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# Mandibular advancement device plus continuous positive airway pressure: does combining two established treatments for obstructive sleep apnoea give added benefits?

**Submission date**
17/11/2021

**Recruitment status**
No longer recruiting

**Registration date**
18/02/2022

**Overall study status**
Completed

**Last Edited**
07/11/2025

**Condition category**
Nervous System Diseases

[X] Prospectively registered
[X] Protocol
[X] 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 a condition in which the walls of the throat relax and narrow during sleep, interrupting normal breathing. Continuous positive airway pressure (CPAP) machines can be used to treat sleep apnea by delivering a stream of air into the airways through a mask and a tube. A mandibular advancement device (MAD) is a treatment method that works by temporarily moving the jaw and tongue forward, which reduces throat constriction and prevents sleep apnea. This study will test the effectiveness of combining MAD with CPAP therapy, compared with CPAP only therapy, for the treatment of OSA. Some patients have difficulty using CPAP as they require a higher pressure than they can easily tolerate, making CPAP more difficult to sleep with and increasing the risk that they will abandon therapy entirely. Combining MAD with CPAP could potentially open the airway enough to allow CPAP pressure to be reduced, making CPAP therapy more comfortable and increasing the likelihood that patients will continue with their treatment. If the new 'combination therapy' is shown to be effective it could fairly easily be introduced into the NHS as an additional tool for helping patients to use CPAP successfully.

Who can participate?
Patients with moderate to severe OSAS

What does the study involve?
Participants will be given a MAD moulding kit to take home with full instructions including how to send the mould to the manufacturer. Once the MAD device has been produced and returned to Papworth Hospital by the manufacturer research visit 1 will take place. At this visit the participant will be randomly allocated to receive standalone CPAP therapy or CPAP plus MAD and will be switched to auto-CPAP (CPAP that automatically adjusts pressures settings as required). They will also be asked to complete some questionnaires. Participants allocated to the combination treatment will be given their MAD and will start their 10-week treatment after 2 weeks of acclimatisation. They will also be given instructions to complete a sleep diary.

Participants allocated to CPAP only will be asked to initiate auto-CPAP treatment straightaway for 10 weeks. During the treatment period participants will be telephoned to check if there are any issues and to check progress. They will also be sent a Watchpat device to use for a one-night sleep study at home during the final week of treatment. Following completion of the first treatment period, participants will attend research visit 2 (alternatively this can be conducted remotely) when they will be crossed over to the other treatment group. The Watchpat device will be returned (either in person or via post) and study questionnaires will be completed again. Those starting the combination treatment will be given/posted their MAD and asked to initiate their 10-week treatment following 2 weeks of acclimatisation, and to complete the sleep diary. Those starting the standalone CPAP treatment will be asked to return their sleep diary and to immediately stop using the MAD and start 10-week treatment of CPAP only
During the second treatment period the participants will be telephoned again to check if there are any issues and to check progress. As in treatment period 1, participants will be sent a Watchpat device to use for a one-night sleep study at home during the final week of treatment. At the end of the second treatment period the participant will attend research visit 3 - either face to face or remotely. The Watchpat device will be returned and the study questionnaires completed. Participants who were on the combination therapy for the second treatment period will be asked to return their sleep diary for treatment period 2. Clinical review and discussion about continuing with CPAP or combination treatment will then take place.

What are the possible benefits and risks of participating?
There is no guarantee of any benefit by participating in this study, though if the use of combination therapy is found to be successful in the treatment of OSA this could be continued after the patient's participation in the study. It is not anticipated that the risks to the participants will exceed current use from using CPAP or MADS, for example, excessive salivation during sleep and jaw pain

Where is the study run from?
Royal Papworth Hospital (UK)

When is the study starting and how long is it expected to run for?
August 2021 to September 2025

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

Who is the main contact?
Dr Tim Quinnell
tim.quinnell@nhs.net

# Contact information

### Type(s)
Scientific

### Contact name
Dr Tim Quinnell

### ORCID ID
https://orcid.org/0000-0002-2397-3652

### Contact details
Royal Papworth Hospital NHS Foundation Trust
Papworth Road
Cambridge Biomedical Campus
Cambridge
United Kingdom
CB2 0AY
+44 (0)1223 639716
tim.quinnell@nhs.net

### Type(s)
Scientific

### Contact name
Dr Victoria Stoneman

### ORCID ID
https://orcid.org/0000-0001-7472-9206

### Contact details
Royal Papworth Hospital NHS Foundation Trust
Papworth Road
Cambridge Biomedical Campus
Cambridge
United Kingdom
CB2 0AY
+44 (0)1223 639865
victoria.stoneman@nhs.net

## Additional identifiers

### Integrated Research Application System (IRAS)
296163

### Central Portfolio Management System (CPMS)
49261

## Study information

### Scientific Title
Positive Airway Pressure plus Mandibular Advancement Therapy (PAPMAT)

### Acronym
PAPMAT

### Study objectives
Combining mandibular advancement device (MAD) with continuous positive airway pressure (CPAP) therapy improves adherence in patients who require a high pressure on CPAP therapy.

### Ethics approval required

Old ethics approval format

## Ethics approval(s)
Approved 02/08/2021, East of England – Cambridgeshire and Hertfordshire Research Ethics Committee (The Old Chapel, Royal Standard Place, Nottingham, NG1 6FS, UK; +44 (0)20 7104 8096; cambsandherts.rec@hra.nhs.uk), REC ref: 21/EE/0125

Substantial amendment to add Bristol Royal Infirmary as a study site approved 24/11/2023

## Primary study design
Interventional

## Study design
Randomized; Interventional; Design type: Treatment, Device

## Study type(s)
Treatment

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

## Interventions
Recruitment:
Patients attending a clinical appointment for initiation of CPAP who meet the inclusion criteria will be approached during their appointment. A member of the research team will explain the trial and give the patient the relevant documentation. At the CPAP follow-up clinic appointment (approx. 6 weeks after the first appointment) written informed consent will be obtained (participants will be advised that they are able to withdraw from the study at any point with no impact on their routine NHS care).
Participants will be given a MAD moulding kit to take home with full instructions including how to send the mould to the manufacturer.
The research team will telephone the participant 1 week following consent to check on their progress with the moulding kit.
Once the MAD device has been produced and returned to Papworth Hospital by the manufacturer, the research team will telephone the participant to check they are still happy to proceed. An appointment will then be made for the participant to return to Royal Papworth Hospital for research visit 1.

Research Visits:

Visit 1
The participant will be randomised to receive standalone CPAP therapy or CPAP plus MAD and will be switched to auto-CPAP. They will also be asked to complete the following questionnaires:
1. Epworth Sleepiness Scale (ESS)
2. Functional Outcomes of Sleep Questionnaire (FOSQ)
3. Pittsburg Sleep Quality Index
4. Short Form 36 Health Survey Questionnaire (SF36)
5. EuroQol-5D (EQ5D)
BP and weight will also be recorded

EITHER
Participants randomised to the combination treatment will be given their MAD and be asked to initiate their 10-week treatment following 2 weeks of acclimatisation. They will be given instructions to complete the sleep diary (electronically or on paper) every day.
OR
Participants randomised to CPAP only will be asked to initiate auto-CPAP treatment straightaway for 10 weeks. No sleep diary is required for this treatment arm.
During their treatment period the participant will be telephoned to check if there are any issues and to check progress. Participants will also be sent a Watchpat device to use for a one-night sleep study at home during the final week of treatment. A pre-paid envelope will be provided to return the device if the patient is unable to attend the next research visit in person.

Visit 2 - cross over to alternative treatment arm
Following completion of the first treatment period, participants will attend a second research visit. It is not essential for this to be a face to face visit as it could be done remotely. BP and weight will be recorded, if possible. The participant will be crossed over to the second treatment arm. Those starting the combination treatment will be given/posted their MAD and asked to initiate their 10-week treatment following 2 weeks of acclimitisation, and to complete the sleep diary. Those starting the standalone CPAP treatment will be asked to immediately stop using the MAD and start 10 week treatment of CPAP only, and return their sleep diary. The Watchpat device will be returned (either in person or via post). The study questionnaires (listed above) will be completed again (via telephone or in-person) by all participants. Automatic download of data from participants' CPAP device will take place.

During the second treatment period the participants will be telephoned again to check if there are any issues and to check progress. As in treatment period 1, participants will be sent a Watchpat device to use for a one-night sleep study at home during the final week of treatment. A pre-paid envelope will be provided to return the device in if the patient is unable to attend the third research visit in person.

Visit 3
At the end of the second treatment period the participant will attend research visit 3 - this can be face to face if it coincides with their routine CPAP follow-up clinic visit, but if not the appointment can be completed remotely. BP and weight will be recorded, if possible. Watchpat device will be returned (either in person or via post). The study questionnaires will be completed and the participants who were on the combination therapy for the second treatment period will be asked to return their sleep diary for treatment period 2. Final automatic download of data from CPAP devices will take place.

Clinical review and discussion about continuing with CPAP or combination treatment will then take place.

## Intervention Type
Device

## Phase
Not Applicable

## Drug/device/biological/vaccine name(s)
Mandibular advancement device

### Primary outcome(s)
CPAP adherence (means hours of use per night) measured using data downloaded from CPAP device after 10 weeks of treatment

### Key secondary outcome(s)
1. CPAP pressure measured using CPAP data download after 10 weeks
2. Control of obstructive sleep apnoea (OSA) using a peripheral arterial tonometry (PAT) oximeter sleep monitor to determine the apnoea hypopnoea index (AHI) and 4% oxygen desaturation index (4% ODI) in each arm after 10 weeks
3. Diastolic and systolic blood pressure arms measured using office-based automated measurement with patient sitting after 10 weeks
4. Patient-reported outcomes measured after 10 weeks:
4.1. Subjective daytime sleepiness measured using the Epworth Sleepiness Scale
4.2. Quality of life measured using Functional Outcomes of Sleep Questionnaire (FOSQ), EuroQoL, Pittsburgh Sleep Quality Index (PSQI)
4.3. Patient satisfaction measured using visual analogue score

### Completion date
30/09/2025

## Eligibility

### Key inclusion criteria
Current inclusion criteria as of 01/05/2024:
1. Adults with moderate to severe OSAS defined by a 4% oxygen desaturation index (4% ODI) or apnoea hypopnoea index (AHI) ≥15/hour
2. An Epworth Sleepiness Scale (ESS) Score >10
3. Auto-titrated CPAP pressure of ≥12 cm water

Previous inclusion criteria:
1. Adults with moderate to severe OSAS defined by a 4% oxygen desaturation index (4% ODI) or apnoea hypopnoea index (AHI) ≥15/hour
2. An Epworth Sleepiness Scale (ESS) Score >10
3. Auto-titrated CPAP pressure of ≥14 cm water

### Participant type(s)
Patient

### Healthy volunteers allowed
No

### Age group
Adult

### Sex
All

### Total final enrolment
94

### Key exclusion criteria
1. Inadequate dentition or other contraindication to MAD determined by a clinician or trained CPAP provider
2. Co-morbid sleep disorder that might affect the patient's ability to comply with treatment or benefit from therapy, or confound the interpretation of results
3. Unstable cardio-respiratory disease or other disorder/factor judged by the clinician to preclude trial participation due to safety concerns or significant potential to confound interpretation of results
4. Previous MAD or CPAP use
5. Other reason for an inability to comply with the trial protocol

### Date of first enrolment
01/05/2022

### Date of final enrolment
26/02/2025

## Locations

### Countries of recruitment
United Kingdom

England

### Study participating centre
**Royal Papworth Hospital**
Papworth Road
Cambridge Biomedical Campus
Cambridge
United Kingdom
CB2 0AY

### Study participating centre
**University Hospital Bristol**
Bristol Royal Infirmary
Marlborough Street
Bristol
United Kingdom
BS2 8HW

## Sponsor information

### Organisation

Royal Papworth Hospital NHS Foundation Trust

# Funder(s)

### Funder type
Government

### Funder Name
NIHR Central Commissioning Facility (CCF); Grant Codes: NIHR201124

# Results and Publications

### Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study will be stored in a non-publicly available repository

### IPD sharing plan summary
Stored in non-publicly available repository

### Study outputs

| Output type | Details | Date created | Date added | Peer reviewed? | Patient-facing? |
|---|---|---|---|---|---|
| Protocol article | | 24/06/2023 | 25/07/2023 | Yes | No |
| HRA research summary | | | 28/06/2023 | No | No |
| Participant information sheet | version 3 | 29/07/2021 | 04/02/2022 | No | Yes |
| Statistical Analysis Plan | | 06/11/2025 | 07/11/2025 | No | No |