, echocardiographic cardiac function and anatomy parameters: SF, E/A wave ratio, LVEDD; LVESD; IVSd; IVSs, LVPWd, LVPWs; calculated LV mass, valves 2D measurement; and cardiac-thoracic index assessed on a chest X-ray. Results were compared with normal values determined by epidemiological studies with respect to body surface area [Heart 2000;83:667-672] and age [Pediatr Cardiol (2009);30:3–8]. Sixty seven children with intestinal failure aged 1-19 years (median: 5.84 years) received parenteral nutrition for 9 months to 14.75 years (median: 3 years) before the study.

Results: Mean percentiles of echocardiographic parameters were respectively: LVEDD – 46th, LVESD-46th, IVSd-70th, IVSs-45th, LVPWd – 49th; LVPWs-34th, LV mass calculated on the basis of M-mode parameters – 70th, mitral valve – 86th, tricuspid valve – 29th, aortic valve – 86th, pulmonary valve – 73th. Shortening fraction was within normal values (28-44%) in almost all of the patients (range: 28.6-49.5%; mean 37%), except for 5 children, in which the SF was augmented over 44%, the tricuspid valve flow pattern expressed as E/A waves ratio was normal in most of the patients (range: 0.65-2.35; mean: 1.5) except for 3 children who had E/A ratio <1; E/A waves ratio for mitral valve was normal in all of the patients (range: 1.2-2.8; mean: 1.66).

46 of 67 children had significantly (over 95th percentile) augmented NTproBNP level, 25 patients (of 59 in which chest X-ray was performed) had an elevated (over 0.5) CTI.

Conclusions: Systolic and diastolic heart function assessed by shortening fraction and E/A wave ratio were in the normal values. IVSd, aortic, mitral and pulmonary valves measurements were slightly augmented (70-86th percentile). Cardiac-thoracic index and NTproBNP values were elevated in most of the patients. Long-term parenteral nutrition and/or intestinal failure might influence cardiac function and anatomy.