Combination therapy with CPAP plus MAS reduces CPAP therapeutic requirements in incomplete MAS responders

INTRODUCTION:
CPAP and mandibular advancement splints (MAS) are common therapies for OSA. CPAP is efficacious but often poorly tolerated. Adherence to MAS is higher but efficacy varies. Treatment options for those who cannot tolerate CPAP or do not fully respond to MAS therapy alone are limited. Combination therapy (CPAP+MAS) may be a therapeutic solution for incomplete responders to MAS or for those who cannot tolerate CPAP (via reduced CPAP requirements). Thus, this study aimed to determine therapeutic CPAP requirements using combination therapy (a novel MAS device [Oventus O2VentT] with a built in oral airway + CPAP) vs. CPAP alone in incomplete responders to MAS.

METHODS:
Data from 10 out of 15 incomplete responders to MAS therapy (residual AHI>10 events/h) who completed the study have been analysed thus far (7 males, aged 31-64y, BMI 22-38 kg/m², residual AHI 13-63 events/h).
Participants were instrumented with a nasal mask, pneumotachograph, epiglottic pressure (Pepi) catheter to define therapeutic CPAP using gold standard methodology, and standard polysomnography equipment. CPAP titrations during NREM supine sleep were performed (order randomised) during: 1) CPAP only, 2) CPAP+MAS (oral airway open), and 3) CPAP+MAS (oral airway closed).

RESULTS:
The mean residual AHI on MAS therapy alone (% advancement= 84±15%) was 24±16 events/h. OSA was treated (normalisation of Pepi swings to near wakefulness levels) with 7.6±1.8 cmH₂O during the CPAP only condition. Compared to CPAP alone, CPAP+MAS reduced therapeutic CPAP requirements by 36±21% (4.8±2.1 cmH₂O, p<0.01) with the oral airway open and by 38±20% (4.8±2.1 cmH₂O, p<0.01) with the oral airway closed. Pepi was normalised to wakefulness levels at the therapeutic CPAP level during all 3 conditions (CPAP alone= -2.0[-3.3,-1.2] cmH₂O vs. CPAP+MAS (oral airway open)= -1.8[-4.3,-1.8] cmH₂O vs. CPAP+MAS (oral airway closed)= -1.7[-3.1,-1.4] cmH₂O, p=0.67).

CONCLUSIONS:
Combination therapy (CPAP+MAS) reduces Pepi swings to a similar extent to CPAP alone with ~40% lower CPAP requirements. This may be a therapeutic option for people with OSA who cannot tolerate high pressures and incomplete MAS responders.

SUPPORT:
This study was funded by a Cooperative Research Centre Project Grant, a joint Government, Academia and Industry collaboration (Industry partner: Oventus Medical).
Introduction

CPAP therapy
- First line treatment for OSA
- Highly efficacious but is often poorly tolerated

MAS therapy
- Common alternative to CPAP therapy
- Higher adherence vs. CPAP but efficacy varies and is difficult to predict

Combination therapy (CPAP + MAS)
- A potential therapeutic solution for:
  - Incomplete responders to MAS therapy alone
  - Patients who cannot tolerate high pressure levels with CPAP including oronasal mask users
- Combination therapy in OSA has been minimally studied

Aims

To compare pharyngeal pressure (Pepi) swings and therapeutic CPAP requirements when CPAP is combined with MAS therapy versus CPAP therapy alone in incomplete MAS responders

Methods

Study design

Incomplete responders to MAS therapy (residual AHI > 10 events/h)

Randomise to split night physiology PSG (3 arm cross-over)

CPAP only
CPAP + MAS (Open)
CPAP + MAS (Closed)

CPAP + MAS (Open)
CPAP only
CPAP + MAS (Open)

CPAP + MAS (Closed)
CPAP + MAS (Closed)
CPAP only

CPAP titrations were conducted during NREM supine sleep

CPAP only
CPAP + MAS (airway open)
CPAP + MAS (airway closed)

Oventus O2 Vent T
- Novel MAS device with a built in oral airway was used

Participant set up

CPAP titration set up
1. Pneumotachograph
2. Mask pressure
3. Epiglottic pressure catheter (Pepi)
4. End tidal CO2
5. Nasal mask

Results

16 complete responders to MAS therapy (residual AHI: 13-63 events/h, average % of maximum mandibular advancement: 83 %) [13 males, 3 females, age: 31-65 years, BMI: 22 – 38 kg/m2]

Figure 1: Therapeutic CPAP level was objectively defined as the pressure at which there were no respiratory events or flow limitation and where pharyngeal pressure swings were stabilised to near wakefulness levels as shown in this individual example

Figure 2: As per study design, pharyngeal pressure swings were successfully normalised to CPAP only levels (near wakefulness levels) with combination therapy (CPAP + MAS) with oral airway opened and closed

RM ANOVA p= 0.144

Figure 3: Combined CPAP plus mandibular advancement splint (MAS) therapy reduces the CPAP requirements required to eliminate OSA by ~35-45%

Conclusion

- Combination therapy (CPAP + MAS) can normalise pharyngeal pressure swings with ~35-45% lower CPAP requirements than CPAP alone
- This may be a therapeutic option for patients who are incomplete responders to MAS therapy alone and those who can not tolerate CPAP due to high pressure requirements

Acknowledgements

- This study was supported by a Cooperative Research Centre Project grant from the Australian Government in collaboration with academia and industry (Industry partner: Oventus Medical)
- DJE is supported by a NHMRC of Australia Senior Research Fellowship (1116942)