

Amplitude Symbolic Analysis Identifies Patients at Risk of Developing Atrial Fibrillation after Cardiac Surgery

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Atrial fibrillation (AF) is one of the most common complications after cardiac surgery, characterizing about 20-40% of patients. Autonomic control impairment, usually studied via heart rate variability, has been suggested as one of the possible leading factors.

We here propose the use of symbolic analysis (SA) and amplitude SA (ASA) markers as derived from the heart period (HP) time series to predict the risk of post-surgery AF. HP was derived from 76 patients in sinus rhythm undergoing cardiac surgery, studied before (BASAL) and after (ANESTH) propofol general anesthesia induction. Patients were labeled as AF (n=21) or noAF (n=55) whether they presented or not a new AF onset after surgery.

Markers of traditional HP variability, of SA and ASA were extracted in BASAL and ANESTH. Results show that SA and ASA were able to detect the expected depression of autonomic control during anesthesia and that ASA markers were able to discriminate noAF and AF patients, with AF showing a reduced cardiac autonomic control in BASAL. Amplitude one variation marker (a1V) was the ASA marker better discriminating groups, being equal to $708 \pm 708 \text{ ms}^2$ in noAF and $309 \pm 379 \text{ ms}^2$ in AF. Remarkably, a1V in BASAL showed the best association with the AF outcome with respect to other variability and traditional clinical variables, reporting an area under the ROC curve of 0.72, a sensitivity of 0.74 and specificity of 0.67.

Present findings suggest the preoperative computation of ASA markers in cardiac surgery patients to improve risk stratification for post-surgery AF.

Acknowledgement: This work was supported by the Italian Ministry of Health Grant GR-2021-12372037.