ISRCTN12361838 https://doi.org/10.1186/ISRCTN12361838

The impact of sleep disorders in patients with type 2 diabetes

Submission date
04/04/2018

Recruitment status
No longer recruiting

Registration date
10/04/2018

Overall study status
Completed

Last Edited
07/02/2024

Condition category
Nutritional, Metabolic, Endocrine

[X] Prospectively registered

[X] Protocol

[_] Statistical analysis plan

[X] Results

[_] Individual participant data

Plain English summary of protocol

Background and study aims
Type 2 diabetes (T2D) is very common and has a huge burden on patients, carers, and the NHS. Much of the burden of T2D is due to blockages in the small blood vessels, leading to eye, kidney, nerve and foot problems. Around two thirds of patients with T2D also have obstructive sleep apnoea (OSA). OSA is a condition where there are episodes of complete or partial blockage to the windpipe during sleep. This causes a short reduction in breathing. OSA might contribute to small blood vessels disease in T2D, so it is important to examine the impact of OSA treatment on diabetes-related blood vessels disease. The aim of this study is to assess the feasibility of conducting a larger study of the impact of OSA treatment on diabetes-related blood vessels disease. The results could help identify new treatment targets that will reduce the burden of T2D.

Who can participate?
Patients aged 18 and over with T2D

What does the study involve?
Participants undergo a sleep assessment to find out if they have OSA. Those participants with OSA are then be randomly allocated to either receive OSA treatment or not. OSA treatment is called continuous positive airway pressure (CPAP), which is a device that delivers pressure to the upper wind pipes (via a mask worn on the face) to prevent the wind pipes from collapsing during sleep. Participants undergo assessments related to diabetes, diabetes-related complications and sleep disorders at the start and end of the study (after 2 years and also receive 6 monthly phone calls.

What are the possible benefits and risks of participating?
Everyone in the study gets an in-depth check of their diabetes, in much more detail than normal NHS care. Patients with diabetes are not always tested for OSA although it is probably very common. OSA is associated with increased risk of road traffic accidents and increased risk of high blood pressure and heart disease. So, patients participating in this study could benefit from being screened for OSA and may receive treatment. Although there may be no direct benefit to the participants, it is hoped that this study will benefit all patients with type 2 diabetes and OSA in the future. There are no painful procedures in this study, but patients have to visit the study

centre. Patients with suspected moderate to severe OSA or those with excessive daytime sleepiness will be referred to the sleep physician who will give advice about whether the patient needs to inform the DVLA (Driver and Vehicle Licencing Agency) after assessing the patient. The DVLA website states that patients must inform the DVLA if the OSA affects the patients' ability to drive safely or if the patient has daytime sleepiness. If patients are found to have OSA as part of this study, they will be referred to the local NHS sleep clinic. The sleep clinic in the NHS trust will make the final decision regarding the diagnosis of OSA and daytime sleepiness, and will advise patients regarding informing the DVLA. Treatment with CPAP can usually improve sleepiness in most cases and if patients adhere to the CPAP treatment and do not suffer from excessive sleepiness, the DVLA is unlikely to revoke the license because of OSA.

Where is the study run from?
1. St James's University Hospital (UK)
2. Birmingham Heartlands Hospital (UK)
3. Royal Stoke University Hospital (UK)
4. Queen Elizabeth Hospital (UK)
5. Royal Derby Hospital (UK)
6. York Hospital (UK)
7. Warwick Hospital (UK)

When is the study starting and how long is it expected to run for?
March 2014 to December 2021

Who is funding the study?
National Institute for Health Research (NIHR) (UK)

Who is the main contact?
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Contact information

Type(s)
Scientific

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Additional identifiers

Protocol serial number
37844

Study information

Scientific Title
The impact of sleep disorders in patients with type 2 diabetes: a cohort study and feasibility randomised controlled trial

Acronym
SLEEP T2D

Study objectives
Type 2 diabetes (T2D) is very common and has a huge burden on patients, carers, and the NHS. Much of the burden of T2D is due to blockages in the small blood vessels leading to eye, kidney, nerve and foot problems. Around two thirds of patients with T2D also have obstructive sleep apnoea (OSA). OSA is a condition where there are episodes of complete or partial blockage to the windpipe during sleep. This causes a short reduction in breathing. Our group showed that OSA might contribute to small blood vessels disease in T2D. Hence, it is important to examine the impact of OSA treatment on diabetes-related blood vessels disease. This study will assess the feasibility of conducting a study assessing the impact of OSA treatment on diabetes-related blood vessels disease. The results could help identify new treatment targets that will reduce the burden of T2D.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 23/05/2018, West Midlands – Solihull (The Old Chapel, Royal Standard Place, Nottingham, NG1 6FS UK; solihull.rec@hra.nhs.uk), ref: 18/WM/0070

Study design
Randomised; Both; Design type: Treatment, Screening, Diagnosis, Prevention, Device, Cohort study

Primary study design
Interventional

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Type 2 diabetes mellitus

Interventions
The trialists will register up to 500 patients with T2D into a observational cohort study. At baseline all participants will receive a sleep assessment to identify OSA. If they consent to it, those participants with OSA will then be randomised (i.e. allocated treatment by chance like

tossing a coin) in a 1:1 ratio to either CPAP or no CPAP. A minimisation algorithm will be used within the computerised randomisation system to ensure balance in the treatment allocation over the following variables: ethnicity, gender, OSA severity. A random element will be included in the minimisation algorithm, so that each patient has a probability of being randomised to the opposite treatment than they would have otherwise received. Full details of the randomisation specification will be stored in a confidential document at BCTU.

Continuous positive airway pressure (CPAP is a device that delivers pressure to the upper wind pipes (via a mask worn on the face) to prevent the wind pipes from collapsing during sleep. CPAP will be given for two years. The frequency should be every night, but compliance will be defined as CPAP use of at least 4 hours per night on 70% of nights. Both registered participants and the randomised subset of participants will remain in the study for 2 years. Patients will have clinical assessments related to diabetes, diabetes-related complications and sleep disorders at baseline and at study end (2 years from baseline). Patients will also receive 6 monthly phone calls.

Intervention Type
Other

Primary outcome(s)
The feasibility of running a substantive RCT in patients with T2D, randomising participants between CPAP and no CPAP. This decision will be based on the assessment of the data of the primary objectives. The aim of such a substantive RCT would be to determine the impact of OSA treatment (CPAP vs no CPAP) on the progression of diabetic nephropathy/CKD in patients with T2D. The proposed clinical primary outcome would be eGFR as measured by serum creatinine levels.

Primary objectives:
1. To assess willingness of participants to be randomised
2. To assess willingness of clinicians to recruit participants
3. To assess follow-up rates and adherence/compliance rates
4. To provide data to inform the sample size for a substantive trial
5. To optimise the choice of outcome measures for a substantive trial

This will be compared to the following criteria:
1. Recruiting the proposed sample size within the planned time frames
2. Meeting the proposed time frames in regard to interpreting the sleep assessments and initiating patients on treatment
3. Achieving a follow-up rate ≥80% for randomised patients
4. Achieving a CPAP usage ≥4 hours/night on ≥70% of nights in ≥80% patients randomised to CPAP treatment
5. Generating a mean and standard deviation regarding the predicted response to the intervention to allow sample size calculations for a substantive RCT

Timepoint(s): End of the study

Key secondary outcome(s))
Current secondary outcome measures as of 06/08/2020:
1. Diabetic nephropathy and CKD measured using eGFR (ml/min/1.73m2), cystatin-C level (mg/L), and albumin/creatinine ratio (mg/mmol) at baseline and end of follow up (up to 2 years)
2. Diabetic neuropathy measured using peripheral neuropathy: Michigan Neuropathy Screening

Instrument, Short Form McGill Pain Questionnaire, vibration perception threshold (present /decreased/absent), monofilament test (normal/reduced/absent); cardiac autonomic neuropathy (normal/borderline/abnormal); and peripheral autonomic neuropathy (normal/borderline /abnormal) at baseline and end of follow up (up to 2 years)
3. Diabetic retinopathy using R grade 0-3 and maculopathy changes using M grade 0-1 at baseline and end of follow up (up to 2 years)
4. Metabolic parameters using weight (kg), HbA1c (mmol/mol), BP (mmHg), and lipids profile (total cholesterol, triglycerides, HDL, LDL; all mmol/L) at baseline and end of follow up (up to 2years)

Previous secondary outcome measures:
1. Diabetic nephropathy and CKD measured using eGFR (ml/min/1.73m2), cystatin-C level (mg/L), and albumin/creatinine ratio (mg/mmol) at baseline and 2 years
2. Diabetic neuropathy measured using peripheral neuropathy: Michigan Neuropathy Screening Instrument, Short Form McGill Pain Questionnaire, vibration perception threshold (present /decreased/absent), monofilament test (normal/reduced/absent); cardiac autonomic neuropathy (normal/borderline/abnormal); and peripheral autonomic neuropathy (normal/borderline /abnormal) at baseline and 2 years
3. Diabetic retinopathy using R grade 0-3 and maculopathy changes using M grade 0-1 at baseline and 2 years
4. Metabolic parameters using weight (kg), HbA1c (mmol/mol), BP (mmHg), and lipids profile (total cholesterol, triglycerides, HDL, LDL; all mmol/L) at baseline and 2 years

Completion date
31/12/2021

Eligibility

Key inclusion criteria
Potential participants will be considered eligible for registration into the study if they:
1. Are ≥18 years old
2. Have Type 2 Diabetes
3. Have an eGFR (MDRD-4) ≥15 mL/min/1.73 m2 in last 3 months
4. Have an ESS <11

Potential participants will be considered eligible for randomisation into the RCT if the patient:
1. Is willing to be randomised to CPAP or no CPAP
2. Has a AHI ≥10

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 years

Sex
All

Total final enrolment
312

Key exclusion criteria
Potential participants will be excluded from the study if they:
1. Have Type 1 diabetes
2. Have known OSA, active malignancy or chronic kidney disease from reasons other than diabetes
3. Are receiving chemotherapy, immunosuppressant drugs or home oxygen treatment
4. Have a history of recurrent hospital admissions due to infective exacerbation of a respiratory condition
5. Have received contrast imaging within the last two months
6. Are pregnant
7. Are intending to undergo bariatric surgery during the study duration
8. Are unable to comply with the study protocol
9. Are unable to give informed consent
10. Are a professional driver, operator of heavy machinery and/or working at high altitude
11. Have a history of falling asleep whilst driving within last two years

After the home-based sleep study, potential participants will be excluded from the RCT if they:
1. Have a resting oxygen saturation < 90% (as detected during the sleep assessment recording) or have central apnoeas > 5/ hour

Date of first enrolment
17/08/2018

Date of final enrolment
31/01/2020

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
St James's University Hospital
Beckett Street
United Kingdom
LS9 7TF

Study participating centre

Birmingham Heartlands Hospital
Bordesley Green East
United Kingdom
B9 5ST

Study participating centre
Royal Stoke University Hospital
Newcastle Road
United Kingdom
ST4 6QG

Study participating centre
Queen Elizabeth Hospital
Mindelsohn Way
United Kingdom
B15 2TH

Study participating centre
Royal Derby Hospital
Uttoxeter Road
United Kingdom
DE22 3NE

Study participating centre
York Hospital
Wigginton Road
United Kingdom
YO31 8HE

Study participating centre
Warwick Hospital
Lakin Road
United Kingdom
CV34 5BW

Sponsor information

Organisation
University of Birmingham

ROR
https://ror.org/03angcq70

Funder(s)

Funder type
Government

Funder Name
NIHR Trainees Co-ordinating Centre (TCC); Grant Codes: CS-2013-13-029

Results and Publications

Individual participant data (IPD) sharing plan
The data sharing plans for the current study are unknown and will be made available at a later date.

IPD sharing plan summary
Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		06/02/2024	07/02/2024	Yes	No
Protocol article		22/03/2021	23/08/2022	Yes	No
HRA research summary			28/06/2023	No	No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes
Study website	Study website	11/11/2025	11/11/2025	No	Yes