

ORAL PRESENTATION

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# Altered electrophysiological properties and deranged cardiac autonomic modulation predispose patients to atrial fibrillation after arrested heart operations

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## Background

Advanced Heart Rate (HR) Variability analyses applying non-linear dynamics and chaos theory provide information about derangement of cardiac autonomic modulation predicting ventricular or atrial arrhythmias. Aim of the present study was to determine which high-resolution ECG and non-linear HR dynamics parameters predispose to development of postoperative atrial fibrillation after surgery on the open arrested heart.

## Methods

43 consecutive patients, 26 men, mean age 70.3 yrs referred either for isolated aortic valve replacement ± concomitant coronary revascularization or Bentall procedure were enrolled into the study. High-resolution 20-minute ECG recordings were performed one day before operation to determine RR, PQ, QT and QTc interval as well as non-linear HR parameters by Detrended Fluctuation Analysis (DFA) with short- ( $\leq 11$  beats) and long-term ( $> 11$  beats) correlation properties of R-R intervals. Statistical analyses included paired-samples t-test, Mann-Whitney or Fischer exact test. Results were reported as mean  $\pm$  SE;  $p < 0.05$  or less was considered significant.

## Results

Out of 43 patients 26 developed AF after operation (AF group) and 17 did not (noAF group). The two groups had similar demographic and perioperative characteristics. Cardiopulmonary bypass time ( $112 \pm 28$  vs.  $97 \pm 30$

min;  $p = 0.11$ ) and aortic cross-clamp time ( $83 \pm 22$  vs.  $76 \pm 27$  min;  $p = 0.15$ ) tended to be longer in AF group. There were no differences in RR, QT or QTc interval between AF and noAF group ( $64 \pm 11$  vs.  $65 \pm 10$ ,  $420 \pm 32$  vs.  $436 \pm 51$  and  $432 \pm 26$  vs.  $452 \pm 55$  ms, respectively;  $p = \text{NS}$ ). DFA parameter  $\alpha_1$  tended to be higher and DFA  $\alpha_2$  proved consistently higher in AF group ( $0.98 \pm 0.36$  vs.  $0.86 \pm 0.28$ ;  $p = 0.26$  and  $0.89 \pm 0.17$  vs.  $0.76 \pm 0.18$ ;  $p = 0.018$ ). In addition, PQ interval was consistently shorter ( $160 \pm 20$  vs.  $184 \pm 44$ ;  $p = 0.033$ ) in AF group.

## Conclusions

We describe for the first time that patients prone to postoperative AF after arrested heart surgery exhibit profoundly altered non-linear Heart Rate dynamics and shorter PQ interval already preoperatively and independently of perioperative factors. In accordance with the results from our previous beating heart studies, parameter DFA  $\alpha_2$  comprehensively indicates higher risk of postoperative atrial fibrillation occurrence.

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