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Letters

Type 1 Brugada Pattern Is Associated With Echocardiography-Detected Delayed Right Ventricular Outflow Tract Contraction

Brugada syndrome (BrS) is a channelopathy associated with a peculiar electrocardiographic pattern. Currently, imaging techniques do not have a specific role in diagnosing this arrhythmic syndrome. Some investigators applied Doppler tissue imaging (DTI) to evaluate the difference in time of contraction between the 2 ventricles (1-3). However, because a depolarization delay is likely to occur at the level of the right ventricular outflow tract (RVOT) in patients with BrS, we used DTI to assess whether time to peak myocardial shortening at the RVOT is prolonged in comparison to that at the RV inflow tract.

We compared 37 patients with diagnosis of BrS or Brugada pattern type 1 (BrP1) with a control group of 50 normal subjects without BrP1 matched for sex and age. A genetic test was performed in the study group to evaluate the underlying genetic mutation. A color DTI parasternal short-axis view was obtained at the level of the great vessels including both RV inflow tract and RVOT in the same image. A high frame rate (median value 145 frames/s) acquisition was performed, recording 3 consecutive cardiac cycles in a single cine loop. Using the EchoPAC software version 201 (GE Health Care, Milwaukee, Wisconsin), 3 adjacent sample volumes were positioned on the RV inflow tract and RVOT myocardium, obtaining 6 myocardial velocity curves (**Figure 1A**). The time interval from QRS complex beginning to peak systolic myocardial velocity was calculated on the tricuspid valve side (q-T interval, ms) and pulmonary valve side (q-P interval, ms) curves (**Figure 1A**). These time intervals were corrected for the cardiac cycle length (RR, ms) using the Bazett formula (q-Tc and q-Pc intervals, respectively). The Student's *t*-test and Mann-Whitney *U* test were used to compare parametric and nonparametric data for the study and control groups, respectively. The analysis of variance with Bonferroni correction was used to evaluate multiple comparisons for the time intervals. A value of $p < 0.01$ was considered statistically significant. SPSS software version 25 (IBM Corp., Armonk, New York) was used for statistical analysis. The study was approved by the local ethics committee, and all patients gave informed consent.

Patients in the study group had a mean age of 46 years and 70% were male. Compared with the control subjects, they had larger RV end-diastolic area (median: 18.3 cm^2 [interquartile range (IQR): 16.1 to 22.2 cm^2] vs. median: 15.6 cm^2 [IQR: 14.4 to 19.0 cm^2]; $p = 0.002$) and end-systolic area (median: 11.0 cm^2 [IQR: 9.5 to 13.2 cm^2] vs. median: 8.7 cm^2 [IQR: 7.5 to 11.0 cm^2]; $p < 0.001$), and lower RV fractional area change (42 ± 5% vs. 45 ± 5%; $p = 0.001$).

Patients in the study group had a q-P interval of 141 ± 19 ms versus 133 ± 17 ms in the control group ($p = 0.039$); this difference became statistically significant after Bazett correction (151 ± 23 ms vs. 136 ± 17 ms; $p = 0.001$). The q-Pc interval was longer in patients with BrP1 expressed at the time of echocardiography than in those without (163 ± 25 ms vs. 143 ± 18 ms; $p = 0.008$) (**Figure 1B**). Conversely, it was not different between control subjects and patients without expressed BrP1 ($p = 0.131$) (**Figure 1B**). The q-T interval was not different between the study and control groups (204 ± 27 ms vs. 203 ± 30 ms; $p = 0.926$), even after Bazett correction (218 ± 31 ms vs. 208 ± 29 ms; $p = 0.131$).

The area under the curve for the q-Pc interval was 0.779 (95% confidence interval: 0.624 to 0.935) and a q-Pc interval ≥155 ms had 60% sensitivity, 82% specificity, 69% positive predictive value, 75% negative predictive value, and 73% accuracy in identifying patients with expressed BrP1 at the time of echocardiography. Intraobserver and interobserver variability in measuring the q-P interval were 3.4 ms and 5.5 ms, respectively. No differences in DTI measures were found according to genetic data.

In conclusion, this echocardiographic study demonstrates that individuals with spontaneous BrP1 have a contraction delay at the RVOT level, which is not evident in patients with a diagnosis of BrS without expressed BrP1 at the time of echocardiography. Therefore, a mechanical contraction delay

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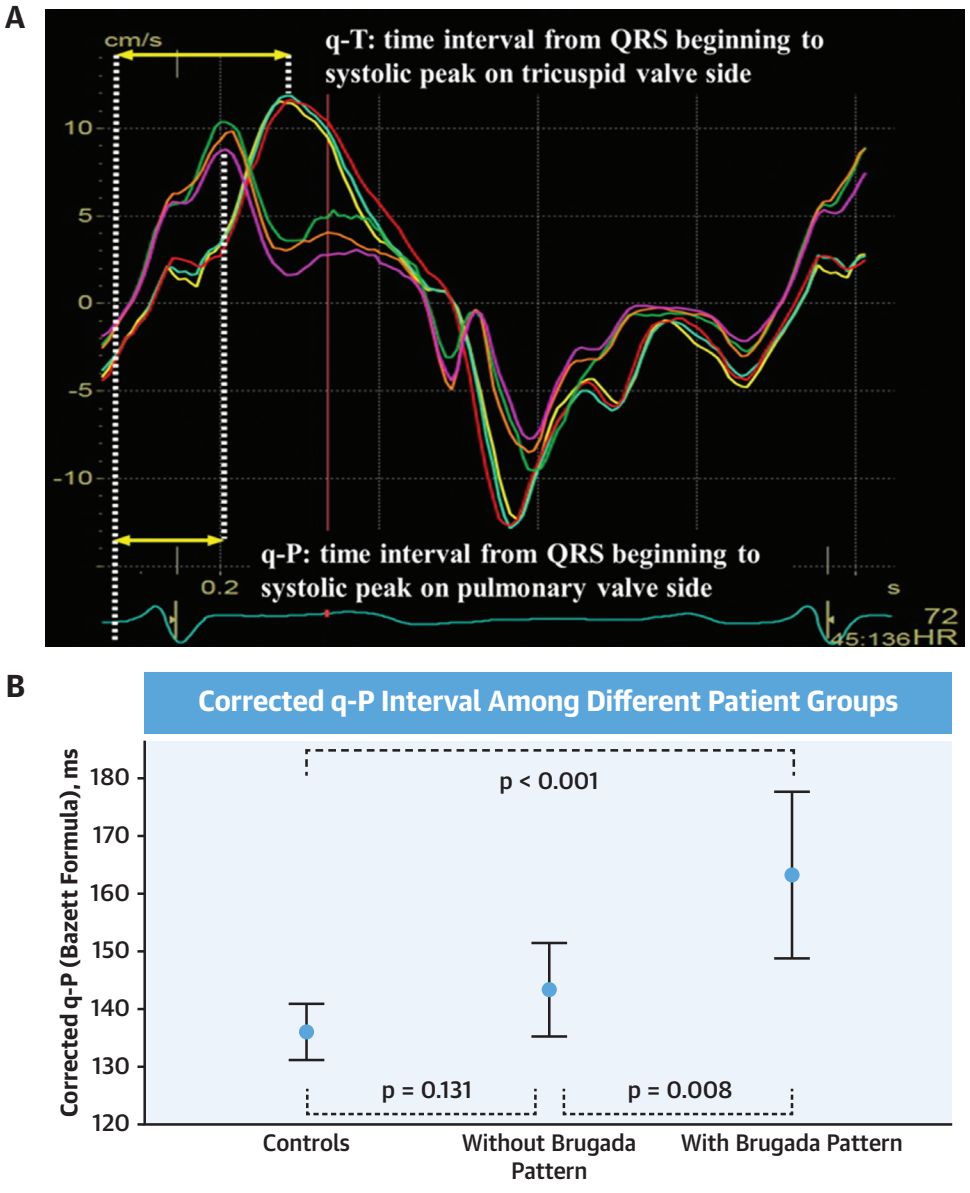
FIGURE 1 Measurement of q-P and q-T Intervals and Comparison Between Control and Patient Groups



(A) Myocardial velocity curves obtained after positioning 3 sample volumes on the right ventricle inflow tract (tricuspid valve side) and 3 on the right ventricle outflow tract (pulmonary valve side). For each time interval, the average value of 3 measurements was taken. **(B)** Mean ± SD of the corrected q-P interval in control subjects, patients without, and patients with Brugada pattern type 1.

within the RV (i.e., a RV intraventricular delay) may be hypothesized when the BrP1 is electrocardiographically expressed.

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Diabetes Mellitus and Risk Stratification After Peripheral Artery Revascularization

Patients with peripheral artery disease (PAD) are at risk for atherothrombotic cardiovascular and limb events (1). Lower extremity revascularization (LER) for PAD is associated with heightened risk for ischemic as well as bleeding complications. Antithrombotic therapies can reduce ischemic events (1), and identifying highest risk patients may help clinicians rationally prescribe post-procedural medications to those with the highest benefit-risk ratio for intensive medical therapy. In patients with coronary artery disease, diabetes mellitus (DM) increases ischemic risk (2); whether concomitant DM is associated with significant incremental risk after LER and could be useful for risk stratification is uncertain. We therefore examined outcomes after LER in patients who have PAD with and without DM in the Premier Healthcare Database (PHD).

The PHD collects inpatient and hospital-based outpatient encounters at participating U.S. hospitals. At the time of analysis, PHD contained data from 685 hospitals and >750 million encounters. Patients age ≥18 years with ≥1 International Classification of Diseases, 9th Revision (ICD-9) discharge diagnosis code for PAD and ≥1 ICD-9 procedure code or current procedural terminology code for LER discharged to home or a nonacute care facility from January 1, 2009, to September 30, 2014, were included. Outcomes included 30-day and 1-year limb and cardiovascular hospitalizations after discharge from the index encounter. Hospitalizations for major adverse limb events (MALEs) involved acute limb ischemia (ALI), major amputation (at or above the ankle), or surgical peripheral revascularization. Comorbidities were identified at admission or within 1 year prior to the index encounter. Relative risks (RRs) with associated 95% confidence intervals (CIs) for outcomes were calculated. Analyses were performed by Premier, Inc. using SAS version 9.4 (SAS Institute, Cary, North Carolina). This study was exempt from Institutional Review Board oversight.

Among 374,776 patients with PAD treated with LER, 148,443 (39.4%) had PAD and DM. Compared with patients who had PAD without DM, those with DM were younger (median age 68 vs. 69 years), less often white (66.3% vs. 77.2%), and had a greater burden of comorbid conditions, including hypertension (91.0% vs. 57.7%), hyperlipidemia (72.1% vs. 44.2%), ischemic heart disease (68.9% vs. 43.1%), and renal insufficiency (38.4% vs. 11.9%; $p < 0.0001$ for all). Patients who had PAD with DM more often had critical limb ischemia (36.5% vs. 19.0%; $p < 0.0001$) and underwent inpatient LER (79.7% vs. 57.8%; $p < 0.0001$) than did patients without DM.

At 30 days, 25,558 (17.2%) patients who had PAD with DM and 23,169 (10.2%) patients who had PAD without DM had ≥1 hospitalization; at 1 year, these numbers increased to 71,846 (48.4%) and 73,314 (32.4%), respectively. At 30 days, patients who had PAD with versus without DM had greater risk of limb hospitalization (5.4% vs. 3.4%; RR: 1.60; 95% CI: 1.55 to 1.65), MALE (3.1% vs. 2.2%; RR: 1.40; 95% CI: 1.34 to 1.45), ALI (0.8% vs. 0.5%; RR: 1.75; 95% CI: 1.61 to 1.90), major amputation (1.4% vs. 0.5%; RR: 2.85; 95% CI: 2.65 to 3.07), and cardiovascular hospitalizations (3.9% vs. 2.3%; RR: 1.68; 95% CI: 1.62 to 1.74). As shown in **Figure 1A**, at 1 year, PAD with versus without DM was associated with increased risk of hospitalization for MALE (RR: 1.42; 95% CI: 1.39 to 1.44), ALI (RR: 1.73; 95% CI: 1.66 to 1.80), and major amputation (RR: 2.92; 95% CI: 2.81 to 3.02). Increased risk for cardiovascular hospitalizations, especially for myocardial infarction (RR: 2.18; 95% CI: 2.08 to 2.28) and heart failure (RR: 2.63; 95% CI: 2.54 to 2.73), was observed for patients who had PAD with versus without DM (**Figure 1B**).