Increased Repolarization Heterogeneity is Associated with Increased Mortality in Hemodialysis Patients

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Background: End Stage Renal Disease (ESRD) is a costly and disabling condition that is associated with a high mortality rate (160 per 1000 patients/year). Today, there are approximately half a million people in the US with ESRD on hemodialysis. Cardiac disease is implicated in as many as 44% of these deaths. Amongst those, cardiac arrhythmias represent 61% of all cardiac deaths. We tested the hypothesis that ECG parameters measuring ventricular repolarization were associated with cardiac death when monitored during or after hemodialysis session (HS). Method: We enrolled ESRD patients with high risk for fatal events over a period of 1 year. Twelve-lead Holter ECGs were recorded for 48 hours starting 30 minutes before the onset of the HS. The ECG measurements include VPCs frequency, QTc, T-wave complexity, QRS-T angle amongst others. We used linear mixed effect models with autoregressive covariance structure to investigate the differences in ECG trends during and after the HS between groups. Results: Forty two ESRD patients were enrolled and survived the 13-month follow-up period (age: 63 ± 12 yrs, EF: $59\pm15\%$, 25 females) while 8 enrolled patients did not (age: 60 ± 12 yrs, EF: $58\pm22\%$, 5 females). No differences in dialysis methods and patients electrolytes were found but the duration of the HS was shorter in non survivors (203 ± 24 vs. 240 ± 29 min., p=0.023). Frequency of ventricular ectopic beats was significantly higher during the second hours of the dialysis in patients who did not survive (26 ± 20 vs. 3 ± 14 VPCs/hour, p=0.02); no statistical differences were found for other parameters during the HS. During the 48 hours following the HS, the non-survivor group had lower heart rate (RR intervals: 855 ± 91 vs. 775 ± 134 msec., p=0.01), increased T-wave complexity (0.29 ± 0.15 vs. 0.23 ± 0.17, p=0.05). Conclusions: More frequent dialysis-induced ventricular ectopy, lower heart rate and increased T-wave complexity indicate increased risk of mortality in ESRD patients.