ABSTRACT

Background: Heart failure (HF), the leading cause of death in the western world, develops when a cardiac injury or insult impairs the ability of the heart to pump blood and maintain tissue perfusion. Cardiac resynchronization therapy (CRT) is a well-established treatment in selected patients with drug-refractory heart failure. In order to improve the response rate of patients treated with CRT, imaging can provide information on mechanical dyssynchrony, viability, and cardiac venous anatomy. Various echocrdiographic methods have been proposed to quantify intra-ventricular dyssynchrony, including M-mode echocardiography and tissue Doppler imaging (TDI). Nuclear imaging techniques can also be used for the assessment of mechanical dyssynchrony. **Chen and coworkers** developed a novel approach for assessing LV dyssynchrony from gated myocardial perfusion SPECT.

Aim of the work: The aim of this study is to compare the degree of LV dyssynchrony as assessed with phase analysis from gated myocardial perfusion SPECT (GMPS) and the degree of LV dyssynchrony as assessed with TDI in patients with HF, depressed LVEF, and wide QRS complex, to validate the use of phase image in gated SPECT technique in selection of patients eligible for CRT.

Subjects and Methods: 30 patients were included, all scheduled for CRT, ATL-HDI 5000 colored echocardiograph was utilized for Echocardiographic imaging, TDI was measured as standard deviation (SD) of time for beginning of QRS to peak systolic velocity in 12 segment 6 basal and 6 mid segment all done by expert Echocardiographer. Myocardial perfusion imaging (MPI) and phase analysis of Gated SPECT acquisition was performed within 1 hr of the injection of 20 mci TC^{99m} sestaMIBI using dual head Siemens Gamma Camera (Symbia E) utilizing

cedar Sinai Gated SPECT 8 frames/ cycle 32 view each 20second over 180 degree arc, software phase analysis parameters is histogram bandwidth which include 95% of the element of the phase distribution. Study population was divided into two groups: responders and non-responders according to increase of at least 15% of LVEF after 3 month by 2D Echo.

Results: After 3 month follow up patients were divided into 23 (76%) were responders and 7 (24%) were non-responders according to 2 D echo with LVEF 32.4±5.9 for responders versus 25.3±4.8 for non responders, *p* value 0.007. Histogram bandwidth pre-implantation in all 30 patients mean 138.2±92.1˚ to be 116.0±75.7˚ post- implantation with *p* value 0.049. In CRT responders pre-implantation 150.4±96.5˚ to be post-implantation 122±80.9˚ *p* value 0.012 , in non responders group 98±66.4˚ to be post-implantation 96.4±56.3˚ *p* value 0.962. TDI PSV in 30 patients 66.4±30.3msec to be 45.7±21.8 msec post-impamtation *p* value 0.001, in CRT responders 70.6±32.3 msec to be 45,6±22.3 *p* value 0.001, in non responders 52.9±17.6 to be post implantation 46±22.1 *p* value 0.06. ROC analysis was done to reveal that Phase analysis parameter acted in better way to predict CRT response with histogram bandwidth 55.5˚Area under curve 68.9% sensitivity 87% specificity 42.9% positive predictive value (PPV)83.3% negative predictive value (NPV) 50% compared to TDI sensitivity 52.25% , specificity 71.4% PPV85.7% NPV 31.3% When applying histogram bandwidth cuttoff 55.5 degree dyssynchrony was illustrated in 20 (87%) patients in comparison to 14 (60%) patients with Echo TDI, there was significant difference in sensitivity of histogram bandwidth compared to TDI with *p* value 0.043.

Conclusion: The LV dyssynchrony assessed from GMPS may be more predictive to response to CRT. Histogram bandwidth of GMPS Tc^{99m} SestMIBI may be more predictive of significant response to CRT as

compared to TDI. This parameter seems more optimal for assessment of LV dyssynchrony with gated SPECT.

Key words: Heart Failure – CRT – TDI – Gated SPECT.