Body Surface Potential Mapping and Conduction Abnormalities at Right Ventricular Outflow Tract in Brugada Syndrome: A Simulation Study

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We proposed computer simulation of body surface potential mapping (BSPM) based on the Wei-Harumi models of normal heart, Brugada syndrome (BrS), and RBBB. The BrS cell models with action potential (AP) dome and prolonged action potential duration (APD) were set at the epicardium of the right ventricular outflow tract (RVOT) in BrS heart models. Type 1 BrS ECGs were reproduced at the right precordial leads both in the standard and higher intercostal spaces (BrS-1SH) or only in the higher intercostal spaces (BrS-1H) through adjusting the locations of BrS model cells. Simulated BSPM of both BrS-1SH and BrS-1H demonstrated an electrical dipole at RVOT and a dipole related to ventricular depolarization at the end of QRS complex, while an electrical dipole with an opposite direction at RVOT and another dipole related to ventricular repolarization were observed during the T wave. Similar dipole patterns at RVOT were not found in the BSPM simulated with normal and RBBB heart models. This simulation research suggests that BSPM may reveal conduction abnormalities at RVOT for the diagnosis of BrS as found by Guillem et al. based on clinical BSPM data.

Keywords: Brugada syndrome, body surface potential mapping, computer simulation