New treatment hope by 'painting the colors of the heart'

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Scientists at the University of Leicester are 'painting' the colours of the heart in an innovative project that has potential to bring benefits for millions of people with irregular heart rhythm.

An estimated 4.5 million people in the European Union are known to have Atrial fibrillation (AF) - the most common type of arrhythmia or abnormal heart rhythm. The condition affects about 10% of people over the age of 70. Considering the advancing age in the general population and links to body size and obesity, scientists say the increase in AF is almost approaching epidemic proportions.

Researchers from the Department of Engineering at the University of Leicester are working with colleagues in the University's Department of Cardiovascular Sciences and St Jude Medical UK to devise a new way of 'mapping' the electrical signals of the heart and creating a colour map of abnormal signals. This will allow cardiologists to target them with unprecedented accuracy.

University of Leicester scientists Dr. André Ng (Cardiovascular Sciences) and Dr. Fernando Schlindwein (Engineering) were recently awarded a CASE (Collaborative Awards in Science and Engineering) studentship, in excess of £63,000, to pursue research on the diagnostic and treatment of atrial arrhythmias by the Engineering and Physical Sciences Research Council.

Additionally, Dr Schlindwein has also been awarded an industry secondment by the Royal Academy of Engineering, worth £15,000, for the same collaborative research involving St. Jude Medical U.K. and Departments of Cardiovascular Sciences and Engineering at the University of Leicester.

Atrial fibrillation (AF) is the most common type of arrhythmia or abnormal heart rhythm. The condition involves the left and right atrial chambers of the heart and is characterised by quivering or 'fibrillating' of heart muscles, instead of the usual coordinated contraction.

AF is currently treated using strategies that either slow the heart rate or revert heart rhythm to normal. Surgical and catheter-based therapies are also used in certain individuals, but these procedures pose a certain amount of risk to the patient.

Dr. Schlindwein says, "A catheter is a very thin tube that is inserted in the patient's femoral vein (usually) and guided into the patient's heart, wherein it can record from or deliver electrical signals to the heart. The ablation catheter delivers high-energy radiofrequency waves to 'burn' and kill the cells that are responsible for the heart rhythm disturbance once identified".

Dr. Ng performs catheter ablation procedures including that for AF at Glenfield Hospital, Leicester, which is one of the largest cardiac electrophysiology centres in the UK. Dr Ng says, "Catheter ablation is a new and effective treatment aimed at 'curing' patients of AF. Patients referred early in the disease respond very well to the procedure whilst others with more advanced form of the condition respond less well. Much research effort is currently focused on improving the success and safety of the procedure with the least amount of 'burning' and best outcome." Dr. Ng is also an expert in the use of state-of-the-art non-contact multi-electrode array catheter for 3-dimensional mapping of the heart to facilitate ablation and is director for pan-European training courses for this technique.

Dr. Ng and Dr. Schlindwein's research aims at improving current techniques by using the non-contact array catheter to detect and map cardiac electrical signals during AF ablation. On account of its 'non-contact' nature, it is possible to map signals more accurately using this strategy.

Dr. Schlindwein explains, "This technique essentially enables us to identify regions of the heart which shows the best promise of a good outcome with ablation. Regions of the heart showing abnormal signals can be visualised using a real-time colour map superimposed to the three-dimensional representation of the atrium. This allows us to pick targets for ablation with unprecedented accuracy".

Dr. Ng and Dr. Schlindwein's collaborative work thus makes a stark improvement on the existing technique by incorporating more sophisticated and near 'real-time' signal analyses, which significantly increases chances for successful ablation therapy. Importantly, they expect that these approaches can potentially reduce the need for a second procedure, which is significant given the inherent risk of the procedure itself.

Currently, Dr Fernando Schlindwein and Dr André Ng are bidding for a larger EPSRC project to support this research.

Provided by University of Leicester