Università
della
Svizzera
italiana

Faculty of Biomedical Sciences

PhD Position

Development of a three-dimensional atrial model for evaluating atrial abnormalities in patients with Brugada syndrome

The Center for Computational Medicine in Cardiology (CCMC), part of the Institute of Computational Science (ICS), Università della Svizzera italiana, Switzerland is looking for a highly motivated PhD student to develop new methods for the analysis and processing of ECG signal data from patients with Brugada syndrome.

The environment
This position is funded by the Swiss National Science Foundation (SNSF) within the project "A novel approach to assess atrial electrical abnormalities in patients with Brugada syndrome: From the ECG to the creation of a patient-specific cardiac model". This is a joint effort between Dr. Giulio Conte (Cardiocentro Ticino), and Prof. Auricchio (CCMC). ICS, chaired by Prof. Rolf Krause, is the largest institute in Switzerland devoted to Computational Science and operates in close collaboration with the CSCS (Centro Svizzero di Calcolo Scientifico) and the CCT (Cardiocentro Ticino). The student will join CCMC, which provides an interdisciplinary environment for the cooperation of computational scientists and cardiologists.

The project
Brugada syndrome (BrS) is a rare cardiovascular disease, caused by genetically-determined ion channel dysfunction, leading individuals with no overt cardiovascular abnormalities to an increased risk of cardiac arrhythmias and sudden cardiac death (SCD). Among the heterogeneous spectrum of the inherited primary arrhythmia syndromes, BrS present with the highest prevalence and a high rate of atrial arrhythmias, more specifically atrial fibrillation (AF) leading to a challenging management. Over the past two decades, our understanding of BrS has been enriched by a considerable number of studies aimed at defining the clinical characteristics, the genetic, cellular and molecular features predisposing patients to an enhanced risk of ventricular arrhythmias. In contrast, a full understanding of the pathogenic mechanisms of atrial arrhythmias in these patients is missing and very little is known about the causative role of the genetically-determined ion channel dysfunction on atrial conduction abnormality. The prognostic role of the presence of atrial arrhythmias in BrS is also controversial. Similarly, unknown is the relationship between the atrial and ventricular phenotype on standard 12-lead electrocardiogram (ECG), and whether the coexistence of a given atrial ECG phenotype with a specific ventricular ECG phenotype influences the risk of subsequent atrial and/or ventricular arrhythmias, conferring an overall higher risk profile to a patient. The best diagnostic and therapeutic management strategy for these patients is therefore unclear and needs a refinement.

A multimodality multiscale approach will be used for the project including patients' clinical data, cardiac magnetic resonance (CMR), ECG advanced signals post-processing analysis, electrophysiologic study (EPS) results and high-resolution cardiac mapping. All these data will be integrated into a generic cardiac model to obtain a patient-specific model. The patient-specific cardiac model will enable the assessment of propensity to atrial arrhythmias

development, the identification of the underlying pathophysiological mechanisms and the evaluation of the response to different pharmacological and invasive therapeutic strategies.

Your challenge
As a PhD student your main tasks are:

- To analyze and post-process continuous, high-resolution 16-lead ECG recordings in sinus rhythm and to extract relevant information regarding P-wave morphology from the ECG signals from different population of patients.
- To perform statistical analysis with the ECG data to uncover possible correlation and biomarkers for classification of Brugada syndrome.
- To have a good understanding of cardiac electrophysiological abnormalities scenarios, with emphasis on Brugada syndrome.
- To publish your research findings in medical, engineering, and physiology journals;
- To assist in teaching activities for biomedical students.

Your profile

- You have a solid background in biomedical engineering, signal analysis, statistics and possibly applied mathematics;;
- You are interested in cardiac arrhythmias and heart rhythm disturbances;
- You have a master's degree in Biomedical Engineering, Physics or Applied Mathematics;
- You have good verbal and written communication skills (English);
- Experience with Matlab, R is an advantage

Salary
In accordance to the SNF regulations.

Application
Interested candidates can send their applications with references and school transcripts Prof. Angelo Auricchio (angelo.auricchio@cardiocentro.org) or Dr. Giulio Conte (giulio.conte@cardiocentro.com)

Deadline
Applications received by November 15th, 2018 will be given priority.
For more detailed information, please contact: Prof. Angelo Auricchio (angelo.auricchio@cardiocentro.org) or Dr. Giulio Conte (giulio.conte@cardiocentro.org)