Principal Component Analysis of the QRS Complex During Diagnostic Ajmaline Test for Suspected Brugada Syndrome

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Background: The Brugada syndrome (BS) is often associated with intraventricular conduction disturbances which may worsen the prognosis. We used principal component analysis (PCA) of the QRS complex in order to assess ventricular depolarisation heterogeity during diagnostic ajmaline test in patients with suspected BS. Methods: Digital 10-second 15-lead electrocardiograms (ECG) (500 Hz, 4.88 V resolution, 12 standard leads + leads V1, V2 and V3 recorded one intercostal space higher, V1h to V3h) were acquired in 96 patients with suspected BS and visibly non-diagnostic resting ECGs (60 men, age 39.4±16.7 years) before, during and after administration of ajmaline (1 mg/kg for 5 minutes). PCA was performed on a beat-to-beat basis on the automatically delineated QRS-onset to J-point interval using 3 different sets of leads: a) V1, V2 and V3 (QRS-PCAstand), b) V1h, V2h and V3h (QRS-PCAhigh), and c) V1, V2, V3 plus V1h, V2h and V3h (QRS-PCAtotal). The mean PCA (ratio of 2nd to 1st eigenvalue) of all individual complexes within a 10-s ECG was analysed. Results: There were 23 patients with positive tests (14 male (61%), age 43±17 years) and 73 with negative tests (46 male (63%), age 38±17 years). Among patients with positive tests, those with symptoms (2 of them with syncope and 4 with aborted cardiac arrest) had higher QRS-PCAhigh both before the test (0.39±0.27 vs 0.13±0.11, p=0.003), as well as during maximum effect of the drug (0.32±0.19 vs 0.12±0.06, p=0.001) compared to those without symptoms (n=17). QRS-PCAstand and QRS-PCAtotal were not significantly different between patients with and without symptoms. Following ajmaline, QRS-PCA decreased significantly compared to baseline in patients with negative tests (e.g. QRS-PCAstand: 0.15±0.02 vs 0.08±0.01, p=0.00004), whereas in those with positive tests the change in QRS-PCA from baseline was not significant (0.21±0.19 vs 0.16±0.15, p=0.098). Conclusion: Depolarisation heterogeneity assessed from the high but not from the standard right precordial leads is increased in symptomatic patients with positive ajmaline tests compared to those without symptoms. Heterogeneity of depolarisation exhibits different dynamics during ajmaline testing for BS in patients with positive compared to those with negative tests. PCA of the QRS can help the diagnosis and risk stratification of patients with BS.