Obstructive sleep apnoea and retinal vasculature reactivity

Submission date	Recruitment status No longer recruiting	[X] Prospectively registered		
17/09/2014		[X] Protocol		
Registration date	Overall study status Completed	Statistical analysis plan		
23/10/2014		[X] Results		
Last Edited	Condition category	[] Individual participant data		
25/02/2022	Nervous System Diseases			

Plain English summary of protocol

Background and study aims

Obstructive sleep apnoea is common problem that happens when the muscles and soft tissues in the throat relax and collapse to cause blockage of the airway. This leads to pauses in breathing and, therefore, a dip in oxygen levels. The lack of oxygen, in turn, results in arousal, whereby the brain pulls the person out of a deep sleep to a lighter one or causes them to wake up, so the airway is reopened and they can breathe normally again. The constant arousal leads to broken sleep and often causes the person to feel very sleepy during the day. Obstructive sleep apnoea is treated by wearing a mask at night which blows air onto the back of the throat, either by nose or nose and face mask. This is called CPAP and this stops the back of the throat collapsing and therefore keeping the airway open. Here, we want to look at how obstructive sleep apnoea affects the retina (the back of the eye which is responsible for picking up light). Patients with obstructive sleep apnoea, who also have diabetes, experience higher levels of damage to the blood vessels in the retina. We dont know why this happens so are going to look at it in more detail. We hope to better understand what is a common problem for these patients which may help in the development of future treatments. Patients with obstructive sleep apnoea have an increased chance of developing high blood pressure, heart attack and stroke as well. By studying the small blood vessels at the back of the eye we also hope to gain more understanding of the way in which this occurs.

Who can participate?

Adults aged between 20 and 75 that have been diagnosed as having obstructive sleep apnoea and having been treated with CPAP for more than a year for at least 4 hours every night.

What does the study involve?

Participants are randomly allocated into one of two groups. Those in group one are treated with CPAP as usual. Those in group two receive sub therapeutic CPAP. The study involves two stages. After completing written consent at their normal sleep unit at visit 1 patients are given a pulse oximeter which is stage 1 of the trial. This is a device, worn overnight whilst sleeping, which sits on the wrist like a watch and also clips onto a finger to measure oxygen levels. Participants wear this on CPAP for three nights and then off of CPAP for 4 nights. They then post this back to us and we analyse the data to check eligibility for stage 2 of the trial. Once we have confirmed that they are eligible for the trial they then go back onto CPAP for at least two weeks before

entering stage 2. After two weeks back on treatment they come for their first visit where we measure their retinal vasculature reactivity at Aston University. We do this by using a specialist camera that shines a flickering light in the back of the eye whilst at the same time recording the size of the blood vessels at the back of the eye. Along with this we will also check their blood pressure, pulse, take blood tests, collect urine and supply them with a blood pressure machine and with their trial CPAP machine (either normal or sub therapeutic depending on their random assignment). After this visit they then use the new CPAP machine every night at home for two weeks whilst checking their blood pressure twice daily which is stage 2. Their final visit is again at Aston University. At the final visit we will repeat the measurements with the specialised retinal camera, repeat blood tests, urine tests and blood pressure measurements. After this visit the trial ends and patients return study equipment and go back onto their normal treatment.

What are the possible benefits and risks of participating?

There are no direct potential benefits as this will not directly lead on to a new treatment but will improve our understanding of eye disease in obstructive sleep apnoea. The major risk or downside for the patients are that they may experience return of excessive sleepiness in the daytime. All participants will be made aware of this and for this reason professional drivers will be excluded.

Where is the study run from?
University Hospital Birmingham Sleep Unit (UK)

When is the study starting and how long is it expected to run for? October 2014 to March 2020

Who is funding the study?

- 1. Oxford Radcliffe Hospitals Charitable Fund No. 0189 (UK)
- 2. ResMed Charitable Foundation (USA)

Who is the main contact? Professor John Stradling john.stradling@ouh.nhs.uk

Contact information

Type(s)

Scientific

Contact name

Dr Christopher Turnbull

ORCID ID

https://orcid.org/0000-0001-8942-5424

Contact details

Respiratory Medicine Churchill Hospital Headington Oxford United Kingdom OX3 7LE christopher.turnbull@ouh.nhs.uk

Type(s)

Scientific

Contact name

Prof John Stradling

Contact details

Respiratory Medicine Churchill Hospital Headington Oxford United Kingdom OX3 7LE

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john.stradling@ouh.nhs.uk

Additional identifiers

Integrated Research Application System (IRAS) 149068

Protocol serial number

IRAS protocol ID 149068

Study information

Scientific Title

Effect of obstructive sleep apnoea on retinal vasculature reactivity following CPAP withdrawal

Study objectives

Obstructive sleep apnoea causes reduction in the retinal vasculature reactivity during and treatment of sleep apnoea stops this reduction. The reduction in retinal vasculature is linked to disease severity, catecholamine activity and cardiovascular risk. This reduction in retinal vasculature reactivity causes a change in gene expression.

Ethics approval required

Old ethics approval format

Ethics approval(s)

Approved 26/09/2014, NRES Committee South Central – Berkshire (Bristol Research Ethics Committee Centre, Whitefriars, Level 3 Block B, Lewins Mead, Bristol, BS1 2NT, UK; +44 (0)117 342 1389; nrescommittee.southcentral-berkshire@nhs.net), REC ref: 14/SC/1235

Study design

Randomised controlled double-blind intervention trial

Primary study design

Interventional

Study type(s)

Treatment

Health condition(s) or problem(s) studied

Obstructive sleep apnoea

Interventions

Patients on established CPAP treatment will be randomised to receive continued treatment on with CPAP or with sub therapeutic CPAP for two weeks. Patients will be blind to their allocation and will continue with their normal mask. This allows us to directly compare the retinal vasculature of patients will fully treated obstructive sleep apnoea and those in whom obstructive sleep apnoea has returned for two weeks.

Intervention Type

Procedure/Surgery

Primary outcome(s)

To establish if OSA reduces retinal vascular reactivity. This will be done using retinal vascular response to flicker light protocol. Outcome measure will be the intervention effect of OSA versus no OSA on retinal vascular reactivity following 14 days CPAP withdrawal, with appropriate controlling for baseline reactivity, OSA severity, BMI and cardio-vascular comorbidities (via Pocock risk score).

Key secondary outcome(s))

Whether any change in retinal vascular reactivity correlate with OSA severity and/or change in markers of sympathetic activity. This will be measured by correlation between change in retinal vascular reactivity (from baseline to two weeks in the CPAP withdrawal arm), with the severity of OSA (>4%ODI) returning, and/or change in both heart rate and blood pressure in the same group (from home measurements over penultimate 3 days), and/or urinary catecholamines.

Tertiary outcomes will be whether any change in retinal vascular reactivity and retinal vessel oxygen saturation variables correlate with changes in mRNA expression. This will be measured by collection of blood samples for later analysis of mRNA expression.

Completion date

31/03/2020

Eligibility

Key inclusion criteria

- 1. Objectively confirmed obstructive sleep apnoea (at the time of original diagnosis) with an oxygen desaturation index (ODI, >4% dips) or AHI of >20 (this threshold will exclude participants with borderline OSA, in whom there may be little experimental effect)
- 2. Currently >20/h oxygen desaturations (>4% dips) returning on any night during home nocturnal pulse oximetry performed for a 4-night period without CPAP, prior to entry into the study
- 3. Treated with CPAP for more than 12 months, minimum compliance 4h per night
- 4. ODI <10 during treatment (obtained during the preliminary week of oximetry monitoring,

from the first 3 nights of oximetry monitoring on CPAP, before the 4 nights CPAP withdrawal)

- 5. Age between 20 and 75 years at trial entry
- 6. Written informed consent

Participant type(s)

Patient

Healthy volunteers allowed

No

Age group

Adult

Sex

All

Total final enrolment

37

Key exclusion criteria

- 1. Previous ventilatory failure (awake resting arterial oxygen saturation <93% or arterial PCO2>6kPa) or severe respiratory disorders other than OSA
- 2. Unstable, untreated coronary or peripheral artery disease, severe arterial hypertension(>180/10mmHg), severe arterial hypotension (<90/60mmHg)
- 3. Previously diagnosed with Cheyne-Stokes breathing
- 4. Current professional driver
- 5. History of any sleep-related driving accident or other accident
- 6. Acute inflammatory disease
- 7. Acute or chronic hepatic or renal disease
- 8. Known type 1 or 2 diabetes (likely to have low retinal reactivity even on CPAP)
- 9. Known severe vascular disease (likely to have low retinal reactivity even on CPAP)
- 10. Mental or physical disability precluding informed consent or compliance with the protocol
- 11. Non-feasible trial follow-up (for example, distance from follow-up centre, physical inability)
- 12. Epilepsy: flickering light used for retinal provocation could lead to a seizure
- 13. Lens opacities: this could lead to insufficient contrast and make it impossible to image the retinal vasculature

Date of first enrolment

19/01/2015

Date of final enrolment

31/07/2017

Locations

Countries of recruitment

United Kingdom

England

Study participating centre Churchill Hospital

Oxford University Hospitals Oxford United Kingdom OX3 7LE

Study participating centre Queen Elizabeth Hospital

University Hospitals Birmingham United Kingdom B15 2TH

Study participating centre Birmingham Heartlands Hospital Heart of England NHS Trust United Kingdom B9 5SS

Study participating centre Coventry Hospital

University Hospitals Coventry and Warwickshire United Kingdom CV2 2DX

Sponsor information

Organisation

University of Oxford (UK)

ROR

https://ror.org/052gg0110

Funder(s)

Funder type

Charity

Funder Name

Oxford Radcliffe Hospitals Charitable Fund No. 0189 (UK)

Funder Name

ResMed Foundation

Alternative Name(s)

The ResMed Foundation, Resmed Foundation Ltd, Resmed Foundation Limited

Funding Body Type

Private sector organisation

Funding Body Subtype

Trusts, charities, foundations (both public and private)

Location

United States of America

Results and Publications

Individual participant data (IPD) sharing plan

Requests for data can be made by contacting Chris Turnbull (Christopher.turnbull@ouh.nhs.uk). Anonymised patient data will be available without time restriction following completion of the trial, for use in ethically approved research. Patients have consented for such third party anonymised data usage.

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		24/02/2022	25/02/2022	Yes	No
HRA research summary			28/06/2023		No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes
Protocol file	version V5.0	03/02/2016	09/12/2020	No	No