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P260 -FREQUENCY ANALYSIS REVEALS UNIQUE HAEMODYNAMIC RESPONSES TO HAEMODIALYSIS: BASELINE RESULTS FROM THE ITREND STUDY

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Introduction:
Intradialytic haemodynamic instability remains a significant problem, leading to long-term consequences including ischaemic end-organ damage. Using continuous intra-dialytic haemodynamic monitoring over sequential dialysis sessions, we aimed to improve the characterisation of individual responses to dialysis.

Methods:
50 participants aged >18 years were recruited from our prevalent dialysis population. Patients' demographics, dialysis background, dialysis prescription and laboratory parameters pre and post dialysis at each session were recorded. All participants had continuous non-invasive monitoring of haemodynamics using pulse wave analysis (Finapres NOVA) during three consecutive dialysis treatments over one week. The reconstructed central aortic waveform allowed calculation of a full range of continuous haemodynamic variables including pulse rate and systolic blood pressure (SBP). The haemodynamic data generated by the Finapres were then analysed further by first identifying the frequency and amplitude of local extrema points (maxima and minima) for SBP[1]. A modified Short-time Fourier Transform method was then applied as a moving asynchronous filter to extract the sinusoidal frequency and phase content of time-varying SBP signals. These spectra were then decomposed into constituent frequency events using the Freedman-Diaconis rule, and plotted as histograms for each individual patient. Finally, sum of squares estimation was used to quantify the variability during and between treatments as well as the variability between patients.

Results:
In total, 44 participants completed all three dialysis sessions with continuous haemodynamic monitoring. 61% were males, mean age was 62.3±16yrs and 43% had diabetes. Analysis of standard haemodynamic parameters showed intradialytic trends in keeping with previously reported data: a gradual near-linear decline in blood pressure, cardiac output, stroke volume; and a rise in total peripheral resistance. However, there was significant intra-individual variation in SBP and haemodynamics between dialysis sessions (examples shown in figure 1). In contrast, frequency analysis of beat to beat blood pressure trends showed a characteristic pattern of results that was unique to each individual, and reproducible for that patient across different dialysis sessions, as shown in Figure 2 (representative histogram plots for frequency response of SBP).

Conclusions:
Blood pressure and haemodynamic changes during haemodialysis treatments are significant, but high variability in standard haemodynamic measures between treatments does not permit characterisation of individual patient responses. In contrast, frequency analysis of SBP changes during dialysis remains consistent within individuals, and may provide a unique descriptor for patients' cardiovascular response to haemodialysis. Prospective follow up of the study cohort with repeat haemodynamic measurement is ongoing, to establish the physiological significance of the different patterns of SBP frequency analysis and how they relate to patient outcomes.