Objective compliance and head position monitoring of mandibular advancement splint therapy for sleep-disordered breathing – a preliminary investigation

Joachim Ngiam[1,2]

[1] Department of Respiratory and Sleep Medicine, Royal North Shore Hospital, Sydney, NSW, Australia;
[2] PhD candidate, The University of Sydney, Sydney, NSW, Australia

Introduction

- Mandibular advancement splints (MAS) are oral appliances that are worn during sleep to protrude the mandible forward. They are a viable treatment alternative to CPAP as they are less cumbersome and more user-friendly [1].
- Compliance of MAS therapy has previously been subjectively quantified [2,3]. There have been few studies that objectively quantify MAS compliance [3,4,5].
- There is also limited data available about head position with MAS in situ during sleep.
- This is a preliminary investigation of objective compliance monitoring with head position measurements using a commercial microsensor embedded in the MAS device.

Figure 1: An example of the Mandibular Advancement Splint (MAS) device used in the study with the Dentitrac objective compliance microsensor, and its reading station
A). Customised titratable MAS (Somnodent Classic) with the Dentitrac chip embedded in the lower half of the device.
B). The Dentitrac objective compliance microsensor is approximately 1mm in diameter, and adds little bulk to the overall device.
C). The Dentitrac reader used infrared signals to read and download data stored on the Dentitrac microsensor. The microsensor needs to be placed on the reader for the chip to be activated, so patients are not exposed to any radiation while wearing the device.

Aims

- To determine whether investigation of objective MAS compliance is feasible in a clinical setting.
- To determine whether a commercial microsensor embedded in MAS devices is well tolerated by patients
- To objectively measure short-term MAS compliance.

Methods

Participants

- 69 primary snorer and OSA patients (43 male) undergoing MAS therapy.

MAS Device

- Patients were fitted with a customised titratable MAS (Somnodent Classic). Embedded within the lower half of the two piece device was a thermo microsensor and acclerometer (DentiTrac, BRAEBON Medical Corporation) which is designed to objectively measure MAS compliance and head position during sleep.

Titration and Follow-Up

- Patients were instructed to titrate the MAS device adopting a standardised protocol (0.3 mm advancement, twice a week) to their maximum comfortable level of advancement.
- Patients returned for a follow-up appointment where the data was read from the microsensor trough a base station reader.

Results

Participant Demographics

- Patients were recorded to have a baseline average Apnoea-Hypopnoea Index (AHI)of 21.7 ±2.4 events/hour with an average body-mass index (BMI)of 28.3 ± 0.62 kg/m^2.
- All patients tolerated the DentiTrac microsensor.

Factor	Mean	Minimum	Maximum
Age (n=69)	51.6	17	87
BMI (n=69)	28.3	19.9	45.1
Initial AHI (n=39)	21.7	0	78

Table 1: Patient Demographics. A total of 69 patients were included in this study. On average, they were over 50 years of age, overweight and experienced moderate obstructive sleep apnoea.

Compliance and Head Position

- Positive compliance was defined as >4 hours of MAS use per day.
- During an average of 39 ±1.9 days, an overall MAS objective compliance of 85.9 ±1.8% with mean 7.5 ±0.1 hours of MAS use was recorded. Head position was 89.9 ±1.3% non-supine during sleep.

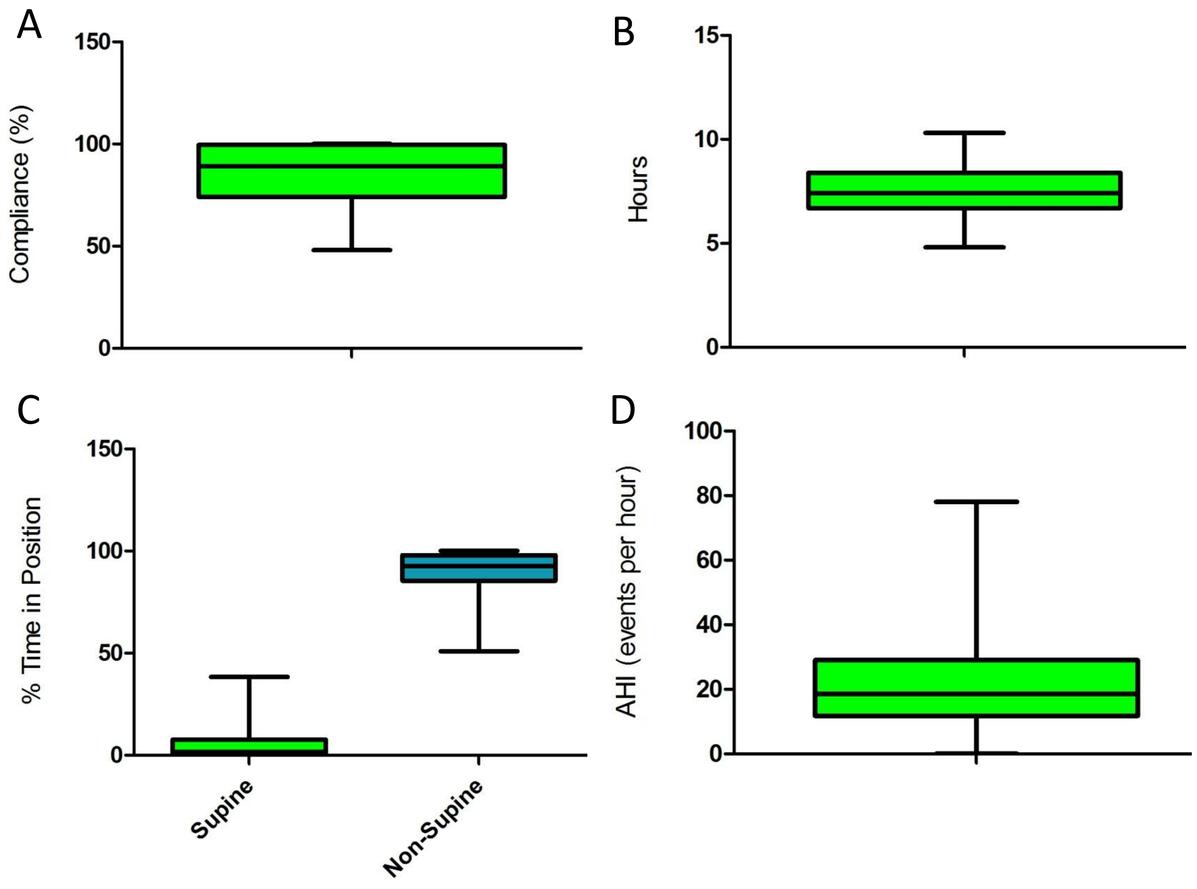

Figure 2: Box-and-whisker (Minimum, lower quartile, median, upper quartile maximum) plots of the relevant compliance data accrued after an average of 39 ± 1.9 days.
A). The distribution of overall compliance (n=69). This distribution is left-skewed, due to a large number of patients scoring close to 100% in compliance.
B). The distribution of average hours per night (n=69). It should be noted that all patients slept more than 4 hours a night on average, meeting positive compliance requirements.
C). The distribution of time spent in supine and non-supine head positions (n=68). It should be noted that most patients' predominant head sleeping position is non-supine.
D). The distribution of initial AHI scores (n=39).

Conclusions

- Objective measurement of MAS compliance and head position with a Dentitrac microsensor embedded within the MAS device is feasible in a clinical setting and appears to be well tolerated by primary snorer and OSA patients.
- An average of 85.9% compliance was found over 39 days. Patients wore the device for an average of 7.5 hours. Further research is being conducted to determine the impact of therapeutic and patient perceived benefit on longer term MAS compliance.

References

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