

Effect of Right Atrial Pacing on Left Ventricular Function

David S. Blondheim¹, Mark Kazatsker², Yuval Konstantino³, Aya Asif¹, Simcha R. Meisel², Michael Shochat², Aaron Frimerman², Avraham Shotan², Noah Liel-Cohen³

¹Noninvasive Cardiology Unit, Hillel Yaffe Medical Center, Israel

²Division of Cardiology, Hillel Yaffe Medical Center, Israel

³Units of Noninvasive Cardiology and Electrophysiology, Soroka Medical Center, Israel

Background:

A decrease in left ventricular (LV) longitudinal strain in stress echocardiograms has been proposed as a tool to detect ischemia, but it may be affected similarly by physiological changes induced by stress.

Aim:

To study the effect of heart rate (HR) on strain and other parameters of LV function.

Methods:

We studied patients with dual chamber pacemakers (mostly for sick sinus syndrome) with intact A-V conduction without known coronary disease. Patients were paced from the right atrium in 10 bpm increments until target HR or occurrence of A-V block or atrial fibrillation. An echo study was performed and blood pressure (BP) measured at each stage. Global longitudinal strain was determined semi-automatically by the speckle tracking method.

Results:

Of 13 patients (age 72.7 ± 3.7 years), 11 had adequate echo quality throughout the study. Mean HR increased from 70.8 ± 10.4 to 123.8 ± 12.6 bpm, (mean increase: 52.3 ± 12.4 bpm). BP did not change (mean 132/70 to 124/77 mmHg, $p=NS$). LV inflow and outflow stroke volumes decreased (estimated by mitral and aortic velocity-time-integrals; inflow: 27.2 ± 7.1 to 16.0 ± 4.9 cm; outflow: 22.0 ± 5.2 to 10.2 ± 2.8 cm, $p < 0.0001$ for both) but estimated cardiac output did not decrease. LV strain decreased in all patients ($-16.5 \pm 3.7\%$ to $-14.1 \pm 3.3\%$, $P < 0.0001$). In figure: % decrease of strain from baseline (blue) and from previous stage (red).

Conclusion:

There is an inverse relation between HR and LV strain. A larger study is necessary to determine the normal range of strain decrease relative to HR increase, which would facilitate differentiation between normal and ischemic responses.

