Fragmented QRS Wave as a Marker of Cardiac Events in Various Cardiac Diseases

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The fragmented QRS (fQRS) wave, defined as additional spikes within the QRS wave, additional R waves, notched S wave, or >1R’ wave, is an easily evaluated, noninvasive electrocardiographic feature and has been shown to be a marker of subsequent myocardial scar, resulting in an intraventricular conduction defect, and has been postulated to be predictive of outcomes in various cardiac diseases, such as ischemic heart disease, arrhythmogenic right ventricular cardiomyopathy, sarcoidosis, Brugada syndrome and acquired long QT syndrome. Historically, slurring and changes in the QRS wave have been investigated since the 1960s when Flowers et al demonstrated that these QRS waves (they called them high-frequency components) were more commonly observed in patients with prior myocardial infarction and either right and left ventricular enlargement. After that, many studies compared the utility of the fQRS wave and Q wave for detecting myocardial scar in patients with coronary artery disease, and their usefulness for predicting cardiac events, sudden cardiac death, risk of requiring implantable cardioverter defibrillator (ICD) and response to cardiac resynchronization therapy (CRT). In ischemic or non-ischemic heart disease and other cardiac diseases. It is now believed that the fQRS wave can be caused by zigzag conduction around the scarred myocardium, resulting in multiple spikes within the QRS complex, and myocardial scar detected by the fQRS wave is strongly associated with subsequent ventricular dysfunction and is a substrate for reentrant ventricular arrhythmias (VT/VF), but the true mechanism is still unclear.

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The results of the study by Hayashi et al published in this issue of the Journal suggest the interesting possibility that the fQRS wave has a strong association with all-cause mortality and cardiovascular death (approximately 30% vs. 6% during a mean follow-up period of 87 months) in patients with an ICD. They also report that the fQRS was not associated with appropriate ICD discharge (=VT/VF events), compared with the non-fQRS group. Because the patients in this study were a highly selected population, it is not surprising that arrhythmic events was not different between the groups. Thus, we might consider CRT more for patients with a fQRS wave.

This ECG marker is highly convenient but does require a careful attention to the filter setting during recording of the ECG. Further attention should be given to the definition of fQRS wave. The original report from Das et al defined the fQRS in a narrow QRS complex duration (<120 ms) and they added fQRS criteria in a wide QRS complex: the QRS complex with >2R’ waves or notches in the R or S wave in a wide QRS complex of bundle branch block, or paced QRS or premature ventricular complexes in 2 contiguous leads. Accordingly, we need to keep these differences in mind when checking the ECGs.

In conclusion, although the number of patients in this study was small and a further prospective or randomized study is needed to reach a definitive conclusion, Hayashi et al have provided important clinical evidence of fQRS as a strong predictor of cardiovascular death and all-cause mortality in patients with structural heart disease and inducible VT/VF.

References

Fragmented QRS complexes are associated with cardiac fibrosis and significant intraventricular systolic dyssynchrony in nonischemic dilated cardiomyopathy patients with a narrow QRS interval. Echocardiography 2011; 28: 62–68.


