ECG-Based Monitoring of Electrolyte Fluctuations During the Long Interdialytic Interval

Ana Rodrigues*, Andrius Petrėnas, Neda Kušleikaitė-Pere, Pablo Laguna, Vaidotas Marozas

Biomedical Engineering Institute, Kaunas University of Technology, Kaunas, Lithuania

**Aims:** Life-threatening arrhythmias commonly occur in hemodialysis (HD) patients during the long interdialytic interval (LII) due to electrolyte fluctuations (EFs). Noninvasive monitoring of EFs at home would allow restoring normal levels by performing early HD before the onset of arrhythmias. This study proposes an ECG-derived descriptor capable of capturing EFs during HD and LII.

**Methods:** ECG and blood samples of 3 patients were acquired during LII, starting at Friday’s HD and ending at Monday’s HD. Gaussian and lognormal functions were fitted to the T wave to characterize the left ($S_L$) and right slope ($S_R$), respectively. Assuming the difference between the two slopes angles varies due to EFs, the changes in the T wave can be reflected by

$$S_{\theta\mu} = \sqrt{(\tan^{-1}(S_R \cdot \mu_R))^2 - (\tan^{-1}(S_L \cdot \mu_L))^2}$$

where $S_L$ and $S_R$ is the mean of the derivative of each slope, and $\mu_L$ and $\mu_R$ are obtained by the composite model used to describe each correspondent slope.

**Results:** Results show that the decrease of the proposed parameter during Friday’s HD is correlated with the decrease in serum electrolyte levels. $S_{\theta\mu}$ tends to increase during the LII (no blood sample was obtained) and further decreases during Monday’s HD.

**Fig. 1** The proposed parameter (top row) compared with the synchronously acquired serum electrolyte levels (bottom row). Note that blood samples were not taken during the LII.

**Conclusions:** The proposed parameter is correlated with the serum electrolyte levels, thus has potential to be used for noninvasive monitoring EFs during the LII between HDs.