Fragmented QRS: A Predictor of Myocardial Fibrosis in Hypertrophic Cardiomyopathy

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Purpose

- Fragmented QRS complexes (fQRS) are defined as different RSR’ patterns with or without an Q wave, including an additional R wave, notching in the nadir of the R wave or the S wave, or the presence of >1 R’ in two contiguous leads (Figures 1A and 1B).
- In the presence of bundle branch block (BBB) or wide QRS complexes (>120 milliseconds), IQRS is defined as the presence of >2 notches (at least 1 notch more than the typical BBB) or multiple notches of the R wave or >2 notches in the nadir of the S wave.

Methods

- The 12-lead ECGs of 82 consecutive patients with HCM who underwent CMR with gadolinium were analysed for the presence of fQRS by 2 independent readers blinded to the CMR findings.
- It is well-established that fQRS on the 12-lead electrocardiogram (ECG) are a predictor of delayed gadolinium enhancement (DGE) on Cardiac MRI (CMR) and indicate myocardial scarring in patients with coronary artery disease & dilated cardiomyopathy.
- Moreover, fQRS appear to correlate well with arrhythmic events and mortality in these cohorts.
- However the significance of fQRS in hypertrophic cardiomyopathy (HCM) is yet to be established.
- We sought to determine whether the presence of fQRS is a predictor of DGE on CMR in patients with HCM.

Results

- Demographics: the number of patients in the DGE +ve group was 44 (male=33, female=11, average age 54 ± 19 years), and in the DGE -ve group 35 (male=27, female=8, average age 57 ± 11 years; Figure 2).
- Patients with documented myocardial infarction (n=3) were excluded from further analysis.
- The ECGs were correlated to CMR findings, and patients separated into DGE positive (DGE +ve) and negative (DGE -ve) groups.
- Electrocardiographic territories of fQRS were correlated with myocardial segments of DGE on CMR, in order to determine whether ECG territories containing fQRS predicted areas of DGE on CMR.

Conclusions

- The presence of a fQRS complex on 12-lead ECG appears to correlate with the DGE on CMR in patients with HCM, with a good PPV and specificity.
- Electrocardiographic territories containing fragmentation also correlate with myocardial segments containing DGE on CMR.
- This simple, inexpensive method may therefore be a valuable tool in predicting scar or fibrosis in patients with HCM. Future work will focus on correlating fQRS with risk factors and events to determine its usefulness in risk stratification.

Declaration of Interest

- No declaration of interest to make.

Figure 1A: The fQRS pattern and its variants (from Das MK, et al. Heart Rhythm 2007:4:1385–1392); B: ECG fQRS in leads II, III, aVF and aVL in a patient with hypertrophic cardiomyopathy.

Figure 2: Demographics of patients in the DGE +ve and -ve groups.

Figure 3: Correlation of fQRS in DGE positive and DGE negative groups.

Figure 4: Correlation of fQRS in the inferior lead territories to areas of DGE on CMR.