The appropriate method for QT interval measurement to predict ventricular tachyarrhythmias in atrial fibrillation patients

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Introduction: Atrial fibrillation (AF) is a common arrhythmia in critical care units and the treatment of atrial fibrillation can lead to ventricular tachyarrhythmias (VA) due to QT interval prolongation. There is still no standard method for QT interval measurement in AF to prevent ventricular tachyarrhythmias from happening.

Methods: Patients with ICD10 records from 1st January 2014 to 30th September 2018 were identified from all in-hospital AF patients in four critical care units at King Chulalongkorn Memorial Hospital. The QT interval was measured from 12-lead Electrocardiograms (EKG) mainly in lead II and V3 by using Fridericia's QT interval correction (QTc) formula and tangent method. Four intervention methods were used in all patients. (1) Average of QTc intervals following the longest and shortest RR intervals (Long & short method) (2) Average of 3 QTc intervals where the middle QTc interval follows right after the longest RR interval (3 consecutive beats method). (3) Average of QTc intervals for 10 beats that include QTc interval that follows the longest RR interval (10 consecutive beats method). (4) Automated QTc interval from Fridericia's QT correction method by Phillips DXL-12 lead algorithm. Primary outcome was to determine the accurate QTc measurement method to predict VA events in AF patients and the secondary outcome was the accurate QTc measurement method to predict torsades de pointes (TdP) events in AF patients.

Result: 239 from 684 atrial fibrillation patients were included in the study (only 59 samples had adequate automated 12-lead EKGs). Out of all patients included, 48 patients had VA events (20.1%) and 19 patients had TdP events (7.9%). The accuracy to predict VA at QTc ≥ 500 milliseconds are 82.8% for Long & short method (interclass correlation coefficient [ICC] 0.822; 95% confident interval [CI] 0.717, 0.893), 84.9% for 3 consecutive beats method (ICC 0.809; 95% CI 0.694, 0.886), 84.9% for 10 consecutive beats method (ICC 0.846; 95% CI 0.725, 0.915) and 69.5% for Automated QTc interval. The accuracy to predict TdP at QTc ≥ 500 milliseconds are 91.6% for Long & short method, 95.4% for 3 consecutive beats method, 95.4% for 10 consecutive beats method and 74.6% for Automated QTc interval.

Conclusion: Among 4 methods for QT interval measurement studies, 3 and 10 consecutive beats methods have acceptable accuracy to predict ventricular tachyarrhythmias and torsades de pointes events in atrial fibrillation patients. The reproducibility of all 3 methods was acceptable. Automated QTc interval measurement method is easy to use but still needs more evidence to be implemented in clinical practice.