Shared UHasselt - MUMC+ (double degree) PhD position

Noninvasive electrocardiographic imaging for improved mechanistic understanding and risk stratification of ventricular tachyarrhythmias

Title: "Noninvasive electrocardiographic imaging for improved mechanistic understanding and risk stratification of ventricular tachyarrhythmias"
Type: Double doctorate degree (PhD) program
Investigators: Volders, Peeters (Maastricht), Dendale (Hasselt)
Period: 2017-2022
Employment: Maastricht (Maastricht UMC+)
Working locations: Maastricht (Maastricht UMC+) & Hasselt (UHasselt & Jessa Hospital)
Date: September 29, 2017
Contact: Prof. Dr. P.G.A. Volders, Cardiologist, Maastricht UMC+
p.volders@maastrichtuniversity.nl

Call for PhD candidate

The research teams of MUMC+ (Maastricht, the Netherlands) and UHasselt (Hasselt, Belgium) collaborate to improve understanding of cardiac arrhythmias and are now hiring a PhD candidate. If you have a MSc degree in Biomedical Engineering, Technical Medicine, Knowledge Engineering, or Applied Mathematics, and you have a demonstrable interest in computational modeling, cardiac imaging, image integration, and/or arrhythmology, this may be a unique opportunity to join internationally renowned investigators on the topic of ventricular arrhythmias and sudden cardiac death.
Our projects focus on the:
(1) establishing of a registry of patients in the Maastricht-Hasselt region with potentially life-threatening ventricular arrhythmias and risk for sudden cardiac death;
(2) characterizing the substrate of such arrhythmias with the novel modality noninvasive electrocardiographic imaging and with invasive intracardiac recordings; and
(3) mechanistic study of arrhythmogenesis with computational modeling.

Requirements

- MSc degree in Biomedical Engineering, Technical Medicine, Knowledge Engineering, Applied Mathematics, or similar. Candidates in the last months of their MSc training may also apply. Clinical doctors who wish to combine their work with a PhD trajectory are also invited but should demonstrate strong interest in computational modeling.
- Excellent CV with demonstrable interest in computational modeling, cardiac imaging and/or arrhythmology, and with a high potential to achieve the PhD degree;
- Team player with an interest to join an international consortium study with investigator meetings and patient contacts across borders.

Conditions of employment

We offer
- ample opportunities for further training, and for developing greater depth and breadth;
- a salary in line with the Collective Labor Agreements of Universities in The Netherlands or Belgium

The appointment will be preferably full-time (38 hours a week), but candidates who prefer 32 hours per week can be considered.

Contract type: temporary, 3 to 4 years until PhD, with continuation after the first year upon proven qualified performance.

Project summary

Heart-rhythm disorders remain a major cause of morbidity. In severe cases, they can precipitate ventricular fibrillation, resulting in sudden cardiac arrest/death (SCA/SCD). Importantly, SCD underlies two-thirds of the sudden deaths in individuals under the age of 40 years. However, in a majority of these patients, no structural cause (e.g., scar from myocardial infarction) can be found. In this doctorate project, we will combine advanced noninvasive imaging methods with computer models to investigate non-structural (i.e., purely electrical) causes of arrhythmias. A novel imaging method, called ECG-imaging (ECGI), will be employed in patient populations with ventricular tachycardia and/or susceptibility to ventricular fibrillation known to cardiologists in Maastricht and Hasselt. This method allows investigating the electrical characteristics in much more detail than has been possible before with standard clinical tools. Invasive electrophysiological recordings will be used to validate noninvasive ECGI reconstructions in patients in whom a cardiogenetic diagnosis is also often made. Moreover, by integrating electrical characteristics in computer models of electrical heart activity at the cellular, tissue and organ level, we will create a patient-specific computer model in which the determinants of arrhythmias can be examined virtually. This will lead to better understanding of the arrhythmogenic mechanisms in patients and their family members, improving diagnosis and therapy, and preventing SCD.

Dutch summary

Hartritmestoornissen zijn een belangrijke oorzaak van morbiditeit. In ernstige gevallen kunnen ze kamerfibrilleren induceren, leidend tot plotse hartdood. Dit is de doodsoorzaak bij tweederde van de plotse overlijdens bij personen onder de 40 jaar. In de meerderheid van deze jonge patiënten is geen structurele oorzaak in het hart (zoals bijvoorbeeld littekenweefsel na een hartinfarct) te vinden. In dit doctoraatsproject combineren we geavanceerde beeldvormende methoden met computermodellen om niet-structurele (d.w.z. zuiver elektrische) oorzaken van ritmestoornissen te onderzoeken bij patiënten die een plotse hartstilstand hebben overleefd. Een nieuwe beeldvormende techniek, genaamd ECG-imaging (ECGI), zal worden toegepast in patiëntenpopulaties met kamertachycardie en/of verhoogde gevoeligheid voor fibrilleren, die bekend zijn bij cardiologen in Maastricht en Hasselt. Deze methode maakt het mogelijk de elektrische eigenschappen veel gedetailleerder in kaart te brengen dan mogelijk is met de huidige cardiologische onderzoeken. Invasieve electrofysiologische metingen zullen worden gebruikt ter validatie van niet-invasieve ECGI reconstructies in patiënten, bij wie ook vaak een cardiogenetische diagnose bekend is. Bovendien zullen deze elektrische eigenschappen geïntegreerd worden in computermodellen van de elektrische activiteit van het hart. Hierdoor creëren we patiënt-specifieke computermodellen waarin hartritmestoornissen virtueel kunnen worden opgewekt en onderzocht. Deze unieke combinatie van technieken zal leiden tot een beter begrip van de mechanismen van ritmestoornissen bij patiënten en hun familieleden, verbeterde diagnose en therapie bevorderen, en plotse hartdood voorkomen.