The correlation between different left ventricular pacing sites using quadripolar lead and electrical-mechanical synchronization index and acute hemodynamic change in CRT-D patients

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Introduction: This study was designed to investigate correlation between electrical and mechanical synchronization index using a quadripolar lead cardiac resynchronization therapy.

Methods: Interventricular conduction time, electrocardiographic and echocardiographic examinations were performed at baseline and three days after CRT during native heart rate in sinus rhythm. QRS duration (QRS\text{d}), aortic velocity time integral (VTI), PETd and Ts-12-SD were assessed in different pacing sites (D1, M2, M3, P4) and "No-pacing". Relative parameter change (%Δparameter i.e. %ΔQRS\text{d}, %ΔVTI, %ΔPETd or %ΔTs-12-SD) was calculated. Then correlation between variables was analyzed with Pearson's coefficient.

Result: This study included 19 consecutive enrolled heart failure patients in accordance with CRT implanting indications. There was no correlation between interventricular conduction time (p>0.05). The RV-LV interventricular conduction time was not significantly correlated with either pacing QRS duration or %ΔQRS\text{d} (p>0.05). But LVp-RV conduction time was obviously correlated with pacing QRS duration (r=0.558, p<0.001) or %ΔQRS\text{d}(r=0.453, p<0.001). There was a negative correlation between %ΔVTI and LVp-RV conduction time (r = -0.459, p<0.001). There was poor positive correlation between RVs-LV conduction time and VTI(r= 0.278,p=0.023), as well as between RVp-LV conduction time and VTI (r=0.325, p=0.007) or %ΔVTI(r=0.266,p=0.030). There was positive correlation between Ts-12-SD and LVp-RV conduction time( r=0.302, p=0.013).

Conclusion: The longer conduction time of RV-LV may produce greater acute hemodynamic change especially in RVp-LV state. And the shorter LVp-RV conduction time could emerge higher VTI value or narrower pacing QRS\text{d} or better LV intraventricular synchrony at the mean while.