Global and regional evaluation of systolic and diastolic left ventricular temporal parameters using a novel program for ECG-gated myocardial perfusion SPECT
—Validation by comparison with gated equilibrium radionuclide angiography and speckle-tracking radial strain from echocardiography—

Akira Yamamoto,* Naoto Takahashi,** Kazuo Munakata,** Tetsuo Hosoya,*** Masato Shiiba,*
Takao Okuyama,* Kazuya Abe,* Tadashi Kaneshiro,* Haruko Tsuruta,*
Toshi Takama* and Masashi Sato*

*Department of Radiology, Nippon Medical School, Musashikosugi Hospital
**Department of Internal Medicine, Nippon Medical School, Musashikosugi Hospital
***Department of Clinical Application Technology, Daiichi Radioisotope Laboratories, Ltd.

Background: A newly developed program, named cardioGRAF, enabled the evaluation of left ventricular (LV) systolic and diastolic temporal parameters for the estimation of heart failure using ECG-gated myocardial perfusion SPECT (GMPS). *Objective:* The feasibility of those global (g-) and regional (r-) parameters was validated to compare with gated equilibrium radionuclide angiography (ERNA) and speckle-tracking radial strain (STS) from echocardiography. *Methods:* Thirty-three patients were studied using GMPS and ERNA (n = 11) or GMPS and STS (n = 22). The following g- or r-parameters obtained by cardioGRAF and ERNA or STS were compared: time to end systole (TES), time from end systole to peak filling rate (TPF1), time from 0 to peak filling rate (TPF2), time to peak radial strain (TPS), time from peak strain to peak negative strain rate (TP-SR1), and time from 0 to peak negative strain rate (TP-SR2). *Results:* All g-parameters were successfully obtained by cardioGRAF and ERNA. The results demonstrated good correlations (g-TES: r = 0.79, p < 0.005; g-TPF1: r = 0.75, p < 0.02; TPF2: r = 0.83, p < 0.005). The differences were 11.9 ± 31.8 ms in g-TES, 19.9 ± 65.4 ms in g-TPF1, and 37.7 ± 67.4 ms in g-TPF2. All r-parameters were successfully obtained by cardioGRAF. Eight patients and 12 segments were excluded because of the inadequate quality of routine echocardiography for STS analysis. However, r-parameters obtained by cardioGRAF were significantly correlated with those of STS (r-TES and r-TPS: r = 0.61, p = 1×10^{-8}; r-TPF1 and r-TP-SR1: r = 0.69, p = 3×10^{-11}; r-TPF2 and r-TP-SR2: r = 0.76, p = 2×10^{-15}). The differences were 22.1 ± 38.2 ms between r-TES and r-TPS, 7.0 ± 123.4 ms between r-TPF1 and r-TP-SR1, and 38.1 ± 111.5 ms between r-TPF2 and r-TP-SR2. *Conclusion:* The feasibility of evaluating systolic and diastolic temporal parameters by a new program was validated. This program has the potential to evaluate both diastolic and systolic heterogeneous wall motions which express dyssynchrony in heart failure.

Key words: left ventricle, synchrony, gated myocardial perfusion SPECT, speckle-tracking strain analysis