

## The QT interval in epilepsy patients compared to controls

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**Background & Objective:** Patients with epilepsy have a mortality rate two to three times that of the general population. Sudden unexpected death in epilepsy (SUDEP) is a major category in studies of mortality in epilepsy. It may account for 8-17% of deaths in this population.<sup>1</sup> Nonspecific electrocardiographic abnormalities have been observed in epilepsy patients. In 1993, Algra *et al*<sup>2</sup> found that both long and short (<400 ms) QT intervals were associated with a twofold increased risk of sudden death. This study compared the QT interval in epilepsy patients and normal controls and identified factors that affected the QT interval.

**Methods:** Standard 12-lead ECGs were recorded from 70 consecutive epilepsy patients from the neurology clinic of Hospital Universiti Kebangsaan Malaysia and 70 age, race and gender matched controls. The QT interval was measured manually from the beginning of the QRS complex to the end of the T wave by 2 independent observers. The lead with a large T wave and a distinct termination was used. The time-corrected QT interval (QTc) was calculated using the Bazett formula, in which the QT interval was adjusted for heart rate by dividing it by the square root of the R-R interval. Three readings were taken and averaged for each sample. The mean QT interval corrected for heart rate (QTc) for each group was calculated. Short QTc was defined as less than 0.40 sec; calculated from the control group.

**Results:** The mean QTc among the epilepsy patients was  $0.401 \pm 0.027$  sec. It was significantly shorter than the QTc ( $0.420 \pm 0.027$  sec) in the control group ( $p < 0.0005$ ). Thirty-five epilepsy patients (50%) and 17 matched controls (24.3%) had a mean QTc shorter than 0.40s ( $p = 0.001$ ). Among the epilepsy patients, the mean QTc did not significantly differ between patients in the duration ( $F = 0.836$ ,  $p = 0.438$ ) and frequency ( $F = 0.273$ ,  $p = 0.845$ ) and types of seizures ( $p = 0.633$ ). There was no significant difference in the mean QTc between the epilepsy patients on different number of antiepileptic agents ( $F = 0.444$ ,  $p = 0.643$ ). Patients with cryptogenic epilepsy had a mean QTc of  $0.392 \pm 0.029$  sec, which was significantly shorter than patients with symptomatic epilepsy (QTc =  $0.410 \pm 0.027$  sec,  $p = 0.015$ ). The mean QTc of the same subjects showed no significant interobserver difference ( $p = 0.661$ ).

**Conclusion:** Epilepsy patients demonstrated a significantly shorter QTc than controls in this study, particularly in the subgroup of patients with cryptogenic epilepsy. This observation revealed previously unrecognized QTc abnormalities in epilepsy patients. Thus, epilepsy patients need to be actively screened for QTc as both shortened and prolonged QTc are associated with increase risk of sudden cardiac death. However the clinical significance of QTc abnormalities, observed in the present study; in relation to the pathogenesis of SUDEP merits further evaluation.

### References

1. Cockerell OC, Johnson AL, Sander SW, Hart YM. Mortality from epilepsy: results from a prospective population-based study. *Lancet* 1994; 334: 918-21.
2. Algra A, Tijssen JGP, Roelandt JRTC, *et al*. QT interval variables from 24 hour electrocardiography and the two year risk of sudden death. *Br Heart J* 1993; 70: 43-8.