JICC

Review Article

"Early repolarisation syndrome – An update"

CrossMark

T.K. Mishra [a,*], Chandrakant Mishra [b], Biswajit Das [b], N.K. Mohanty [b]

[a] Prof & HOD, Department of Cardiology, S C B Medical College, Cuttack 753007, Orissa, India
[b] Assistant Professor, Department of Cardiology, S C B Medical College, Cuttack 753007, Orissa, India

ARTICLE INFO

ABSTRACT

Early repolarization pattern has been long considered as a benign electocardiographic manifestation. Recent publications however, have drawn attention to increased incidence of sudden cardiac death in this population, suggesting that it is no more a benign condition. As the scientific community is geared towards studying its natural history, pathogenetic mechanism, risk pattern, debate has been raised regarding the nomenclature, pathogenesis and mechanistic issues. Heterogeneity in the population studied and diversity in definitions used make calculating exact odds of risk complicated. However recent publication of definite and probable criteria for diagnosis of ER may bring some semblance to the ongoing debate.

Copyright © 2014, Indian College of Cardiology. All rights reserved.

1. Introducton

Early repolarization pattern (ERP) is a common ECG variant, characterized by J point elevation manifested either as terminal QRS slurring (the transition from the QRS segment to the ST segment) or notching (a positive deflection inscribed on terminal QRS complex) associated with concave upward ST-segment elevation and prominent T waves in at least two contiguous leads.[1] ERP has generally been considered a normal ECG variant with good long-term prognosis.[2] However, this long-held concept has been challenged, and recently published population-based studies and reports of associations with ventricular fibrillation and sudden death continue to fuel more momentum.[3–6] In the seminal article by Haïssaguerre et al, cases of ERP associated with cardiac arrest had at least 0.1-mV J point elevation manifested as QRS slurring or notching in the 2 contiguous inferior or lateral leads.[3] ERP has also emerged as a marker of increased long-term mortality (cardiac and arrhythmic) in the general population. Thus, ERP is probably not as benign as traditionally believed.

Clinical interest in electrocardiographic (ECG) phenomena of early repolarization (ER) has been rekindled recently mainly because of their clinically established association with fatal cardiac arrhythmias, particularly in otherwise healthy individuals with no (or minimal) structural diseases of the heart. ECG phenomena of ER have often been misdiagnosed, misinterpreted, or undermined. This happened mainly because of prevailing opinion of the "benign" or "misleading" nature of various ER phenomena. For instance, early repolarization changes consistent with Brugada syndrome have been interpreted "innocent" and overlooked for decades until 1992.1 Another example - so-called "early repolarization syndrome" (ERS) that universally and unequivocally has been regarded as "normal", "normal variant", "benign early repolarization" until 2000. In 2008, seminal article by Haissaguerre et al accompanied by editorial comments by Wellens and letter to the editor

by Nam et al brought clinical attention to an increased prevalence of the ERS among patients with a history of idiopathic ventricular fibrillation (VF).[7]

The potential consequences of such an association are huge, especially as related to ECG screening and risk stratification in the general population. It is therefore extremely important to read carefully in between the lines the criteria used for the selection of the population. In this regard, the definition of ERP in these reports is crucial, because differences in definition used in studies with inhomogeneous population screening will introduce confusion.

2.   Definition of ER: an evolving concept

In 1936, Shipley and Hallarad analyzed the ECGs of 200 normal persons, aged 20 to 35, and noted first of all that a normal variant of ST elevation occurred quite frequently.[2] In 1938, Tomaszewski presented the case of an accidentally frozen man whose ECG depicted a very slowly inscribed deflection between the QRS complex and the ST segment, representing a J wave.[8] In 1951, Grant et al studied the clinical characteristics of ST-T vectors and coined the term "early repolarization" for this normal variant.[9] In 1953, Osborn[10] described a "current of injury" —later named "the Osborn wave" — in acidotic and hypothermic dogs at rectal temperatures less than 25 °C followed by several publications in the next 10 years considering this pattern a normal variant. These early studies not only were heterogenous in terms of population studied but their definitions were also not uniform. Mehta et al interpreted the ECGs from 60,000 files of adult patients over a 5-year period and kept **ST** elevation of 0.1 mV as a mandatory feature for diagnosing ER. In 1961, Wasserburger[11] described (1) ST elevation, (2) upward concavity, (3) notch and/or slur on QRS, and (4) symmetrical T waves of large amplitudes as criteria for ER. Uberoi et al[12] evaluated the association of ST elevation on cardiovascular mortality in an ambulatory clinic population of approximately 29,000 patients followed longitudinally The following points were used to define the population as ERP positive: (1) PR segment defined the isoelectric line; (2) ST elevation measured at the end of QRS complex; (3) J waves defined as an upward deflection, slurs as a conduction delay beginning on the QRS down stroke; (4) requirement of 2 contiguous leads with ST elevation or J wave was not always fulfilled, especially if the group size was less than 1% of the total population, so 1 lead affection was considered sufficient for inclusion; (5) ST elevation or J wave occurring in the anterior leads (V1 through V3) were not excluded. In 2008 Haïssaguerre et al,[3] proposed a more comprehensive definition of ERP which is widely accepted. The new definition, which has been used exclusively since, requires J-point elevation of at least 0.1 mV in two leads with a slurred or notched appearance, but concomitant ST-segment elevation is not necessary. Following work by Tikkanen et al[6] in 2011, the ST-segment and T-wave morphology were again identified as important. Two ST-segment types were described in addition to the Haissaguerre definition of ER: rapidly ascending with >0.1 Mv ST-segment elevation within 100 ms after the J point or persisting through the ST-segment; and horizontal/descending with ≥0.1 mV ST-segment elevation within 100 ms after the J point. This represents an evolution of the definition into two different forms: one compatible with the original description and seen predominantly in athletes (ER with rapidly ascending ST-segment); and another that historically would not have been considered premature repolarisation (ER with horizontal/descending ST segment). Antzelevitch et al[13] recently published their classification system of ERS, which they termed as J-wave syndrome. Walsh et al[14] examined 5069 participants (mean age 25 years at baseline; 40% black) from the CARDIA (Coronary Artery Risk Development in Young Adults) cohort over 20 years. They used for the first time definite and probable criteria for the diagnosis of ER (Fig. 1).

Definite early repolarization (ER) is defined as the presence of ST-segment J elevation >1 mm in ≥50% of beats, T-wave
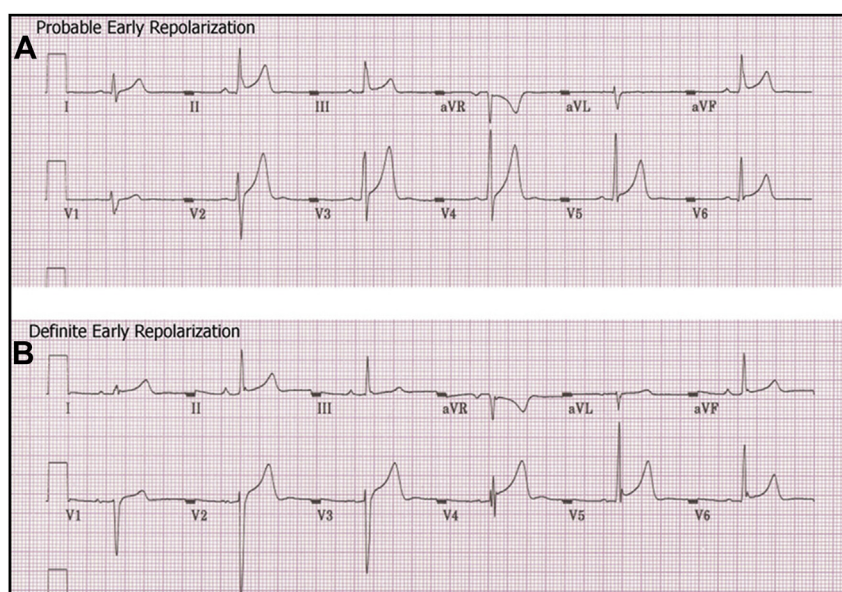

Fig. 1 — **Definite and probable pattern of ER.**