Comparison of Voltage Map Calculation Methods using Non-Fractionated EGM Signals in a Persistent AF Patient

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Aims: Catheter ablation targeting low voltage areas (LVA) is commonly being used to treat atrial fibrillation, specifically in patients with persistent AF. However, it is not always certain that the areas marked as low voltage were robustly found. This can be related to how the voltage is calculated. Therefore, this paper focuses on comparing different voltage calculation methods in AF, specifically, the difference between using one beat compared to the whole signal and using various time segments of the signal.

Methods: A voltage map obtained in AF was used, removing points, which did not meet the required specifications. The peaks for the remaining points were then found in various segments of the signals and the voltage was calculated based on taking the peak to peak (p2p) for different beats. This includes calculating the mean, median and 75% quartile over 1.25s segments and the entire 2.5s signals.

Results: For around 44% of the points on the map, the voltage only changed by 0.1mV when taking one beat versus all beats for calculating the voltage, with an average difference of 0.2mV between methods. However, for some individual points, the difference was substantial, with a change of around 0.8mV, depending on the beat chosen. Additionally, a significant difference ($p < 0.05$) of around 0.05mV occurred when the voltage was calculated in the first half of the signal rather than the second half for all methods.

Conclusion: It was found that taking the median over all p2p values in each point would be a more appropriate method for calculating the voltage. Thus, providing a technique, which could improve the accuracy of identifying LVA in an AF map.