Bicycle Stress echocardiography in children: feasibility, safety and determination of interobserver variability.

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Background. Exercise stress echocardiography (ESE) is a well validated technique able to provide a dynamic evaluation of myocardial structure and function in adult population. However its use in children is quite limited, mainly because of the precipitous rapid drop in peak heart rate after exercise. Therefore we aimed to assess the feasibility, the safety and the reproducibility of ESE, using on-line scanning in semi–supine cycloergometer protocol in a large paediatric population.

Methods. Between July 2008 and January 2013, 47 patients (mean age 14 ± 3.1) were evaluated with a bicycle ESE. Two independent observers without knowledge of any patient data interpreted 42 stress studies, grading quality of each acquired image and presence of regional wall motion abnormalities (RWMA).

Results
ESE was successfully performed and well tolerated by all patients. No patient had arrhythmia or complications from stress-induced ischemia. HR was 82 ± 14.3 at rest, and 152.3 ± 19.1 during peak exercise (80.2 ± 15 to 161.4±18 excluding heart transplant patients and patients on beta-blockers).
Among 544 views analyzed for grading of image quality, the visualization was optimal in 473 (87%), suboptimal in 39 (7%) and inadequate in 32 (6%). Among 10 patients with hypertrophic cardiomyopathy we were able to assess a significant increase (> 25 mmHg) of the left ventricular outflow tract gradient during exercise in 3 patients (33%). ESE was performed in 34 patients with congenital or acquired coronary abnormality (Kawasaki disease, heart transplant recipients, congenital coronary abnormalities, transposition of the great arteries after arterial switch operation). In this group, the RWMA were revealed in 8 patients (24%). The agreement between the two different observers showed a K index of 0.7276 (95% CI = 0.6497 to 0.8055) for the image quality and a K index of 0.5125 (95%CI = 0.4782 to 0.5468) for the RWMA analysis.

Conclusions: Bicycle stress echocardiography performed by on-line scanning during exercise is feasible, safe and reproducible modality in children. Further data to assess its diagnostic accuracy are however needed.