Relevance of quantitative exercise Doppler echocardiography in asymptomatic valvular aortic stenosis versus bicycle exercise stress test

Background: In patients with asymptomatic valvular aortic stenosis, exercise testing may help at stratifying the clinical risk. However, data are still limited, and the role of quantitative exercise Doppler echocardiography has never been investigated.

Methods and results: Forty consecutive patients (68 ± 12 years old) with critical asymptomatic aortic stenosis (aortic valve area < 1 cm²) were assessed by a conventional standardized bicycle exercise stress test (EST) and quantitative Doppler echocardiographic measurements at rest and during semi-supine EST. EKG and blood pressure were monitored during the 2-exam. Gradients, effective orifice area, pulmonary pressure, or outputs were measured during exercise-echocardiography. No serious adverse event was observed during the study. No correlation was observed between baseline echocardiographic results and the EST results. Exercise increase in outputs and gradients were significantly greater in patients with a negative-EST, compared to patients having a positive-EST according to ESC-guidelines (maximum gradient +10 ± 20 vs +15 ± 20 mm Hg; aortic valve effective orifice area +0.12 ± 0.23 vs -0.09 ± 0.18 cm²). A correlation was observed between effective orifice area and cardiac output during exercise (figure 1) and interestingly the correlation was significantly higher in the negative-EST group (p=0.04).

Conclusion: Quantitative Doppler exercise echocardiography could be useful to identify a subset of patients with asymptomatic valvular aortic stenosis suspect of justifying a prompt valvular surgery. The delta of increase in outputs and gradients, during exercise, appears extremely useful. It might help for clinical decision making despite the lake of large series in the literature.

Left ventricular hypertrophy has been identified as an important predictor of cardiovascular morbidity and mortality necessitating reliable measurement of left ventricular mass (LVM). The aim of this study was to measure LVM by real-time three-dimensional echocardiography (RT-3DE) in patients with severe aortic stenosis in comparison to M-mode echocardiography. Therefore, we studied 20 patients (age 69 ± 6 years) in normal sinus rhythm with severe aortic stenosis (mean pressure gradient 64 ± 14 mm Hg, aortic valve area 0.64 ± 0.16 cm² by continuity equation) and normal left ventricular size (enddiastolic diameter 48 ± 4 mm) and function (ejection fraction 62 ± 8%). LVM was measured by M-mode echocardiography according to formula of Devereux and by RT-3DE (iE33, Philips Medical Ultrasound) using the built-in quantitative program. LVM by RT-3DE (297 ± 51 g) showed a modest correlation (r=0.56) with M-mode echocardiography (293 ± 58 g). The linear relationship could be described by the equation LVMM-mode = 76 g + 0.84x (LVVRT-3DE). Broad limits of agreement (-41 to 113 g) demonstrated a large variability between both methods. M-mode echocardiography overestimated RT-3DE LVM by a mean of 13 ± 14% (p<0.01).

Although M-mode and RT-3DE LVM measurements are moderately correlated in patients with aortic stenosis, M-mode echocardiography systematically overestimates LVM determined by RT-3DE, possibly due to a systematic bias. Moreover, previously published cutoff values for left ventricular hypertrophy may not apply to LVM determinations by RT-3DE.

Feasibility of real time three dimensional transthoracic echocardiography for planning mitral reconstructive surgery

Background: Transoesophageal echocardiography (TOE) is considered the gold standard imaging technique for mitral valve assessment prior to surgery. We compared the accuracy of 2-Dimensional TOE with Real Time 3-Dimensional transthoracic echocardiography (RT-3DE) for the pre-operative functional assessment of patients with mitral valve prolapse.

Methods. In 44 patients with severe mitral regurgitation due to type 2 valve dysfuncion, TOE and RT-3DE were performed 24 hours prior to surgery.