

Early Ventricular Repolarization : ECG Phenomena and Arrhythmogenic Potentials

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Introduction and Background

- ECG phenomena of Early Ventricular Repolarization (EVR) have often been misdiagnosed, misinterpreted, or undermined. This happened mainly because of prevailing opinion of the “benign” or “misleading” nature of various EVR phenomena :
 - Early repolarization changes consistent with Brugada syndrome have been interpreted “innocent” and overlooked for decades - until 1992
 - “Early repolarization syndrome” has been regarded as “normal”, “normal variant”, “benign early repolarization” - until 2000
- Clinical interest in EVR has been rekindled recently mainly because of :
 - “Pre-clinical” concern about “universally and unequivocally benign” nature of ERS (2000)
 - Clinically established association with between ERS (in otherwise healthy individuals with no (or minimal) structural diseases of the heart) and fatal cardiac arrhythmias (2008)

ECG Phenomena of EVR : Definitions

- J-point :
 - point at which there is abrupt transition from the QRS complex to the ST-segment
- J-deflection :
 - deviation of the J-point from the isoelectric line ; common ECG feature of ERS, acute myocardial ischemia, hyperkalemia, and various IVCD
- QRS-notching :
 - J-deflection inscribed on either the downsloping limb of the QRS complex or S wave
- QRS-slurring :
 - smooth and prolonged transition from the QRS segment to the ST segment
- J-wave (Hypothermic, Non-hypothermic, and Idiopathic) :
 - Increased amplitude and duration of the J-deflection that takes the shape of a “dome or a hump”

Summary and Clinical Implementation

1. Different ECG phenomena of the EVR often share similar ECG presentations, yet their mechanisms and arrhythmogenic potentials - different
 - ECG similarities between different ECG phenomena of EVR raise certain concerns for their misdiagnosis, misinterpretation, and clinical relevance
 - Standard 12L ECG is very valuable diagnostic tool to identify ERS subjects, yet its clinical utility in the risk stratification is of limited intrinsic value
2. ERS should not be regarded as either benign or malignant, unless otherwise proven
 - Clinical judgment based on clinical presentation, family history or syncope/SCD, potential use of cardio-active drugs is the most essential in the risk stratification in ERS
 - Additional diagnostic work-up, such as tilt-test, signal-averaging ECG, and EPS with or without drug testing, should be considered on the case-by-case basis upon physician's discretion
 - Genetic screening of ERS subjects at risk could be one of the most important diagnostic tools to identify and/or confirm the diagnosis of primary electrical abnormalities/diseases of the EVR and risk stratification
3. ERS subjects might be predisposed to the drug-induced ventricular arrhythmias
4. New ECG/VCG technologies should be developed and clinically validated to help to identify, differentiate ERS from other forms of EVR phenomena, and stratify this risk