

## Electrocardiographic Frontal QRS-T Angle is a Highly Significant Predictor of Increased Morbidity and Mortality in Patients with Chronic Heart Failure

Israel Gotsman, Andre Keren, Yaron Hellman, Jeffrey Banker, Chaim Lotan, Donna R. Zwas  
Heart Institute, Hadassah University Hospital, Israel

### **Background:**

The risk of death in heart failure (HF) is high. The electrocardiographic spatial QRS-T angle reflects changes in the direction of the repolarization sequence and predicts death in the general population. The frontal QRS-T angle is simple to measure but has not been evaluated in a large chronic HF cohort. We examined the significance of the frontal QRS-T angle in predicting clinical outcome in a large cohort of patients with HF.

### **Methods:**

QRS-T angle was calculated from the frontal QRS and T axis of the baseline 12-lead surface electrocardiogram. Patients were followed for cardiac related hospitalizations and death.

### **Results:**

5,038 HF patients were evaluated. Mean follow-up was 576 days; 51% were males. Overall survival during follow-up was 83%. QRS-T angle was a significant predictor of reduced survival (Figure). Cox regression analysis after adjustment for significant predictors including age, gender, IHD, hypertension, atrial fibrillation, body mass index, pulse, serum hemoglobin, sodium, eGFR and urea levels demonstrated that the QRS-T angle was an incremental predictor of increased mortality in both genders; women: QRS-T angle  $\geq 60^\circ$  (HR 1.35, 95% CI 1.04-1.75,  $P < 0.05$ ); QRS-T angle  $\geq 120^\circ$  (HR 1.45, 95% CI 1.10-1.92,  $P < 0.01$ ); men: QRS-T angle  $\geq 132^\circ$  (HR 1.53, 95% CI 1.14-2.06,  $P < 0.01$ ); whole cohort: QRS-T angle  $\geq 125^\circ$  (HR 1.47, 95% CI 1.20-1.80,  $P < 0.0001$ ). QRS-T angle was also an independent predictor of increased cardiac-related hospitalizations. QRS-T angle was a predictor in patients with reduced and preserved left ventricular function and in patients with normal QRS interval.

### **Conclusions:**

QRS-T angle is a powerful predictor of outcome.

QRS-T angle should be part of the electrocardiographic evaluation of patients with HF.

