

Arterial tonometry-derived subendocardial viability ratio in coronary artery disease patients: the jury is still out

Several studies have confirmed the benefits of exercise-based cardiac rehabilitation (CR) in reducing both total and cardiovascular mortality and hospital admissions (1–3) and these results justify the recommendation that participation in a CR program should be considered for all patients requiring hospitalization or invasive intervention after an acute ischemic event (4). Although most patients will benefit from such a program, identifying patients that would respond poorly, and particularly, eventual predictors of poor response, would be very useful before initiating an exercise program.

Report by Aslanger et al. (5) published in this issue of *Anatol J Cardiol* 2016 entitled “Baseline subendocardial viability ratio influences left ventricular systolic improvement with cardiac rehabilitation” discusses use of subendocardial viability ratio (SEVR) as a predictor of echocardiographic and exercise test response in coronary artery disease (CAD) patients included in a CR program. Subendocardial viability ratio, also known as ratio of diastolic pressure time index (DPTI) over systolic pressure time index (SPTI), was introduced by Buckberg et al. (6) at the beginning of the 1970s, derived from invasive cardiovascular hemodynamic experience in dogs. It represents the ratio between myocardial oxygen demand and supply and can be defined, noninvasively, based on central pulse wave analysis, using arterial tonometry.

In this issue the authors reported that patients with baseline above-median SEVR had significantly higher peak oxygen pulse in the follow-up exercise test compared with patients with lower baseline SEVR. All other exercise test parameters (including peak VO_2) increased significantly in both groups after 20 training sessions. Echo-measured left ventricular ejection fraction (LVEF) and volumes increased in both groups, but the difference was not statistically significant. Stroke volume index (SVI) increased significantly only in patients with higher SEVR.

Evidence of reverse left ventricular remodeling following CR training in CAD patients is equivocal, particularly in patients with normal LVEF (7). Additionally, the good results of CR programs are somewhat biased by the fact that the population included in most studies is middle-aged and low risk (3). The population included in the present study also had these characteristics: Patients were young (mean age ± 54 years) and had mostly normal LVEF. As such, significant improvement in LV vol-

ume and systolic function was not to be expected and, indeed, did not happen. The observed increase in SVI in patients with higher SEVR, in this context, is likely due to chance.

Improvements on exercise test, on the other hand, could be expected after an exercise program in this population: Indeed, higher peak VO_2 , percentage of peak VO_2 and circulatory power were observed in both groups in the follow-up exercise test. However, the authors reported a significant increase in peak oxygen pulse only in the group with higher baseline SEVR and they claim that this parameter is more sensitive to changes in myocardial function induced by exercise training. This is a somewhat intriguing conclusion. Peak oxygen pulse has been used as a surrogate for stroke volume at peak exercise (8), but there is no clear evidence that it provides any complementary information to peak VO_2 about cardiorespiratory fitness and prognosis in CAD patients (9). Furthermore, peak oxygen pulse is, by definition, determined by heart rate and it would be important to know if the observed difference would still be significant in multivariable analysis between groups. In fact, baseline heart rate (which could influence peak heart rate) is not described and, additionally, there are some apparent differences in groups that may eventually explain these results: Patients with lower baseline SEVR were significantly heavier and tended to have less beta-blocker use.

It is also important to assume that tonometry measurements are somehow uncertain, since they are affected by a myriad of factors that we do not fully comprehend. Although this is a very interesting and well conducted study, more information is needed to confirm and fully understand its results. Including older and sicker patients would be important, along with repeating the tonometry measurement at follow-up.

Finally, it should be stressed that the benefit observed in patients involved in CR programs is probably mostly due to non-cardiac factors (including health behavior changes, motivation gains, and global physical improvement), much more than to intrinsic improvements in pulmonary or cardiac efficiency (10).

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References

1. Taylor RS, Brown A, Ebrahim S, Jolliffe J, Noorani H, Rees K, et al. Exercise-based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomized controlled trials. *Am J Med* 2004; 116: 682-92.
2. Clark AM, Hartling L, Vandermeer B, McAlister FA. Meta-Analysis: Secondary Prevention Programs for Patients with Coronary Artery Disease. *Ann Intern Med* 2005; 143: 659-73.
3. Heran BS, Chen JM, Ebrahim S, Moxham T, Oldridge N, Rees K, et al. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev* 2011; 7: CD001800.
4. The Task Force on Myocardial Revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS). 2014 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J* 2014; 35: 2541-619.
5. Aslanger E, Assous B, Bihry N, Beauvais F, Logeart D, Cohen-Solal A. Baseline subendocardial viability ratio influences left ventricular systolic improvement with cardiac rehabilitation. *Anatol J Cardiol* 2017; 17: 37-43.
6. Buckberg GD, Fixler DE, Archie JP, Hoffman JI. Experimental subendocardial ischemia in dogs with normal coronary arteries. *Circ Res* 1972; 30: 67-81.
7. Haykowsky M, Scott J, Esch B, Schopflocher D, Myers J, Paterson I, et al. A meta-analysis of the effects of exercise training on left ventricular remodeling following myocardial infarction: start early and go longer for greatest exercise benefits on remodeling. *Trials* 2011; 12: 92.
8. Mezzani A, Agostoni P, Cohen-Solal A, Corrà U, Jegier A, Kouidi E, et al. Standards for the use of cardiopulmonary exercise testing for the functional evaluation of cardiac patients: a report from the Exercise Physiology Section of the European Association for Cardiovascular Prevention and Rehabilitation. *Eur J Cardiovasc Prev Rehabil* 2009; 16: 249-67.
9. Laukkanen JA, Kurl S, Salonen JT, Lakka TA, Rauramaa R. Peak oxygen pulse during exercise as a predictor for coronary heart disease and all cause death. *Heart* 2006; 92: 1219-24.
10. Sandesara PB, Lambert CT, Gordon NF, Fletcher GF, Franklin BA, Wenger NK, et al. Cardiac rehabilitation and risk reduction: time to "rebrand and reinvigorate". *J Am Coll Cardiol* 2015; 65: 389-95.



Mihri Müşfik Hanım, the renowned female Turkish portrait painter, lived a bohemian and eccentric life in Europe and the US. She also taught painting, and was a co-founder and the first female director of Istanbul's Fine Arts School for Women. (From Prof. Dr. Cumhuriyet Ertekin's collection)