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 (QRSd), 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. %ΔQRSd, %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 %ΔQRSd (p>0.05). But LVp-RV conduction time was obviously correlated with pacing QRS duration (r=0.558, p<0.001) or %ΔQRSd(r=0.453, p<0.001). There was a negative correlation between %ΔVTI and LVp-RV conduction time (r = -0.459, p<0.0001). 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 QRSd or better LV intraventricular synchrony at the mean while.