Time interval from left ventricular stimulation to QRS onset is a predictor of mortality in patients with cardiac resynchronization therapy

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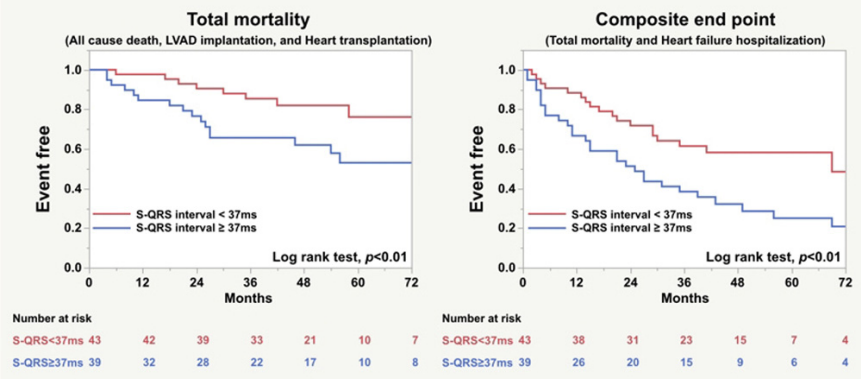
Introduction: In our previous report, the time interval from left ventricular (LV) pacing to the earliest onset of QRS (S-QRS interval) has been found to be an independent predictor of mechanical response to cardiac resynchronization therapy (CRT). The S-QRS interval may indicate the conduction disturbance relevant to the localized tissue property such as scar or fibrotic lesion. Therefore, S-QRS interval longer than 37ms was associated with poor response to CRT, and proposed as suboptimal LV lead position. Then, we hypothesized that the longer S-QRS interval at the LV pacing site could be related to long term mortality and heart failure events in patients with CRT.

Methods: This retrospective study included 82 consecutive heart failure patients with sinus rhythm, reduced LV ejection fraction (≤35%), and a wide QRS complex (≥120ms), who undergone CRT implantation between 2012 January and 2017 December. Patients were divided into Short S-QRS group (<37ms, SS-QRS) and Long S-QRS group (≥37ms, LS-QRS) according to the previously reported optimal cut off value. A responder was defined as one with ≥15% reduction in LV end-systolic volume assessed by echocardiography at 6 months after CRT. The primary endpoint was total mortality, which included LV assist device implantation or heart transplantation. The secondary endpoints included the composite endpoint of total mortality or heart failure hospitalization.

Results: The study patients were divided into SS-QRS (N=43, age 65.9±13.2 years, 77% male) and LS-QRS (N=39, age 63.0±13.4, 85% male). In the electrocardiographic measurements, there were no significant differences in baseline QRS duration (162.4±30.3ms in SS-QRS vs. 154.5±31.6ms in LS-QRS, P=0.19) and LV local activation time assessed as Q-LV interval (118.3±34.3ms in SS-QRS vs. 115.3±32.0ms in LS-QRS, P=0.71). S-QRS interval was 25.9±5.3ms in SS-QRS and 51.5±13.7ms in LS-QRS (P<0.01), and the responder rate was significantly higher in SS-QRS compared with LS-QRS (79% vs. 29%, P<0.01). During mean follow up of 47.7±22.4 months, 24 patients (29%) reached to the primary endpoint, while the secondary endpoints were observed in 47 patients (57%). LS-QRS patients had significantly worse event-free survival for both primary and secondary endpoints (Figure). After the multivariate Cox regression analysis, LS-QRS (≥37ms) was an independent predictor of total mortality (HR=2.6, 95% CI: 1.11 to 6.12, P=0.03) and the secondary composite events (HR=2.4, 95% CI: 1.31 to 4.33, P<0.01).

Conclusion: The S-QRS interval longer than 37ms, which may reflect the conduction disturbance relevant to the scar or fibrotic lesion at the LV pacing site, was a significant predictor of the total mortality and heart failure hospitalization. These findings have implications for the optimal LV lead placement in patients with CRT device.



Clinical outcomes according to S-QRS