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How an electrical stimulation device which sticks under the jaw affects people with obstructive sleep apnoea

Submission date
23/08/2022

Recruitment status
No longer recruiting

Registration date
24/08/2022

Overall study status
Completed

Last Edited
05/09/2022

Condition category
Nervous System Diseases

[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
Obstructive sleep apnoea (OSA) is when the muscles of the throat relax too much when a person is asleep, which makes the airway get narrower or close entirely. People with OSA will stop breathing for a few seconds and the oxygen in their blood will get low. Low oxygen makes the brain wake up enough to tell the body to tighten the throat muscles so that the person can breathe again. This can happen lots of times every hour when the person is asleep, and it causes problems such as daytime tiredness and sleepiness, poor concentration, forgetfulness and getting angry too easily. If OSA is not treated, it can cause serious long-term effects like a higher risk of having a heart attack or stroke, and a higher risk of getting diabetes or being overweight, as well as causing problems for people at work or causing arguments at home.
The best treatment for OSA is continuous positive airway pressure (CPAP) therapy. This is when you wear an airtight facemask attached to a bedside air pump, which blows air to hold the airway open even when the throat muscles are relaxed. But it can be very hard for people to get used to wearing a facemask when they sleep and some people find the airflow from the machine to be scary or uncomfortable. Between a third to half of the people who try to use CPAP don't manage to keep using it for more than a year. This means that their OSA is left untreated.
A new treatment has been invented where electricity is used to activate nerves in the neck to keep the throat muscles working even when people are asleep. This works very well for some people, but it involves putting the wires and electrical box inside the body (implanting) in a very difficult and expensive operation.
The Zeus device uses the same idea to activate nerves in the throat with electricity, but it sticks onto the skin under the jaw and sends gentle electricity to the nerves through the skin. The Zeus device has been proven to help people snore less.
This study wants to look at whether the Zeus device may help people with OSA to stop breathing less often when they're asleep, and make them feel better in the daytime. It may help us to make a new treatment for people with OSA who can't or don't want to wear a CPAP mask.

Who can participate?
Adults who have been diagnosed with OSA by Dorset County Hospital in the last 3 years. These people will either be self-treating their OSA by losing weight or drinking less alcohol, or they will

be on the waiting list to start using a CPAP machine to treat their OSA. They can't have any other sleep problems except for OSA, and they can't have any problems that mean that it would be unsafe to use the Zeus device, like having a pacemaker fitted.

What does the study involve?
People will have their height, weight and collar size measured, and answer a questionnaire about their sleep quality and daytime sleepiness. They will do a sleep study in their own homes. Then they will wear a Zeus device and a small oxygen meter every night for a week so they can get used to how it works and feels. On the last night of the week, they will do a home sleep study while wearing the Zeus device. The next week, they'll wear a different Zeus device every night and do one last home sleep study on the last day. One of the Zeus devices will be working, and the other one will be a dummy that doesn't work. No one will know which Zeus device is which, to keep the study fair. People will also be asked to fill in questionnaires about how they feel and what it was like to use the Zeus devices.

What are the possible benefits and risks of participating?
People who take part will have reasonable travel costs repaid and they will also be given a new Zeus device as a thank-you when they finish the study. The study will give them some up-to-date information about their OSA and this might be helpful for them to understand their sleep problems better.
There is a small risk that the Zeus device or the sticky pad used to stick it to the skin might irritate people's skin. If this happens, they will be asked to stop taking part in the study. There is also a small risk that wearing unfamiliar things in bed might make people sleep badly, which could make them very tired or sleepy in the daytime. The researchers will ask everyone to think about their tiredness and sleepiness carefully and to tell us if they think they are getting too tired to do their daily tasks safely.

Where is the study run from?
Dorset County Hospital (UK)

When is the study starting and how long is it expected to run for?
June 2022 to April 2023

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

Who is the main contact?
Catherine Morgan, zeus@dchft.nhs.uk

Contact information

Type(s)
Principal Investigator

Contact name
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Additional identifiers

EudraCT/CTIS number
Nil known

IRAS number
311802

ClinicalTrials.gov number
Nil known

Secondary identifying numbers
0.7 18/8/2022, IRAS 311802, CPMS 53936

Study information

Scientific Title
Effect of transcutaneous electrical hypoglossal nerve stimulation on apnoea/hypopnoea index in obstructive sleep apnoea patients using the ZeusOSA device compared with a placebo device

Acronym
Zeus-OSA

Study objectives
Does the ZeusOSA device significantly change apnoea/hypopnoea index (AHI) in obstructive sleep apnoea (OSA) patients?

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approval pending, MHRA (10 South Colonnade, London, E14 4PU, UK)

Study design
Double-blind randomized crossover study

Primary study design
Interventional

Secondary study design
Randomised cross over trial

Study setting(s)
Home

Study type(s)
Treatment

Participant information sheet
See trial outputs table

Health condition(s) or problem(s) studied
Obstructive sleep apnoea

Interventions
The proposed study aims to investigate the effectiveness of a modified Zeus device called ZeusOSA in improving sleep-disordered breathing and related symptoms in OSA patients via a randomised double-blind crossover trial using active and sham devices. Participants will be recruited from a pool of patients who have undergone a diagnostic multi-channel sleep study within the last 24 months which demonstrated an AHI between 5-35/hr and who are currently either awaiting initiation of continuous positive airway pressure (CPAP) therapy or engaging with lifestyle advice to improve their OSA symptoms. Engagement with the study will have no impact on their current care plans. Participants should not already be on CPAP therapy, should not have any sleep disorder other than OSA, and should not have any serious comorbidity or contraindication to using the transcutaneous electrical stimulation device.

The active and the sham devices will be paired, and the devices assigned labels ‘A’ and ‘B’, with the order of labelling randomly assigned by a computer randomisation program. Participants will undergo a domiciliary diagnostic multi-channel sleep study on Night 0. They will wear Device A and an overnight oximeter at home for 7 nights, repeating the multi-channel sleep study on Night 7. Then patients will wear Device B and overnight oximeter for a further 7 nights, repeating the multi-channel sleep study on Night 14. Qualitative data on perceived sleep quality, snoring, daytime sleepiness will be collected via a daily questionnaire over the entire 15 nights.

Intervention Type
Device

Phase
Not Applicable

Drug/device/biological/vaccine name(s)
Zeus OSA device

Primary outcome measure
Apnoea-Hypopnoea Index will be measured by multi-channel sleep study on Days 0, 7 and 14

Secondary outcome measures
1. Oxygen Desaturation Index will be measured by multi-channel sleep study on Days 0, 7 and 14, and also by pulse oximeter on Days 0-14
2. Snoring will be measured by multi-channel sleep study on Days 0, 7 and 14
3. Perceived sleep quality will be measured by weekly questionnaire on Days 0, 8 and 15; and also by daily questionnaire on days 1-15

4. Perceived daytime sleepiness will be measured by weekly questionnaire on Days 0, 8 and 15; and also by daily questionnaire on days 1-15
5. Perceived daytime alertness will be measured by weekly questionnaire on Days 0, 8 and 15; and also by daily questionnaire on days 1-15
6. Perceived daytime functionality will be measured by a weekly questionnaire on Days 0, 8 and 15
7. Short-term trends in the efficacy of the Zeus device will be measured by analysis of ODI recorded by pulse oximeter on Days 0-14 and sleep quality, daytime sleepiness, and daytime alertness recorded by daily questionnaire on Days 1-15
8. Tolerance of the Zeus device will be measured by weekly questionnaire on Days 8 and 15

Overall study start date
01/06/2022

Completion date
30/04/2023

Eligibility

Key inclusion criteria
OSA patients awaiting CPAP therapy or treating symptoms with lifestyle changes

Participant type(s)
Patient

Age group
Adult

Sex
Both

Target number of participants
50

Key exclusion criteria
Participants meeting any of the following will be excluded:
1. Participants with complex sleep disorders such as central sleep apnoea, REM-related parasomnias, restless leg syndrome, periodic limb movement disorder, chronic insomnia or paradoxical insomnia, sleep disorders caused by medications or drugs, or other sleep disorders that the Chief Investigator or his deputies consider may contaminate the focus of the study.
2. Participants with significant co-morbidities such as heart failure, respiratory failure, uncontrolled diabetes, polyuria, neuromuscular disorders, or other medical conditions that the Chief Investigator or his deputies consider may contaminate the focus of the study.

In addition, the following are contraindications to using the ZeusOSA device as stated by the manufacturer, Morgan IAT Ltd., therefore participants meeting any of the following will be excluded:
1. Participants fitted with a pacemaker, defibrillator, or any other implantable medical devices
2. Participants with metal implants (excluding fillings) in the head and neck region
3. Participants diagnosed with cancer in the head and neck region

4. Participants who have had head or neck surgery in the last 6 months
5. Participants with swollen, infected, inflamed areas or broken skin under the jaw
6. Participants who have a recently diagnosed (last two months) deep vein thrombosis (DVT)
7. Participants experiencing unstable cardiovascular status including uncontrolled hypertension and arrhythmias
8. Participants experiencing recurrent seizures, epilepsy, or migraines
9. Participants experiencing cognitive impairment, including cognitive impairment caused by medication, drug, or alcohol use, or those who are unable to give informed consent
10. Participants with thick facial hair under the jaw who do not wish to shave, or patients who use moisturising creams on the skin under the jaw who do not wish to pause this routine
11. Participants using any other any other medical devices during sleep

Date of first enrolment
01/09/2022

Date of final enrolment
01/12/2022

Locations

Countries of recruitment
England

United Kingdom

Study participating centre
Dorset County Hospital
Dorset County Hospital
Williams Avenue
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United Kingdom
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Sponsor information

Organisation
Morgan Innovation and Technology (United Kingdom)

Sponsor details
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Sponsor type
Industry

Website
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ROR
https://ror.org/01vspgn73

Funder(s)

Funder type
Government

Funder Name
Invention for Innovation Programme

Alternative Name(s)
NIHR Invention for Innovation Programme, i4i

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
United Kingdom

Results and Publications

Publication and dissemination plan
It is intended to compile the findings of this study into a comprehensive Final Report and accompanying single-page Lay Summary of Findings. Results will be published regardless of whether there is a ‘positive’ or ‘negative’ outcome. It is intended to submit the Final Report to a relevant reputable medical journal such as Thorax, Sleep, the European Respiratory Journal or ARTP Inspire. It is also intended to present the findings at relevant conferences such as the ARTP, British Sleep Society or European Respiratory Society.

At their final appointment at Dorset County Hospital, all participants will be asked to confirm their email address for dissemination of the final report and lay summary of findings. If any

participant does not wish to have the final report sent to them, they can opt-out at this point. The decision to disseminate the final report electronically rather than by paper and post was made on the grounds of economic and environmental friendliness, and due to the possibility of participants moving addresses between their involvement in the study and the final publication of the report; a confirmed email address was considered to be a better solution. The email sent to participants will not contain any of their personal information, nor will a visible 'mailing list' of email addresses be used that could be seen by all recipients. The final report and lay summary will be attached as .pdf documents.

Intention to publish date

01/06/2023

Individual participant data (IPD) sharing plan

Only the Chief Investigator and Principal Investigator will have access to participants' identifying information and this will only be used during recruitment and screening, for contacting participants in the event of an Adverse Event during the study, and to disseminate the final report once the study has been completed. Once enrolled, all participants will be identified only by their assigned pseudonymous Participant ID and no identifying data will be recorded with their study data.

During the study, data will be recorded onto paper proformas by GCP-certified respiratory physiologists. All paper records will be stored in a locked filing cabinet, inside a locked office, in a locked department at Dorset County Hospital for the duration of the participants' involvement, then will be scanned, uploaded to the Edge database, verified, and the original paper documents shredded securely. All sleep study data will be deleted from devices immediately after download of the data, as is standard practice for routine NHS sleep studies. Once participants are enrolled, data will be recorded by a GCP-certified Respiratory Physiologist when collected in person using a standardised proforma.

Weekly and daily questionnaires will be completed by participants – they will be given the opportunity to see these during their enrolment appointment and given time to ask questions or for guidance should anything be unclear. At the end of the study, the questionnaires will be scored and a summary of the results compiled on documents ZS08 – Weekly Questionnaire Results Summary and ZS09 – Daily Questionnaire Results Summary.

Weekly sleep study data will be collected using a 'Somnotouch RESP Eco' multi-channel sleep study device which is the routine sleep study device used by Dorset County Hospital in the investigation, diagnosis and monitoring of Obstructive Sleep Apnoea. The devices will be worn by participants whilst sleeping in their own homes and then returned to Dorset County Hospital so that the recorded data can be downloaded. The raw data from these sleep studies will be sent by password-protected encrypted email to the supplier of the devices, S-Med, who will perform data analysis and return standardised reports for each sleep study on document ZS06 – Weekly Sleep Study Results. No personal identifying data will be sent to S-Med. No additional data beyond that which is required for the study will be returned to the study organisers.

Daily overnight oximetry will be collected by a 'CIRCUL ring' pulse oximeter via a smartphone app and Zeus device usage time will be recorded by the Zeus app. On Day-8 and Day-15, a GCP-certified respiratory physiologist will ask the participants to access these apps so that the data can be transcribed onto document ZS07 – Daily Sleep Study Results. The transcription will be verified by a second GCP-certified Investigator and signed to confirm.

All study data will be recorded onto a password-protected Edge database by the Principal Investigator and verified by the Chief Investigator. Paper records will be scanned, uploaded to the Edge database, verified, and the original documents destroyed securely.

IPD sharing plan summary

Stored in non-publicly available repository

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet			23/08/2022	No	Yes