NIHR | Guy's and St Thomas' Biomedical Research Centre

NHS Guy's and St Thomas' NHS Foundation Trust

Our research explained

BRCsnapshots

Using computer modelling to understand catheter ablation therapy

What we know

Atrial fibrillation (AF) is an irregular, often unusually fast heart rate which causes problems with breathing, dizziness and tiredness.

People affected by AF are at a high risk of heart failure and stroke, and need to be treated. Medication is usually prescribed to treat AF in the first instance but when this doesn't work, other options such as catheter ablation (CA) need to be considered.

CA is a procedure which involves inserting a thin flexible tube into the heart to destroy the tissue responsible for the abnormal heart rate using radio waves. This should restore the heart to a normal, healthy rhythm.

However, this doesn't always work and AF can come back which means the person may need to have the procedure again.

Around one million people in the UK and over thirty million worldwide suffer from atrial fibrillation

Computer modelling uses a specially designed computer to simulate (model) what might happen in a particular situation or something that has already happened such as an earthquake.

In medicine, we can use computer modelling to show how the body could respond to a procedure.

What we did

We took information from MRI and ultrasound scans from two patients before and after CA. By adding this information to mathematical equations and advanced software, we were able to simulate (model) the patients' heart function and blood flow before and after the procedure.

This information was also used to look at the best place to position the catheter during CA and how that affects the success of the procedure.

What we found

Our simulations showed that AF causes blood flow to slow down and that it increases "blood pooling" which leads to a greater risk of clotting.

We also found that placing the catheter in the area of the heart where the blood flow is slowest increases the blood's temperature. This then raises the risk of clotting and therefore of stroke.

We will need to do more testing but we are hopeful that our models will, in the future, help doctors to predict a person's risk of stroke following CA and tailor the procedure to a patient's individual needs. This will greatly improve the person's outcome.

About the study
The study was supported by the NIHR Guy's and St Thomas' Biomedical Research Centre and by the EPSRC grant "Personalised thermal-fluid models for planning catheter ablation therapy for atrial arrhythmia" (EP/P013228/1).

Further information
This research was completed by Dr Adelaide de Vecchi, Dr Oleg Aslanidi, Dr David Nordsletten and Dr Desmond Dillon-Murphy.

This work was presented to the Cardiovascular MedTech Co-operative Imaging Science PPI group in Sep 2018.

You can find out more about the Cardiovascular MedTech Co-operative at https://cardiovascularmic.nihr.ac.uk/

Link to journal article
https://kclpure.kcl.ac.uk/portal/files/103897803/Modeling_Left_Atrial_Flow_DILLON_MURPHY_Publishedonline14December2018_GOLD_VoR_CC_BY_.pdf

Patient and Public Advisory Group (PPIAG)
This research snapshot has been put together with support of the Patient and Public Advisory Group. To find out more about how you can work with us to improve healthcare through research contact brcppi@gstt.nhs.uk

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Our NIHR Biomedical Research Centre is a partnership between Guy's and St Thomas' NHS Foundation Trust and King's College London. We work to develop and deliver new medicines and diagnostics to patients. We drive research and innovation into the NHS to provide maximum impact to our patients.
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