

Case Studies on Apnea-Hypopnea Index Variability During Treatment with an Oral Appliance

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Introduction: Outcomes studies to assess the benefit of oral appliance treatment for sleep disordered breathing are commonly limited to one night. Four case studies are presented using repeated measures assessment to identify factors that influence treatment outcomes.

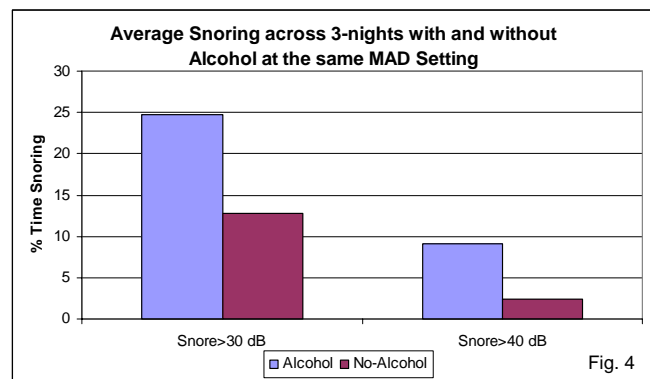
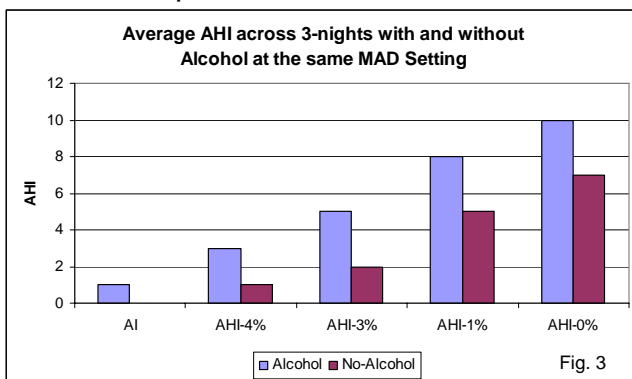
Methods: A portable monitor (Fig. 1) was worn on multiple nights for in-home sleep studies by four patients treated for SDB with a TAP II mandibular advancement device (MAD). The MAD was adjusted at the time of insertion so the patient could just hook the lower tray with the upper tray with active protrusion of the mandible. Data were analyzed using autoscoring techniques that compute Apnea-Hypopnea Index (AHI) based on four desaturation criteria and time-in-bed (Fig. 2), and the percent time snoring at multiple decibel levels. Central events were identified by visual inspection.



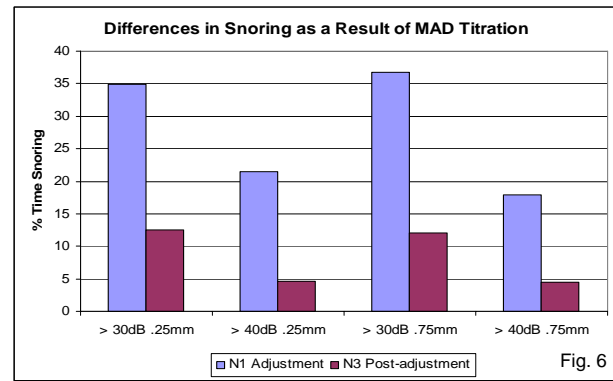
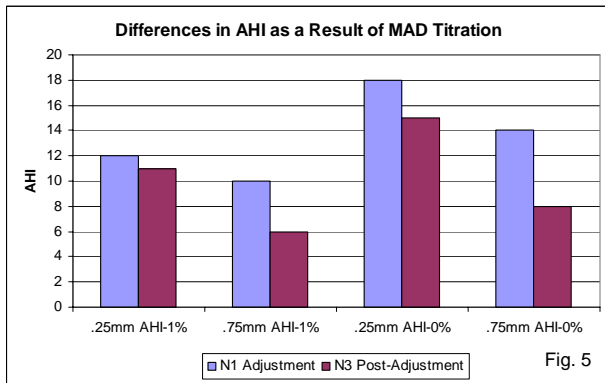
ARES AHI Criteria									
Group Apnea	Desat	AirFlow	Arousal	Present Events for editing	4%	3%	1%	0%	
ApA	N/A	Apnea	Yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ap	N/A	Apnea	No	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
H4A	>3.5%	Hypop	Yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
H4	>3.5%	Hypop	No	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
H3A	~3%	Hypop	Yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
H3	~3%	Hypop	No	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
H1A	~1%	Hypop	Yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
H0A	0%	Hypop	Yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

AHI criteria presented on front page of ARES Report: Temporary change for this record Permanent change for all records

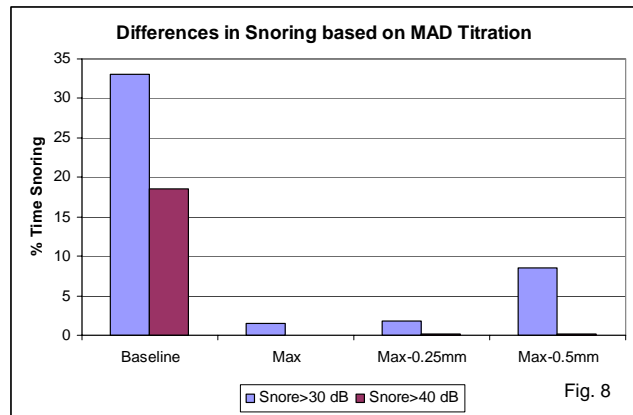
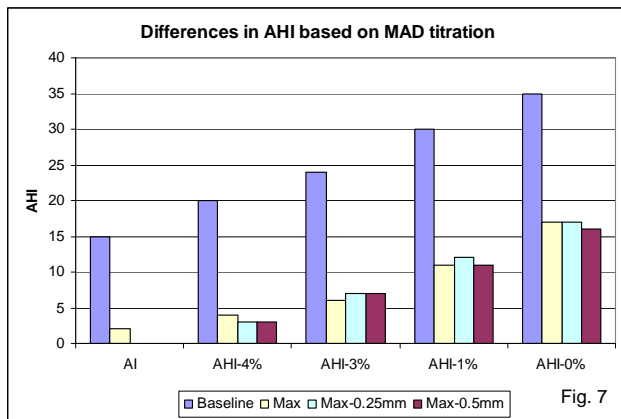
Case 1: A 48 year-old male with mild OSA. Three studies were completed prior to treatment. Eighteen sleep studies were completed over a 45-day period at five 0.25 mm adjustment points. Figures 3 and 4 present the mean AHI and percent time snoring from three night of recordings averaged after 1.3 glasses of wine < 2 hours before sleep and three nights with no alcohol at the same titration setting. With alcohol, the AHI more than doubled at 3% and 4% desaturation levels and the percentage time snoring doubled at 30 dB and tripled at 40 dB.



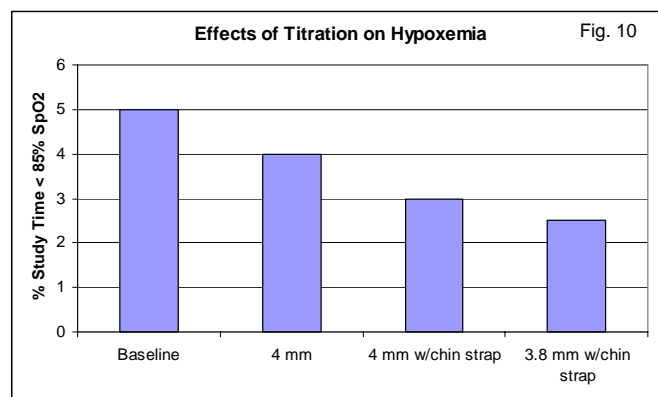
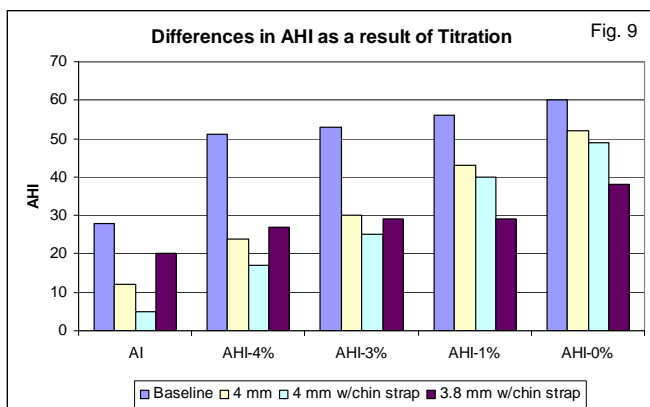
Figures 5 and 6 highlight what appears to be a first night effect in the AHI and percent time snoring that occurred during the first night of adjustment of the MAD compared to two nights later at the same setting while controlling for alcohol consumption. Snoring at 30 and 40 dB was approximately three times higher on the titration nights as compared to two nights post-adjustment.

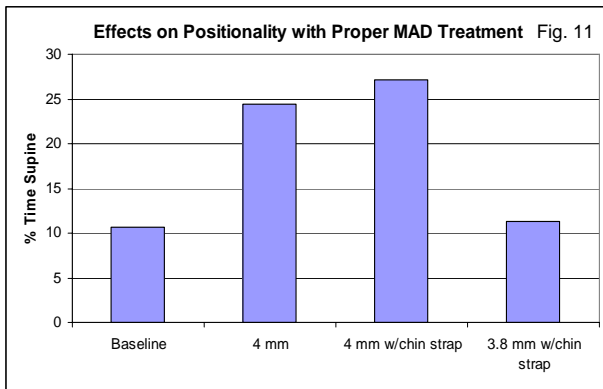


Case 2: Sixty-two year old male with hypertension and moderate OSA completed four x 2-night studies: 1) prior to treatment, 2) at maximum acceptable protrusion, 3) 0.25 mm less than maximum, and 4) 0.5 mm less than maximum. The AHI at the three titration settings were almost identical (Fig. 7) and the percent time snoring increased slightly at 0.5 mm less protrusion (Fig. 8).

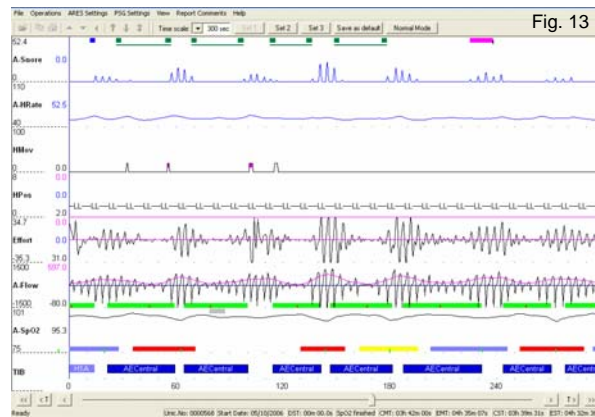
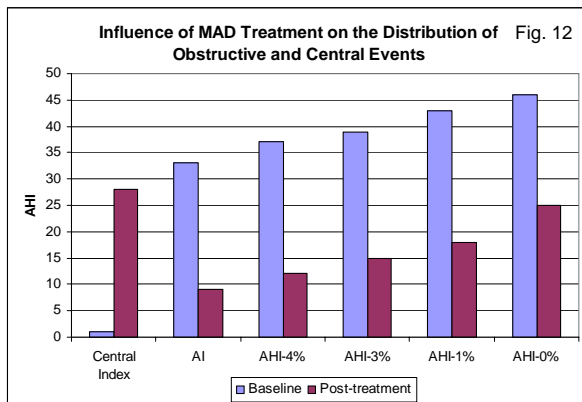


Case 3: Sixty-seven year old hypertensive and diabetic male with severe OSA who was a CPAP failure completed four x 2-night studies: 1) prior to treatment, 2) at maximum acceptable protrusion, 3) at maximum with a chin strap, and 4) 0.25 mm less than maximum with a chin strap. Due to the severity of the apneas the patient was provided a chin strap so the appliance did not dislodge during the night. Figure 9 shows the change in the apnea index and across all AHI criteria. Through additional titration, patient's AHI was reduced by more than 50% although it was not reduced into a normal range (i.e., < 10 based on 4% -Medicare criteria). The percentage of time below 85% SpO₂ was also reduced by 50% from 5% to 2.5% of the night (Fig. 10). The greatest percent of time supine corresponded with the lowest Apnea Index. (Fig. 11).





Case 4: Sixty-six year old male who was a CPAP failure completed a 2-night study prior to treatment and a two-night study upon completion of titration. Figure 12 suggests that many mixed central/obstructive events at baseline became central only events as a result of MAD treatment. Figure 13 shows the patterns of the signals used to identify central events.



Conclusions:

- Alcohol consumption prior to sleep should be considered when assessing treatment outcomes.
- Repeated measures titration studies can be used to optimize clinical benefits while minimizing the risk of long term changes in overbite and mandibular plane angle.
- For MAD treatment of patients with severe OSA, the use of a chin strap and/or increased supine sleep time may result in improved outcomes.
- To assess the true clinical benefit, MAD treatment outcome studies should include the signals needed to distinguish obstructive from central events.
- Treatment outcome studies may not accurately reflect the maximum clinical benefit when conducted immediately after a MAD advancement.
- The computation of AHI using multiple desaturation criteria provides additional insight into the resolution of SDB.

This research was funded in part by DE016772.