openhrt-2021-001615 - "Determinants of LV +dP/dt$_{max}$ and QRS duration with different fusion strategies in cardiac resynchronization therapy"

Supplemental material:

Figures captions:

Supplemental Figure 1. Electrical intervals related to the left ventricular distal and proximal electrodes.

Not all patient included in this study were considered to have true left bundle branch block when evaluated retrospectively (16%). In patients without LBBB there is a potential for conduction through the left bundle branch with early activation of the left lateral wall. In this study we found the Q-LV interval to distal (1) and proximal (4) LV electrodes to be in keeping with what is seen in LBBB patients (left hand panel). Positioning of the leads were also confirmed to be remote from the RV pacing site with similarity between distal and proximal electrodes as seen in the middle and right hand panel, with a sequence of distal to proximal activation as expected and seen in all panels.

Supplemental Figure 2. Relationship between maximum and minimum left ventricular pressure first order derivative.

An interesting phenomenon with regards to the filling phase of the left ventricle is the overall strong relationship between maximum and minimum LV pressure derivative. The relationship is strong and present both on a group level (left hand panel) and on an individual level (right hand panel). The relationship shows that a higher dP/dt is associated with improved relaxation. This is interesting also because relaxation in the left heart chamber is dispersed so that delayed activated segments may also have deleyed onset of relaxation an as such hamper the early passive filling of the heart. Preexcitation of the left lateral wall may provide an earlier onset of relaxation as the LV is given more time to relax compared to the later activated segments, and together with a lower dP/dt provide improved filling characteristics. This warrants further investigations that should include other relaxation parameters derived from pressure measurements.

Supplemental Figure 3. Manual measurements of QRS duration using multiple ECG channels and EGM from both right and left electrodes.

LV dP/dt$_{max}$ was measured automatically from each and subsequent beats, hence multiple measures of LV dP/dt$_{max}$ at each level of QRS duration (left hand panel, individual patients marked up with colors). QRS duration was measured manually (right hand panel) from summed up QRS complexes confirmed to

be identical by morphology inspection at each change in pacing (either from FUSION, Preexcitation Class or electrode configuration).

Supplemental Figure 4. Atrium to left ventricular paced interval in relationship with LV dP/dt$_{max}$.

The interval between RV pace and LV pace can be modified within a CRT device to promote pacing at one site earlier than the other adjusting a VV-delay. In our study the VV-delay was captured within the Preexcitation Classes (PC). When modifying the VV-delay one is also modifying the AV-delay to the respective ventricles, so that with a delayed ventricular stimulation, this ventricle will also experience a delayed AV timing compared to the counterpart. We measured the AV-delay to the earliest ventricular activation in this study and may therefore have missed a relationship between Atrium - LV activation and LV dP/dt$_{max}$. We have therefore, in this supplement, analyzed the delay from atrial pace to left ventricular pace and compared this in a scatterplot to LV dP/dt$_{max}$. No significant relationship was found.