MY-ATRIA

Newsletter 02
2019

Lund Winter School

Lund's Winter School was the first of the three training activities planned for MY-ATRIA project, gathering together professionals from different fields for the study of cardiac tachyarrhythmia. This multidisciplinary environment provided a great opportunity for in-depth interdisciplinary discussions about atrial structure, function and clinical treatments; the pillars of MY-ATRIA network.

The activities were hosted by the Department of Biomedical Engineering (Institutionen för biomedicinsk teknik) of Lund University, Sweden, from the 15th to 17th January 2019. It was attended by the ESRs, their supervisors, MY-ATRIA partners and researchers from the hosting University. Also open to any university student, clinical doctors and professionals in the biomedical field.

Throughout the three-day winter school, attendants were immersed in a dynamic training environment. Workshops, activities and lectures, provided them the opportunity to gain a deeper insight into atrial tachyarrhythmia from both a clinical, an engineering and a management perspective, as well as to train other relevant skills as public presentation, group debate and scientific writing.

ESR Research activity: project pitching

The ESR scientific performance was subject to debate through a project pitching activity. Attendants from different fields of expertise questioned and provided feedback to each PhD student regarding their work and future steps. Lund organizers came up with an original role-playing game for questioning each presentation involving 4 different coloured hats, 4 roles and 4 different questions!

This activity had two main objectives; keep all MY-ATRIA members updated about the ongoing research within the consortium as a way of strengthening the network and to contribute to the development of meaningful and high-quality projects taking advantage of the experience and various expert perspectives of the attendants.

Contents

Edited and reviewed by the ESRs

ESRs discussing the talks.

Prof. Frida Sandberg during the Project pitching exercise.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No.766082

Seminars. Arrhythmic substrate in the human atria: histology, structure and function*

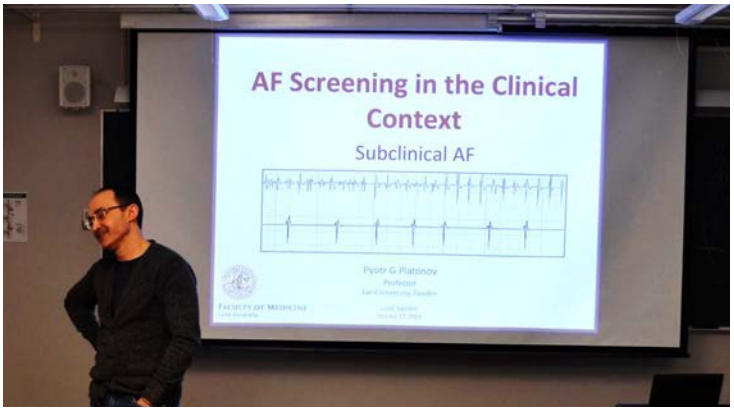
Seminars aimed to expose the atrial tachyarrhythmia problem visualized from a physiological and clinical perspective. Lectures covered AF identification (characterization, classification and screening), monitoring and intervention (management, ablation, treatments) stressing on current clinical needs, procedures and challenges.

The topics covered from a clinical point of view were imparted by: Prof. Pyotr Platonov, professor at Cardiology on Lund University, MD. David Mörtsell, director of device surgery/arrhythmia services at Skåne University Hospital, Prof. Mårten Rosenquist professor of heart disease and senior physician at the Heart Clinic at Danderyd Hospital, and Dr. Fredrik Holmquist researcher at Lund University. These were complemented with the engineering perspective of Prof. Martin Stridh, Lund University professor, and the management point of view of Dr. Mirko de Melis, Medtronic Bakker Research Center, (BRC) regarding AF handling and clinical procedures.

The combination of perspectives and professionals aimed to bring researchers closer to the understanding of current clinical needs and processes involved in a research project with direct clinical application. This targeted a current aim of high importance; to bridge between research, business and clinicians for a development of meaningful research.

Workshops: scientific communication

Three workshops served as training for communication and writing skills through an abstract-writing, a debate and a paper-analysis activity. Prof. Pyotr Platonov and Prof. Leif Sörmo led the writing and paper analysis activity that was followed by the ESRs and students. Alternatively, all attendants contributed to the debate activity. These workshops trained the ESRs in key soft skills transversal to research and scientific activity.



Prof. Pyotr Platonov giving a lecture about AF Screening.

Not everything was work!

Lund members organized a social event in an escape room for the ESRs giving them the chance to work as a team and get to know each other better. Furthermore, all the attendants of the winter school participated in two dinners arranged by Lund organizers, and had the opportunity to taste Swedish traditional cuisine have fun and share experiences.

Photograph of the ESRs at the organised social event.

The ESRs at the Lund Winter School.

*find the full list of all the seminars imparted in the last page!

Beneficiary Profile: Lund University

Founded in 1666, Lund University is consistently ranked among the top 100 universities in the world. Located in the south of Sweden, in the province of Scania, Lund University has campuses in Lund city, Malmö city and Helsingborg and is the most popular institute for higher education in Sweden. Offering the broadest range of programmes in Scandinavia, the institute focuses on cross-disciplinary and cutting-edge research. Lund's University library (figure on the left) is one of the oldest and most iconic buildings associated with the institute. It is one of the country's oldest and largest buildings still in use today.

The newly established Department of Biomedical Engineering and the Department of Cardiology and Clinical Sciences work together as part of the MY ATRIA network. Lund University is also the hosting institute for two of the ESRs. Professors Leif Sörnmo, Pyotr Platonov, associate professor Freida Sandberg and Martin Stridh PhD all worked together to organise and run the winter school and provide insightful talks and events throughout the week.

Prof. Leif Sörnmo

Assoc. Prof. Frida Sandberg

Alongside their involvement in the MY ATRIA group, the institute is partaking in a variety of projects in the fields of biomedical applications. This includes topics such as electrocardiology, dialysis, neuroengineering and eye-tracking technology. The main focus of the departmental research is that of atrial fibrillation, with the number of journal papers published on this topic alone, exceeding 100 in the last decade. This has been aided by their long-standing partnership with the Swedish medical industry (which has led to ten patents) and the university hospitals of Lund and Malmö.

Martin Stridh, PhD

Prof. Pyotr Platonov

AF diagnosis and Treatment

Atrial fibrillation is a serious heart condition that can increase the risk of stroke five-fold, in addition to doubling the risk of heart related death. Despite this, there are many treatment methods to reduce the risk of stroke and heart complications as a result of AF. The first stage in treating AF is identifying sufferers before determining the best approach for each individual. The earlier AF can be diagnosed, the more effective the treatment can be.

Diagnosis

Using patient history can often lead to doctors suspecting AF. Patients that have a history of palpitations, strokes, breathlessness, dizziness and chest discomfort could indicate AF, leading to an ECG for diagnosis. However, for some AF sufferers there are no symptoms so diagnosis is near impossible. These patients can sometimes be identified through screening methods.

Opportunistic AF screening can be done by taking the ECG of patients with greater risk of developing AF, each time they visit their doctor. Other approaches include large scale screening, however this is expensive and labour intensive. When AF is suspected in a patient, it can be confirmed using a 12-lead ECG or a 24 to 48 hour portable ECG monitor. For longer term observations patient activated loop recorders can be used to record AF episodes as identified by the patient and the recorded ECG can be retrieved by the doctor to identify and diagnose suspected arrhythmias.

Treatment

The aims of treatment for AF are to restore normal heart rhythm, reduce the associated high heart rate back to a normal rate, and minimize the risks of blood clots, strokes and heart failure. Treatment methods can vary from primarily pharmacological approaches to surgical intervention. Pharmacological intervention can include channel blockers to control the rhythm and rate of contraction in the atria, in addition to anticoagulants to minimize the risk of blood clots.

There are two types of non-surgical interventions used if pharmacological intervention proves insufficient. A cardioversion is a controlled shock used to reset the hearts contraction to return it to normal sinus rhythm. Alternatively, ablation therapy is used to isolate tissue in the heart which causes the fibrillation in order to regain normal sinus rhythm. The standard ablation method used to treat AF is the catheter ablation of the pulmonary veins (PVA).

Occasionally the non-surgical methods prove ineffective and surgical procedures are considered, whereby a pacemaker is implanted, or a patient undergoes an open heart maze procedure.

Atrial fibrillation is a serious condition that is treatable. Efforts are continually being made to improve the identification and diagnosis of AF, in addition to improving treatment methods and predicting individual response to treatments. This is the underlying motivation for the MY-ATRIA group.

Researcher profiles

ESR1
Jordan Elliott
(POLIMI)

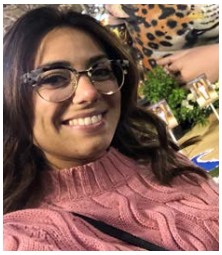
Bottom-up study on the implications of interatrial block in the mechanisms of atrial fibrillation.

I grew up in the UK, along with my siblings. I obtained a master's degree in Biomedical Engineering at the University of Surrey shortly before joining the MY-ATRIA project. I have always been fascinated with the human body and how everything works together. When I found this great opportunity to join the MY-ATRIA group, I jumped at it. It was too good to miss.

I am an active person, having spent years competing in figure skating, rowing, football and cheerleading competitions. I love to travel and meet new people and am always looking for my next adventure. My hobbies also include painting, photography and sketching, along with settling into a good book with a cup of tea in my hands.

Being on the MY-ATRIA project has not only challenged and excited my academic interests, but has also provided me with the opportunity to travel, see new cultures and broaden my view of the world.

I would say I am a fun-loving person who is always up for a challenge and has a love of new experiences. I would rather see the world and own nothing, than own everything and miss seeing the world.



ESR2
Rebecca Belletti
(UPV)

Detailed 3-D computer models of human atria and torso for studying atrial fibrillation, initiation and progression

I was working on my master thesis just for two months when a notification lit up the screen: I would have never imagined my future was there, in the incoming mailbox. Thanks to a professor to whom I will be forever grateful, I had the opportunity to know about the MY-ATRIA project. When reading the call for applications, I suddenly thought it would be one of the best chances I could ever wish for, so I applied without thinking too much and in the end, I was selected to be part of this amazing team.

Now I am living in Valencia, one of the sunniest cities I´ve ever seen, trying to learn Spanish but actually pushing everyone around me to speak Italian and having the best paella ever, whenever I want!!

Most importantly, I am carrying on my Ph.D. getting in touch with people coming from all over the world, working together for a common goal, giving my best to contribute to the knowledge of one of the most common cardiac diseases with the help and the supervision of some of the best universities and companies.

ESR3
Giorgio Luongo
(KIT)

Body Surface Potential Maps and ECG-signals of atrial fibrillation

When I finished my master's degree in Rome I found myself faced with the big question: what do I do now?

I've always been fascinated by research, and I think that the role of the biomedical engineer is perfect for this type of work. There are many things we still don't know about the human body and its mechanisms and it's our job to investigate it. So, I turned to undertake a doctorate! As soon as I saw the call for application of the MY-ATRIA project I said to myself: this is what I want. Not only because of my interest in the topic, but also for the opportunities the network gives you to know other cultures, to live abroad and to participate in many international events. So, I packed my bags and moved here to Karlsruhe, Germany.

As an Italian I was particularly worried about two things: climate and food. But in the end, I fell in love with the Schnitzel and except for a few weeks a year, it's not so cold. Now my life is divided between research, whose results you can follow on my personal page, trips around Europe and beyond for conferences and meetings, new friends and the many extreme sports that the Schwarzwald can offer!

Members of the MY-ATRIA group: ESRs and project supervisors.

"Anatomy and electrical function of the human atria"	**Prof. Pyotr Platonov**	**Lund University**
"Mechanisms of atrial arrhythmias"	**MD. David Mörtsell**	**Skåne Hospital**
"Atrial arrhythmias: clinical impact and diagnostic challenges"	**Prof. Mårten Rosenquist**	**Dandery Hospital**
"Lecture on scientific writing in medicine and engineering"	**Prof. Pyotr Platonov**	**Lund University**
"Techniques for AF screening"	**Prof. Martin Stridh**	**Lund University**
"AF screening in the clinical context"	**Prof. Pyotr Platonov**	**Lund University**
"AF management and evidence based recommendations"	**Dr. Mirko de Melis**	**BRC**
"Catheter ablation on AF"	**Dr. Fredik Holmquist**	**Lund University**
"Scientific experiments, clinical trial and ethical issues"	**Dr. Mirko de Melis**	**BRC**

List of lectures imparted during the winter school and their corresponding lecturers.

Luigi Galvani: A pioneer in bioelectricity

Luigi Galvani was an Italian physician born on September 9th, 1737 in Bologna, Italy. Following in his fathers footsteps, he devoted his life to the study of medicine. In 1759 Galvani graduated with a medical degree from the University of Bologna. He returned as a lecturer of anatomy and obstetrics in 1762. His most notable work was the study of electrophysiology in muscle stimulation. He conducted his most famous experiment in 1786, whereby he caused muscle contraction in a deceased frog, using a pair of scissors and an electrical storm.

Galvani later conducted further experiments to prove that the contraction was as a result of the electrical stimulation. He concluded that animal tissue contained an intrinsic vital force previously unobserved, which activates nerve and muscle cells. He called this intrinsic force "animal electricity".

Alessandro Volta once said of Galvani's work that it "contains one of the most beautiful and surprising discoveries" but argued that the contraction was not as a result of "animal electricity" as defined by Galvani, but always required two different metals.

Luigi Galvani experimenting on frogs.

In 1794 Galvani published a book defending his work. He was also the first to establish that bioelectric forces exist within living tissue by touching the muscle of one frog with the nerve of another frog and causing a contraction. This disproved Volta's theory that metals are required for every electrophysiological reaction. Galvani died in his childhood home, aged 61 in 1798, a mere 70 years before the electrical revolution, and his contributions were invaluable. Galvani's research inspired Volta's work which included the creation of the voltaic pile, a battery that could provide a constant electric current. Seen as a pioneer in the study of electricity, his name lives on in the field to which he devoted his life. The Galvanometer is an instrument designed to detect electric current, and Galvanic corrosion is defined as an accelerated electrochemical corrosion that occurs when dissimilar metals are in contact. As well as his contribution to the study of electricity, Galvani paved the way for new research in muscle and nerve physiology and is the founder of electrophysiological studies and neuroscience. Volta even coined the term galvanism to describe the phenomenon of muscular contraction stimulated by an electric current.

Sources:
https://www.heart.org/en/health-topics/atrial-fibrillation; https://www.hrsonline.org/diagnosing-atrial-fibrillation-afib; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1952519/; https://www.britannica.com/biography/Luigi-Galvani; https://lunduniversity.lu.se/about/about-lund-university;

CONTACT US MY-ATRIA
email: myatria@polimi.it
phone: +39 02 23993347
My-Atria
MY_ATRIA