QRS T ANGLE PREDICTS MAJOR CARDIAC EVENTS IN HAEMODIALYSIS PATIENTS

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OBJECTIVES

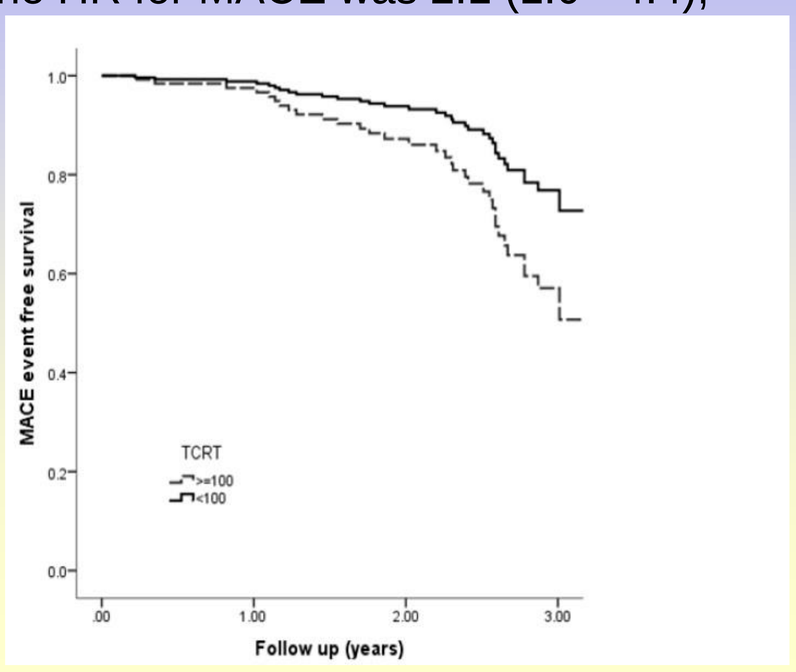
Cardiovascular disease is the most common cause of mortality in dialysis patients but accurate risk prediction is lacking. Non-atherosclerotic risk factors are believed to significantly contribute to the burden of cardiac disease although the pathogenic mechanisms are not fully understood in this population. Wide spatial QRS-T angle calculated from resting digital 12 lead ECG is a marker of global repolarisation heterogeneity which is associated with increased cardiac risk in non CKD population. Recently, it was shown that QRS-T angle calculated from signal-averaged electrocardiograms predicts risk in dialysis patients. The aim of this study was to assess the prognostic value of QRS-T angle calculated in routinely collected snapshot electrocardiograms in haemodialysis patients.

METHODS

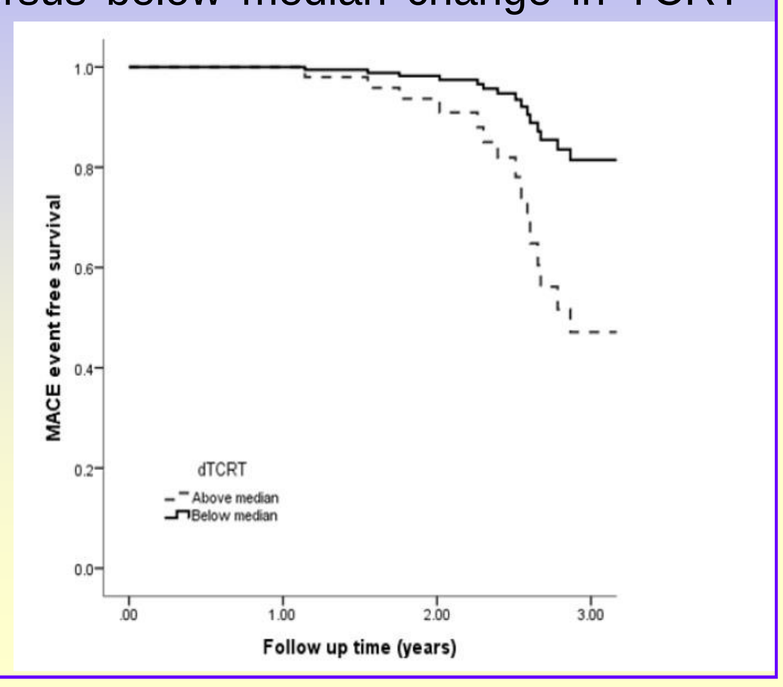
This was a single center prospective study of adult haemodialysis patients. ECG were performed on the same non-dialysis day during a short midweek break with the patient clinically stable and were repeated annually. QRS-T angle was calculated from the 10 second ECG as the total cosine R-to-T (TCRT) using singular value decomposition with the aid of custom written software and is expressed in degrees. Abnormal QRS-T angle (TCRT) was defined as ≥100o. Follow up was until death, transplantation, or most recent dialysis session. Follow up was censored at transplantation. End points were death and major cardiac events (MACE: acute coronary syndrome, coronary revascularisation, hospitalisation due to heart failure or arrhythmia, cardiac or sudden cardiac death).The association of TCRT ≥100o with these end points was calculated using a Cox proportional hazard model adjusted for age, gender, time on dialysis, left ventricular ejection fraction, and left ventricular mass indexed to height. The univariate association of above versus below median annualised change with MACE was calculated using a Cox proportional hazard model.

RESULTS

There were 170 patients: mean age 61±15 years, time on dialysis 4±7 years, 66% male gender, 17% coronary artery disease. The mean TCRT was 88 ± 39o, 70 patients 41% had TCRT ≥100o. Follow up was 2.1 ± 0.8 years during which there were 40 deaths (24%) and also 40 MACE. The hazard ratio for death if TCRT ≥100o was 0.80 (0.40 - 1.59), p = 0.524. The HR for MACE was 2.1 (1.0 - 4.4), p = 0.039



There were 74 patients with follow up analysable electrocardiograms (age 62±14 years, 16% coronary artery disease, 69% male). Baseline QRS-T angle (TCRT) was 86 ± 36o and median (range) annualised change was 5 (-84 to +127)o. Over a follow up of 2.3±0.7 years there were 17 MACE end points. The HR for MACE in above versus below median change in TCRT (dTCRT) was 3.67 (1.27 - 10.60, p = 0.036)



CONCLUSIONS

Baseline abnormal values and longitudinal changes in QRS-T angle (dTCRT) correlate with adverse cardiac outcomes and may improve risk prediction models in haemodialysis patients.

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