EDITORIAL

Early Repolarization Pattern: Another Brick in the Wall of Vagal Tone

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In the current issue of the *Annals of Noninvasive Electrocardiology*,[1] Baek et al. report that the presence of early repolarization (ER) pattern is independently associated with a slow heart rate, male sex, and increased vagal activity (based on Holter parameters) in a Korean population without obvious structural heart disease. They report a trend toward a higher high frequency (HF) components and a lower low frequency/HF ratio in subject with J wave compared to those without. As already published[2,3] in patients with idiopathic ventricular fibrillation (VF), HF components increased during nighttime versus daytime and is higher in patients with ER pattern compared to patients without this pattern both during daytime and nighttime. One of the strength of this manuscript is the number of patients studied (n = 684) even if the study was retrospective. Other groups already pointed out the relationship between J wave amplitude and bradycardia. Mizumaki et al.[3] compared patients with J wave with (n = 8) or without idiopathic VF (n = 22). They demonstrated that J wave amplitude was independently modulated by both heart rate and vagal activity in normal subjects and in patients with idiopathic VF and ER. By using ambulatory recordings, they demonstrated in a very simple manner a significant increase in J wave amplitude when the heart rate slowed or during increased levels of vagal activity, both phenomena culminated at night. Interestingly in patients with idiopathic VF as compared to control subjects, J wave elevation was more strongly augmented during bradycardia and was associated with an increase in vagal activity. A direct relationship existed between HF components of heart rate variability and the amplitude of J waves in patients with ER and idiopathic VF, but also in their control group although much weaker. Baek et al.[1] find a similar tendency in normal subject with J wave. They also compare functional capacity, peak heart rate, and ST changes during stress test in a small subgroup of patients with versus without ER pattern. No significant difference between patients with and without ER pattern was identified. Unfortunately, there is no description of the ER pattern or ST orientation (horizontal/descending or rapidly ascending/upsloping) during stress test. Classically, ER pattern disappears at increased heart rate.

ER pattern prevalence in their study is 13.4%. Interestingly, this prevalence is highly variable from one study to the other (1.9–31%).[4] Potential explanations include the ethnicity of the population studied (African vs. Asian vs. Caucasian), filters setting, definition of ER. When reading studies on ER pattern, it is important to pay attention to these items. For example, ER pattern is frequent

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in African or African/American and has not been associated with an increased risk in this population. Conversely, in their population from Finland, Tikkanen et al.[5] reported a prevalence of ER pattern with a J wave peak amplitude >0.1 mV of 5.8% and 0.6% if the J wave peak amplitude was >0.2%. This was associated with an increased risk of arrhythmic death of 1.43 and 2.92, respectively. In this study, the authors found a prevalence of 13.4% and 8.7%, respectively. It can be partly due to the different population studied (Korean vs. Finnish). However, a recruitment bias may not be ruled out. It is not really clear why people included in this study had an ECG, echo, and Holter monitoring. Moreover, up to 23.5% of the population had hypertension that may have an impact on the ECG even before clear hypertrophy on echocardiogram. Another unusual finding is the ratio slur versus notch, in our multicentric registry[6]; the ratio slur versus notch of the ER pattern is 74% versus 26%, whereas in this study, notches are highly preponderant (71% vs. 29%). Another potential important bias concerning studies on ECG characteristics is filters settings. It is probably the most underestimated bias concerning all the studies on ECG markers such as Brugada and ER, particularly when looking at fragmentation. In most of the studies, filters are not mentioned and this is a pity. Not so many cardiologists are aware of recommended filters settings. The consensus conference recommends having filters set at 0.67–150 Hz for adults and even 0.67–250 Hz for children.[7]

Finally the definition of ER may also differ from one study to the other. Before the seminal paper of Haissagerre et al.,[8] reporting an association between ER pattern and VF, ER was mainly defined based on the J point including ST elevation but not necessarily slurring or notching. The pattern was mainly present in V_2 to V_6 but rarely in inferior leads whereas since Haissaguerre report,[8] the definition used to identify ER pattern does not include ST elevation but J wave slurring or notching particularly in the inferior leads. ER amplitude is measured on J wave peak and not ST elevation. A consensus document on ER definition has recently been established stressing that any new study on ER should mention precisely how ER was measured to be able to compare the different studies and try to avoid confusion.[9]

Anyways, this study is another evidence that ECG and particularly J wave is intimately related to vagal activity. Although high vagal tone is generally good for athletes, in patients with some kind of channelopathy it may represent the trigger for VF episode.

REFERENCES

1. Baek YS, Park SD, Lee MJ, et al. Relationship between J-waves and vagal activity in patients who do not have structural heart disease. Ann Noninvas Electrocardiol 2015 (In Press).
2. Abe A, Ikeda T, Tsukada T, et al. Circadian variation of late potentials in idiopathic ventricular fibrillation associated with J-waves: Insights into alternative pathophysiology and risk stratification. Heart Rhythm 2010;7:675–682.
3. Mizumaki K, Nishida K, Iwamoto J, et al. Vagal activity modulates spontaneous augmentation of J-wave elevation in patients with idiopathic ventricular fibrillation. Heart Rhythm 2012;9:249–255.
4. Maury P, Rollin A. Prevalence of early repolarisation/J-wave patterns in the normal population. J Electrocardiol 2013;46:411–416.
5. Tikkanen JT, Anttonen O, Junttila MJ, et al. Long-term outcome associated with early repolarization on electrocardiography. N Engl J Med 2009;361:2529–2537.
6. Sacher F, Lim HS, Haissaguerre M. Sudden cardiac death associated with J-wave elevation in the inferolateral leads: Insights from a multicenter registry. J Electrocardiol 2013;46:456–460.
7. Kligfield P, Gettes LS, Bailey JJ, et al.; American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; American College of Cardiology Foundation; Heart Rhythm Society. Recommendations for the standardization and interpretation of the electrocardiogram: Part I: The electrocardiogram and its technology a scientific statement from the American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; the American College of Cardiology Foundation; and the Heart Rhythm Society endorsed by the International Society for Computerized Electrocardiology. J Am Coll Cardiol 2007;49:1109–1127.
8. Haissaguerre M, Derval N, Sacher F, et al. Sudden cardiac arrest associated with early repolarization. N Engl J Med 2008;358:2016–2023.
9. Macfarlane PW, Antzelevitch C, Haissaguerre M, et al. The early repolarization pattern: A consensus paper. J Am Coll Cardiol 2015;66:470–477.