Dental Sleep Medicine Research Update

This white paper reviews advances in oral appliance and titration/trial appliance data.

In 2006, the National Institute of Dental and Craniofacial Research funded a $1.05 mm grant to investigate how to improve oral appliance therapy outcomes for obstructive sleep apnea (OSA) patients. Dan Levendowski served as the principal investigator, Todd Morgan as the sub-investigator, Victoria Melzer as the site administrator for the novice dental office, and Philip Westbrook, MD, provided clinical oversight.

The primary conclusion from their research was there is too much trial-and-error involved in the determination of a jaw-forward position that optimizes oral appliance outcomes for the treatment of OSA. The findings were reported in 5 manuscripts and 10 conference proceedings and led to the development and validation of the Apnea Guard® trial appliance. References for the 15 manuscripts and proceedings are provided at the end of this white paper. A summary of the results is presented below.

How prevalent is OSA in a typical general dental practice?

- 68% of the males and 29% of females were via questionnaire determined to be at high risk of having OSA.
- Of those at high risk and previously undiagnosed, 94% were found to have at least mild OSA and 70% were diagnosed with moderate or severe OSA severity.

Conclusion:

- The majority of patients over age 50 in a general dentistry practice likely have undiagnosed OSA.

Are there differences between males and females that influence the recognition and possible treatment of OSA?

- With age, OSA severity increased in males across all sleeping positions.
- With age, females only showed age-related increases in supine OSA severity.
- Age did not affect on how loudly males snored.
- Older females but not younger females snored as loudly as males.

Conclusions:

- The custom appliance may require additional adjustments as patients age.
- The recognition of OSA in younger females is more difficult because they do not snore loudly.

Should oral appliance therapy be limited to only patients with mild-to-moderate OSA severity?

- With proper titration, 96% of patients with severe OSA and 83% of those with moderate OSA achieved >50% reduction in OSA severity.
- In addition to achieving a >50% reduction in OSA severity, 54% with severe OSA and 80% of those with moderate OSA also achieved a post-treatment severity <10 events/hr.
- Significant reductions in daytime somnolence were observed in the moderate and severe OSA patients who achieved >50% reduction but not an OSA severity <10.

Conclusions:

- The vast majority of patients respond to oral appliance therapy.
- A trial appliance should be offered to identify those who respond to oral appliance therapy.
- A positive response to oral appliance therapy in those with moderate to severe OSA should include >50% reduction in severity plus an improvement in reported symptoms. .

Does the vertical dimension of occlusion (VDO) of the custom oral appliance affect treatment efficacy?

- High VDO (10 mm) provided superior therapeutic benefit for over 70% of males while sleeping supine as compared to a low VDO (7 mm); 24% showed no difference with low or high VDO.
- 50% of the females showed improved outcomes with a low VDO as compared to a high VDO custom appliance; 50% showed no difference in outcomes with low or high VDO.

Conclusion:

- VDO and gender should be considered when fabricating a custom appliance, especially if the patient sleeps supine.

How does increased VDO improve outcomes in males?

- High VDO in case studies of four males improved celphalographic measured airway space and reduced OSA severity as compared to low VDO.

Conclusion:

- VDO provides a complementary alternative to exclusive use of protrusion to engage the pharyngeal dilator muscles during sleep.

What information is most predictive in determining a successful oral appliance outcome?

- Patients with larger necks and higher BMIs tended to have non-positional OSA.
- Patients with non-positional OSA did not respond to oral appliance therapy as well as positional OSA patients.

Conclusion:

- The custom appliance should be fabricated with increased VDO to accommodate the fatter tongues of obese patients.

Can a novice dental sleep medicine dentist achieve treatment outcomes equivalent to an expert dentist?

- There were no differences in outcomes between the novice and expert dentist based on OSA severity.
- More consistent follow-up and coaching by the novice practitioner achieved better outcomes after one month as compared to the expert.
- The vast majority of patients do not advance their custom appliance as instructed upon delivery without telephone follow-up.
- The novice managed all complications without assistance using the expert's protocol.

Conclusion:

- The faster a patient advances to 70% protrusion, the sooner they will be optimally treated.
- A novice can achieve results similar to an expert dentist so long as they follow proven protocols.

How similar are the outcomes of a trial appliance using a predicted setting vs. a custom appliance titrated with multiple home sleep tests to achieve optimal outcomes?

- The trial appliance provided slightly better outcomes in the supine and slightly worse outcomes in the non-supine position vs. the custom appliance.
- Over 80% of the patients were titrated to 70% protrusion in order to achieve optimal custom appliance outcomes.

Conclusion:

- A trial appliance can be used to predict treatment response and predict the protrusion setting that achieves optimal outcomes.

If the optimal jaw-forward position for a custom appliance can be optimally predicted with a trial appliance, what impact does it have on patient care and outcomes?

- The time to reach optimal custom appliance titration was reduced from an average of 136 days to 34 days and the number of office visits was reduced by an average 2.2 visits.
- Use of the trial appliance while waiting for the custom appliance to be fabricated decreased time to treatment from an average of 33 days to 0 days.
- The "trial appliance" technique improved outcomes as compared to the "George Gauge" technique by 24%, with optimal outcomes increased by 14% and non responder outcomes reduced by 10%.

Conclusions:

- The "trial appliance" technique is superior to the "George Gauge" technique in determining the optimal jaw-forward position.
- Treatment outcomes and patient care can be improved, and practice profitability can be increased, with the use of a trial appliance.

What impact does the short-term unavailability of an oral appliance have on a patient's health and safety?

- The greater the OSA severity, the more likely the OSA severity returned to pre-treatment baseline the first night without therapy.
- For patients with very mild OSA (AHI < 10) there was a slight halo effect (from prior use of the oral appliance) in the depth of desaturation and snoring during the first two nights without therapy.
- Patients did not report significant differences in daytime alertness or exhaustion after two nights without therapy.

Conclusion:

- Given there is a little to no "treatment halo effect", a temporary appliance should be offered to all patients who lose access to the custom appliance e.g., while it is being repaired.

Once an oral appliance is properly titrated, how often should it be monitored for efficacy?

- Once optimally titrated, the OSA severity tended to decrease from month one to month six.
- Epworth sleepiness scores decrease from month one to month three, and slightly rebound at month six, but are still lower than at month 2.
- Once an MRD is properly adjusted, it provided consistent efficacy across the first six-months of therapy.

Conclusion:

- Once optimal efficacy is established, ongoing monitoring is likely required only once per year.

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