ISRCTN64279315 https://doi.org/10.1186/ISRCTN64279315

A pilot study of a new technology for the investigation of high blood pressure in humans

Submission date
16/03/2022

Recruitment status
No longer recruiting

Registration date
21/03/2022

Overall study status
Completed

Last Edited
04/12/2023

Condition category
Cancer

[X] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
The purpose of this research is to generate pilot data to demonstrate how we could use detailed information about rhythms of special group of hormones called catecholamines to tell us more about blood pressure changes in health and disease. High blood pressure (hypertension) is common and often leads to poor health especially if it becomes a long-term condition. Even though it is common, in most people, the cause remains unknown. What we do understand is that, in at least some circumstances, abnormal levels of chemical messengers (hormones) can contribute. We also know that many activities in the body including blood pressure and hormones change across the day, in a rhythmic pattern. However, normally it is very difficult to measure hormone dynamics in detail without a complicated hospital admission. We think that understanding the relationships between rhythms of hormones and blood pressure is important because it will help improve our knowledge of what causes hypertension in the first place.
We will use a novel method called U-RHYTHM microdialysis. This allows us to sample hormones very frequently without taking any blood, and allows the person being sampled to continue normal activities, out of hospital, in a more natural setting. As this is a first-of-its kind investigation, we are testing in a small number of people in anticipation of a future, larger trial. We will test healthy people and compare the results with a group of patients with severe hypertension due to a rare disease called phaeochromocytoma, which results from catecholamine excess. We will also compare the results from the U-RHYTHM method with 'traditional' tests like blood samples and blood pressure. We believe that the U-RHYTHM method will provide very important new information that could eventually lead to improvements in the diagnosis and treatment of hypertension.

Who can participate?
Healthy males and females aged over 16, and patients with a diagnosis of secretory phaeochromocytoma or paraganglioma

What does the study involve?
1. A baseline observation period of 7 days in which activity and glucose are monitored automatically by wearable devices
2. Wearing our portable U-RHYTHM sampling device for approximately 24 hours, along with an ambulatory blood pressure monitor, heart rate monitor, and continued glucose and activity

measurements.
3. Providing 1 blood sample and collecting urine in a bottle over the sample 24 hours
4. For patients, being invited to participate again after surgical treatment for their condition

What are the possible benefits and risks of participating?
There are no direct benefits but the data will contribute to new knowledge in the field, and results from the study will be shared with the participants if they wish. Risk is very minimal as previous trials have shown U-RHYTHM sampling to be very safe. There is a small risk that a previously undiagnosed medical condition may be revealed as part of the investigation in which case this will be discussed and referred for further assessment as appropriate.

Where is the study run from?
The main study site in the UK will be Bristol with study visits at facilities shared between the University of Bristol and the Bristol Royal Infirmary. Patients will also be recruited through the Endocrinology Department at Evangelismos Hospital, Athens, Greece.

When is the study starting and how long is it expected to run for?
March 2022 to March 2025

Who is funding the study?
The study is funded by a Wellcome Trust Technology Development grant (UK)

Who is the main contact?
Dr Thomas Upton, thomas.upton@bristol.ac.uk

Contact information

Type(s)
Principal investigator

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Additional identifiers

Integrated Research Application System (IRAS)
309240

Protocol serial number
WT 223704/Z/21

Study information

Scientific Title
A pilot study of U-RHYTHM technology to validate 24-hour catecholamine measurements

Study objectives
1. Test an experimental method (ambulatory microdialysis) to provide an initial characterisation of the 24-hour patterns of catecholamines in interstitial fluid in:
a) healthy conditions and
b) in conditions of hormone excess (secretory paraganglioma/phaeochromocytoma)
2. Provide an initial assessment of how measurements from conventional diagnostic tests (24-hour ambulatory blood pressure monitoring, urine and plasma catecholamines) compare with the novel ambulatory assessment (tissue metanephrines profiles) and other rhythmic processes linked to catecholamine secretion (glucose patterns, heart rate and heart rate variability).

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 07/09/2022, West Midlands - Edgbaston Research Ethics Committee (3rd Floor Barlow House, Minshull Street, Manchester, M1 3DZ, UK; +44 (0)207 104 8070, +44 (0)207 104 8019, +44 (0)2071048089; edgbaston.rec@hra.nhs.uk); ref: 22/WM/0163

Primary study design
Observational

Study design
Multi-centre pilot observational trial

Study type(s)
Diagnostic

Health condition(s) or problem(s) studied
Understanding the relationship between blood pressure and catecholamine rhythms in health and in secretory paraganglioma/phaeochromocytoma

Interventions
Conventional measurements of catecholamines in single-time point blood and 24-hour urine collections will be compared with 24-hour, 72-sample profiles collected using subcutaneous ambulatory microdialysis. Blood pressure, interstitial glucose, and daily activity will also be captured for context and comparison.

Intervention Type
Other

Primary outcome(s)

1. Concentrations of catecholamines and their metabolites in samples of microdialysate collected every 20 minutes for 24 hours
2. Concentrations of catecholamines and their metabolites in a venous plasma sample and in a 24 hour urine collection
3. Blood pressure measured using an automated ambulatory blood pressure cuff over 24 hours
4. Heart rate and heart rate variability measured using a portable ECG monitor over 24 hours
5. Peripheral temperature measurements collected every 1 minute using a skin thermometer (iButton) for 24 hours
6. Food intake using a self-reported food diary for 24 hours
7. Sleep and wake patterns and light exposure from a self-reported sleep diary and calculated from wrist actigraphy and light monitoring data for 8 days
8. Blood glucose estimates derived from measurements collected using an interstitial continuous glucose monitor (CGM), sampled every 15 minutes for 8 days

Key secondary outcome(s)
Catecholamine features (area under the curve, peak concentrations, peak and nadir times etc) measured as per primary outcome measure 1

Completion date
01/03/2025

Eligibility

Key inclusion criteria
1. Males and females
2. Age >16 years
3. Clinical and radiological diagnosis of hormone-secreting phaeochromocytoma/paraganglioma
4. Healthy volunteers

Participant type(s)
Mixed

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
16 Years

Sex
All

Key exclusion criteria
1. Inability to attend study visits due to location
2. Positive urine drug screen (drugs of abuse – cocaine, methamphetamines etc) as these will

alter catecholamine measurements
3. History of intravenous drug use - any
4. Current pregnancy, breast feeding

Patients:
5. Use of medication known to significantly interfere with measurement of metanephrines within 48 hours of or during the microdialysis sampling period

Healthy volunteers:
6. Any active medical condition
7. Any regular prescribed medication
8. Use of any prescribed, over-the-counter, herbal or other medication within or during the 48 hours of microdialysis sampling period, or, at the investigator's discretion,
9. Significant hypertension at screening (SBP >160/DBP >100)
10. Night shift work or international travel (more than 2 time zones) within the previous 60 days
11. Regular intake of alcohol well in excess of recommended weekly consumption

Date of first enrolment
01/11/2022

Date of final enrolment
01/06/2024

Locations

Countries of recruitment
United Kingdom

England

Greece

Study participating centre
University of Bristol
Senate House
Tyndall Avenue
Bristol
United Kingdom
BS8 1TH

Study participating centre
Evangelismos Hospital
Endocrinology Department
AHEPA Building
45-47 Ipsilantou Str

Athens
Greece
10676

Study participating centre
Southmead Hospital
Southmead Road
Westbury-on-Trym
Bristol
United Kingdom
BS10 5NB

Sponsor information

Organisation
University of Bristol

ROR
https://ror.org/0524sp257

Funder(s)

Funder type
Charity

Funder Name
Wellcome Trust

Alternative Name(s)
Wellcome, WT

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan

The dataset will have exclusive use by the PI and study team from the start of the study, and anonymised data will be made available at the time of publication of research outputs, estimated to be within 1 year of completion of the study.

Anonymised outputs (including the removal of all direct identifiers) will be published in the University of Bristol Research Data Repository in a form suitable for long-term retention and will be available on an open data basis. The Data Repository is managed by the University of Bristol Research Data Service (http://www.bristol.ac.uk/staff/researchers/data/).

Pseudo-anonymised data, as defined by the General Data Protection Regulations (2018) Recital 26, will be shared in open access journals and publications and made available on University open access repositories. Primary research databases will be recorded on the University of Bristol's research information service (PURE) which includes an online portal to search data (data.bris data catalogue). The deposit will be assigned a unique DOI and appear in the DataCite registry. Published research outputs will be stored in the University's secure Research Data Storage Facility (RDSF) with information made available for both the DOI, and data access via data.bris.

IPD sharing plan summary

Stored in publicly available repository, Published as a supplement to the results publication

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
HRA research summary			28/06/2023	No	No
Study website	Study website	11/11/2025	11/11/2025	No	Yes