RELATION BETWEEN QRS DURATION AND ATRIAL SYNCHRONICITY IN PATIENTS WITH SYSTOLIC HEART FAILURE: A COLOR TISSUE DOPPLER IMAGING STUDY

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• **Background:** Prolonged QRS is associated with dyssynchronous ventricular contraction in systolic heart failure (HF). However, there is no data about relation between QRS duration and atrial synchronicity in patients with HF.

• **Aim:** We aimed to investigate the effect of QRS duration on intra- and inter-atrial dyssynchrony in patients with systolic HF by using color tissue Doppler imaging (TDI).
Methods: The study population consisted of 70 systolic HF patients and 35 healthy subjects as control. According to QRS (QRS< 120 or ≥120 ms), HF patients were categorized into two groups: narrow QRS group (n=35) and wide QRS group (n=35). (Table 1: Baseline characteristics)

The timing of atrial contraction was measured as the interval between the beginning of P wave on electrocardiogram and the beginning of A-wave on color TDI. The time intervals from the onset of the P wave to the onset of the A wave at the right atrium (P-RA), the inter-atrial septum (P-IAS), and the left atrium (P-LA) were measured.

Intra-atrial dyssynchrony was defined as the prolongation of the differences between P-RA and P-IAS (RA dyssynchrony) (Figure 1) and between P-LA and P-IAS (LA dyssynchrony). Inter-atrial dyssynchrony was defined as the prolongation of the difference between P-RA and P-LA.
Data are expressed as mean ± standard deviation or median for normally distributed data and percentage (%) for categorical variables.
a: control vs. narrow QRS group
b: control vs. wide QRS group
c: narrow QRS group vs. wide QRS group
Figure 1: Color tissue Doppler imaging demonstrates the RA dyssynchrony in control and heart failure subjects. The velocity curves were obtained just below the level of the tricuspid annulus at the right atrium (RA) (yellow) and the inter-atrial septum (IAS) (blue). RA dyssynchrony were measured in control, narrow QRS and wide QRS subjects as 12, 25 and 40 milliseconds, respectively.
Results:

• In patients with both HF groups, we observed a significant impairment in intra- and inter-atrial synchronicity compared with control group.

• The LA dyssynchrony, RA dyssynchrony and inter-atrial dyssynchrony were significantly impaired in the wide QRS group compared with narrow QRS group (LA dyssynchrony: 20.6±3.5 vs. 17.1±3.8, P<0.001; RA dyssynchrony: 36.9±6.8 vs 26.3±4.7, P<0.001; Inter-atrial dyssynchrony: 52.9±6.8 vs. 40.8±6.3, P<0.001) (Figure 2).

• Stepwise multivariate analysis revealed that QRS duration as an independent predictor of intra- and inter-atrial dyssynchrony in systolic HF.
Figure 2: Atrial dyssynchrony in patients with systolic HF with wide QRS duration compared with normal QRS duration and controls.
Conclusion

In patients with systolic HF, prolonged QRS is associated with impaired intra- and inter-atrial dyssynchrony.