

Oral Communication Abstract

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Intradialytic Monitoring of Stroke Volume using EIT: A Feasibility Study

Ahrim Han¹, Sehun Kwon¹, Yang-Gyun Kim¹, Sang-Ho Lee¹, Tong In Oh², Eung Je Woo², Ju-Young Moon¹

¹Department of Internal Medicine, Kyung Hee University Hospital at Gangdong, Korea, Republic of

²Department of Medical Engineering, Kyung Hee University School of Medicine, Korea, Republic of

Objectives: Intradialytic hypotension is the most common complication in 20-30% of patients for hemodialysis. The patient's hemodynamic status changes rapidly over time, and it is difficult to provide timely patient-specific treatment by monitoring them non-invasively.

Methods: First, we measured the patient's height and weight, and BCM was measured to assess dry weight and determine the fluid overload. The patient's blood pressure was measured at 20-second intervals using a ClearSight finger cuff and EV1000, and the patient's hemodynamic status was evaluated through echocardiography before and after hemodialysis. In 4 hours of hemodialysis using an HD machine, impedance images were simultaneously acquired at 100 frames/s using a high-speed EIT system (AirTom-R) and a pad electrode that included 16 electrodes. Additionally, blood pressure was periodically measured using NIBP every 30 minutes. The self-reported symptoms and treatment intervention were recorded in the case report. We calculated relative thoracic impedance (TI) changes from the reconstructed time-difference EIT images. Five times of HD sessions were monitored for each patient.

Results: The difference of systolic blood pressure more than 20 mmHg between before and during hemodialysis was reported in 18 out of 25 cases. The hypotensive symptoms occurring as systolic blood pressure declining below 100mgHg was reported in 9 out of 18 cases. These results were interpreted with AirTom-R indicators on 5,10 and 15 minutes before hypotensive events, and clinical data was obtained for its correlation. The changes in delta stroke volume and delta cardiac output were observed 420 seconds and 360 seconds before hypotensive events, respectively - these changes were monitored in a real-time sequence.

Conclusions: From the results of the clinical study, we showed the possibility of real-time, non-invasive monitoring of hemodialysis patients with rapidly changing hemodynamic parameters using EIT technology. We look forward to developing into clinical technology for predicting IDH or for patient-specific treatment interventions and verification.

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Figure 1: Clinical trial for hemodynamic monitoring during hemodialysis.

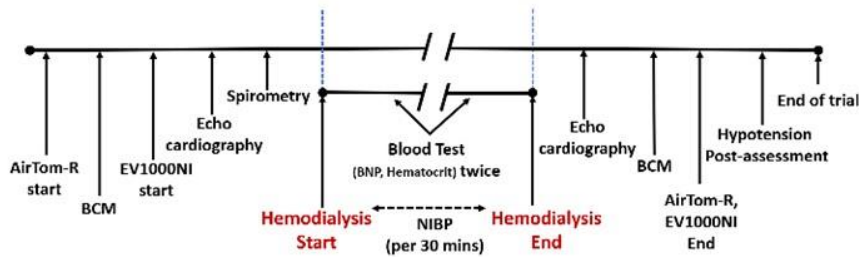


Figure 1: Clinical trial for hemodynamic monitoring during hemodialysis.

Figure 2. Extracted hemodynamic parameters from EIT images

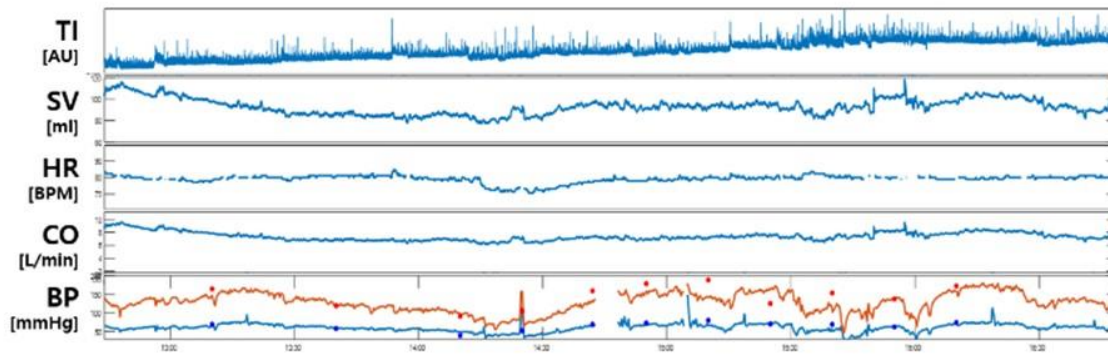


Figure 2: Extracted hemodynamic parameters (TI, SV, HR, CO) from EIT images synchronously measured with BP during hemodialysis.