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SCIENTIFIC INVESTIGATIONS

Jaw thrust versus the use of a boil-and-bite mandibular advancement device as a screening tool during drug-induced sleep endoscopy

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Study Objectives: The objectives of this study were to analyze agreement in degree of obstruction and configuration of the upper airway between jaw thrust and an oral device in situ during drug-induced sleep endoscopy and to evaluate clinical decision making using jaw thrust or a boil-and-bite mandibular advancement device (MAD; the MyTAP).

Methods: This was a single-center prospective cohort study in patients with obstructive sleep apnea who underwent drug-induced sleep endoscopy between January and July 2019.

Results: Sixty-three patients were included. Agreement among observations in the supine position for degree of obstruction was 60% (n = 36, $\kappa = 0.41$) at the level of the velum, 68.3% (n = 41, $\kappa = 0.35$) for oropharynx, 58.3% (n = 35, $\kappa = 0.28$) for tongue base, and 56.7% (n = 34, $\kappa = 0.14$) for epiglottis; agreement among observations in the lateral position were 81.7% (n = 49, $\kappa = 0.32$), 71.7% (n = 43, $\kappa = 0.36$), 90.0% (n = 54, $\kappa = 0.23$), and 96.7% (n = 58, κ = could not be determined), respectively. In the supine position, agreement for configuration of obstruction at the level of the velum was found in 20 of 29 patients (69.0%, $\kappa = 0.41$) and in the lateral position was 100%. Thirty patients would have been prescribed a MAD using jaw thrust and 34 using the boil-and-bite MAD as a screening instrument. The main reason for being labeled as nonsuitable was complete residual retropalatal collapse during jaw thrust. Using the boil-and-bite MAD, this was caused by complete retropalatal or hypopharyngeal collapse.

Conclusions: There is only slight to moderate agreement in degree of obstruction for jaw thrust and a new-generation boil-and-bite MAD during drug-induced sleep endoscopy. Greater improvement of upper airway patency at the hypopharyngeal level was observed during jaw thrust, but this maneuver was less effective in improving upper airway obstruction at the retropalatal level.

Keywords: drug-induced sleep endoscopy, jaw thrust, mandibular advancement device, obstructive sleep apnea, sleep-disordered breathing, treatment outcome

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BRIEF SUMMARY

Current Knowledge/Study Rationale: Identification of suitable candidates for mandibular advancement device (MAD) therapy can be challenging. Relevant variables used to predict treatment outcome include body mass index, total apnea-hypopnea index, age, sex, and cephalometric outcomes, but another, more controversial, way to predict MAD treatment outcome is the use of jaw thrust during drug-induced sleep endoscopy. Although alternatives to jaw thrust have been proposed, there is still a demand for readily available, quick, and easy-to-use systems that mimic the effect of a MAD during DISE to predict and improve MAD treatment outcome.

Study Impact: The results of this study indicate that there is only a slight to moderate agreement in degree of obstruction measured with jaw thrust and a new-generation boil-and-bite MAD during drug-induced sleep endoscopy. Overall, a greater improvement of upper airway patency at hypopharyngeal level was observed when applying jaw thrust. In contrast, jaw thrust was less effective in improving upper airway obstruction at retropalatal level than the boil-and-bite device. There is still a need for an alternative to jaw thrust that can be used as a screening method and prediction tool for MAD treatment outcome during drug-induced sleep endoscopy.

INTRODUCTION

Obstructive sleep apnea (OSA) is the most prevalent sleep-related breathing disorder caused by episodes of partial or complete obstruction of the upper airway (UA) during sleep. Currently, continuous positive airway pressure is the standard therapy for moderate to severe OSA, but because of poor tolerance and low acceptance, noncompliance rates are often high.[1] In cases of mild or moderate OSA or if continuous positive airway pressure treatment fails, UA surgery, positional therapy, and mandibular advancement devices (MADs) can be viable alternatives.

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MADs are designed to advance the mandible, such that the tongue base, epiglottis, and soft palate are protruded. This improves UA patency and stability.[2] Previous studies have shown that MADs are successful in 84% of patients with mild to moderate OSA and 69.2% of patients with severe OSA.[3] MAD treatment failure might be explained by the fact that it is difficult to identify suitable candidates for this treatment. Relevant variables that are used to predict treatment outcome include body mass index (BMI), total apnea-hypopnea index (AHI), age, sex, and cephalometric outcomes.[4]

Another, more controversial, tool that is used to predict MAD treatment outcome is drug-induced sleep endoscopy (DISE). This tool provides additional information on the anatomical sites in the UA related to obstruction. Several studies have shown that MADs are less effective in cases involving a complete concentric collapse at the level of the velum.[5,6] In addition, DISE has the unique advantage of allowing the physician to perform different passive maneuvers that are considered to serve as predictors for surgical or nonsurgical treatment outcomes.[7] One of these maneuvers is the jaw thrust. Through jaw thrust, the physician actively protrudes the mandible. The mandible is protruded up to approximately 5–10 mm or 75% of maximal protrusion, thus mimicking the protrusive position of the mandible with MAD treatment.[8]

However, the jaw thrust maneuver during DISE has been criticized, and the positive predictive value of maximal passive protrusion of the mandible during DISE has varied between studies.[9–13] This is probably because this maneuver does not account for the thickness of a MAD, thereby overlooking the fact that the vertical opening (VO) of the mandible is not similar to a MAD. Second, a MAD is often set at 60–75% of maximum mandibular protrusion. The degree of advancement of the mandible during jaw thrust is generally less precise than a preset degree of protrusion with a MAD. As a result, it is difficult to mimic the real-life effect of a MAD during DISE using the jaw thrust maneuver. In addition, there is probably a variability in the performance of jaw thrust during DISE among surgeons, and in some cases, jaw thrust is not performed by the surgeon but, for example, by a trained nurse anesthetist.

Over recent years, several alternatives to jaw thrust have been proposed. In 2008, Vanderveken et al[14] compared the efficacy of a thermoplastic appliance with a classic custom-made MAD as a screening tool in search of good candidates for a definitive custom-made MAD during 4 months of follow-up. It was concluded that a custom-made MAD was more effective than a thermoplastic monobloc device and that it could not be recommended as a screening method. This was mainly because of the lack of retention and poor comfort of the thermoplastic appliance. In 2013, Vroegop et al[13] evaluated the use of a simulation bite during DISE. They concluded that a positive effect on UA patency with the simulation bite in maximal comfortable protrusion during DISE was significantly associated with a favorable treatment response to MAD.

Although the use of a simulation bite seems to be promising, it is, with the exception of a few centers, not part of daily practice. Therefore, readily available, quick, and easy-to-use systems that mimic the effect of a MAD during DISE need to be developed to predict and improve MAD treatment outcome. Since 2008, new thermoplastic MADs have been introduced, which are thinner, have better retention, and are easier to use. Because of better retention, these devices may also be used in an in-home setting after using them for UA evaluation during DISE.

The primary aim of this study was to improve insight in agreement in the degree of obstruction and configuration of the UA between jaw thrust and an oral device in situ during DISE with the ultimate goal of improving the predictive value of DISE as a selection tool for MAD treatment in OSA. We also wanted to evaluate the theoretical implications on clinical decision making using either the jaw thrust or a new-generation boil-and-bite MAD as potential screening instruments.

METHODS

Study participants

We performed a single-center prospective cohort study including patients who underwent DISE at the Department of Otolaryngology, Head and Neck Surgery of the OLVG (Amsterdam, Netherlands) between January 2019 and July 2019. Patients were included if they were 18 years of age or older, diagnosed with OSA confirmed by polysomnography (PSG, AHI ≥ 5 events/h), and if they were able to give written informed consent. Patients were excluded in case of poor dental condition (eg, partial or complete edentulism, extensive periodontal disease, or tooth decay) or when patients were diagnosed with central sleep apnea (>50% of central apneas).

Ethical considerations

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Declaration of Helsinki of 1975. Data on study participants were collected, encoded, and stored to protect personal information. All patients gave written informed consent.

Study-related procedures

Polysomnography

The results of a full-night diagnostic PSG (EMBLA A10/Titanium, Medcare Flaga, Reykjavík, Iceland, and SomnoscreenTM, SOMNOmedics GmbH, Randersacker, Germany) were collected in each participant at baseline. To determine the stages of sleep, an electroencephalogram (Fp1, Fp2, C3 C4, O1, O2), electrooculogram, and electromyogram of the submental muscle were obtained. Nasal airflow was measured by a nasal cannula/pressure transducer inserted in the opening of the nostrils. Arterial blood oxyhemoglobin was recorded with the use of a finger pulse oximeter. Thoracoabdominal excursions were measured qualitatively by respiratory effort belts placed over the rib cage and abdomen. Body position was determined by a position sensor, which differentiated between the upright, left side, right side, prone, and supine position.

Sleep stages were scored using 30-second epochs according to American Academy of Sleep Medicine criteria, with N3 reflecting slow wave sleep. Obstructive respiratory events were analyzed according to the American Academy of Sleep Medicine criteria

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2017.[15] An obstructive respiratory event in adults was scored as an apnea if there was a drop in the peak signal excursion by ≥90% with a duration of ≥10 seconds. A hypopnea was defined as a decrease of airflow by ≥30% during a period of ≥10 seconds combined with an oxygen desaturation of ≥3%. The number of apneic or hypopneic episodes per hour of sleep was referred to as the AHI.

Fitting of the MyTAP

The MyTAP (My Thornton Adjustable Positioner, Airway Management Inc, Dallas, TX) is a new-generation thermoplastic boil-and-bite MAD, which consists of 2 separate trays of polymeric material. The MyTAP fully covers the upper and lower dental arches and can be fixed in a protrusive position by a single screw in the frontal area of the appliance. The appliance was adjusted for each patient according to the manufacturer's recommendations and instructions.

First, both trays were heated in boiling water until the material turned transparent. Second, the trays were, one by one, placed covering the upper or lower dental arch, and the patient was instructed to bite into habitual occlusion, by actively closing the mouth for 3 minutes. After fitting both trays, a shim was placed between the trays, resulting in a vertical opening allowing movement of the tongue. In patients with a BMI < 30 kg/m^2, a 6-mm shim was used, and in patients with BMI > 30 kg/m^2, a 9-mm shim was used. Subsequently, the mandible was advanced by tightening the screw in the frontal area until the patient indicated an uncomfortable sensation. This was followed by a 1-mm retraction of the mandible, described as the maximal comfortable protrusion (MCP).

Drug-induced sleep endoscopy

The DISE procedure was performed according to the practice guidelines as recommended in the European position paper on DISE (update 2017).[16] The DISE procedure took place in a day care setting in an outpatient endoscopy room with standard anesthetic equipment. The drug of choice for sedation was propofol. The level of sedation was controlled by a target controlled infusion pump using the methods described by Schnider and colleagues[17,18] to calculate the effective dose. Before the intravenous infusion of propofol, 2 ml lidocaine was given intravenously to prevent pain caused by the infusion of propofol. In all patients, glycopyrrolate (Robinul) was given intravenously to prevent mucosal hypersecretion, because this could interfere with the quality of the endoscopic assessment. Proper sedation levels were achieved when the patient showed hyporesponsiveness to verbal and tactile stimuli or when the patient began to snore.

Initially, participants were placed in the lateral position with the boil-and-bite MAD in situ. The boil-and-bite MAD was adjusted to MCP after proper sedation levels were achieved. Adequate and stable sedation levels were retained during the whole procedure. Patients were then tilted to the supine position, both head and trunk, with the boil-and-bite MAD still in situ. In both positions, the UA was assessed at 4 different levels (velum, oropharynx, tongue base, and epiglottis) according to the VOTE classification system. Subsequently, the boil-and-bite MAD was removed, after which the UA was observed in the lateral and the supine position, with and without a manually performed jaw thrust aiming for 65–75% protrusion of the mandible.

Classification system

To report on the anatomical structures causing UA collapse, the VOTE classification system was applied.[19] The VOTE classification system distinguishes between 4 different levels and structures that may be involved in UA collapse: velum (V), oropharynx (O), tongue base (T), and epiglottis (E). To define the degree of obstruction, 3 different categories are used: no obstruction in cases of a collapse <50% (scored as 0); a partial obstruction with a collapse between 50 and 75% and typically with vibration (scored as 1); or a complete collapse with a collapse of >75% (scored as 2). An X is used when no observation can be made. Depending on the different site(s) involved in UA obstruction, the configuration may be anteroposterior (A-P), lateral, or concentric.

Definitions

Patients were considered suitable candidates for MAD treatment when a decrease in degree of obstruction was observed of at least 1 point at each potential level of obstruction, leading to absence of a complete collapse at the V, O, T, or E level.

Statistical analysis

Statistical analysis was performed using SPSS (version 22; SPSS Inc, Chicago, IL). Quantitative data were reported as mean and standard deviation or as median and Q1–Q3 when not normally distributed. $P < .05$ was considered to indicate statistical significance.

Agreement among observations made using the 2 different screening instruments—jaw thrust and the boil-and-bite MAD—were calculated by dividing the number of agreements with regard to the degree of obstruction by the number of disagreements between both measurements. To correct for chance agreement and because of the use of an ordinal scale, a weighted, Cohen's κ was determined. κ values were interpreted as following: κ < 0, poor; κ = 0–0.20, slight; κ = 0.21–0.4, fair; κ = 0.41–0.60, moderate; κ = 0.61–0.8, substantial; κ > 0.81, almost perfect agreement.

Sample size

The aim of this study was to reject the null hypothesis that the effect on UA patency of manually performed jaw thrust is similar to the effect of the boil-and-bite MAD during DISE. To compare 2 measurement instruments, a minimum of 50 participants had to be included.[20]

RESULTS

A total of 63 patients were included in this study. In 3 patients, measurement with the boil-and-bite MAD in situ failed because of technical problems with the fitting of the device. Therefore, the results of 60 patients were used for analysis.

Of the 60 patients, 50 patients were male (83.3%), and 45 patients were diagnosed with position-dependent OSA

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according to Cartwright's criteria.[21] The mean age of all patients was 46.9 ± 11.8 years, with a BMI of 27.9 ± 2.7 kg/m^2 and a neck circumference of 40.8 ± 3.0 cm. The median AHI was 15.9 events/h (12.1, 26.0), the median supine AHI was 36.4 events/h (19.4, 65.3), and the median nonsupine AHI was 7.1 events/h (2.8, 19.9). Patients spent a median percentage of total sleeping time in the supine position of 39.3% (12.5, 51.5). The median oxygen desaturation index was 21.9 events/h (15.5, 28.6). The MCP was 84.2 ± 13.2% of the maximal protrusion of the mandible. **Table 1** provides an overview of the baseline characteristics of the total study group.

Table 1—Baseline characteristics.

Patient Characteristic	Total n = 60
Age (yr)	46.9 ± 11.8
Male/female	50/10
BMI (kg/m^2)	27.9 ± 2.7
Neck circumference (cm)	40.8 ± 3.0
Total AHI (events/h)	15.9 (12.1, 26.0)
Supine AHI (events/h)	36.4 (19.4, 65.3)
Nonsupine AHI (events/h)	9.9 (3.9, 18.2)
TST in the supine position (%)	39.3 (12.5, 51.5)
ODI (events/h)	21.9 (15.5, 28.6)
MCP (%)*	84.2 ± 13.8

Data are presented as mean ± SD or median (Q1, Q3). *MCP as a percentage of the maximal protrusion of the mandible during wakefulness. AHI = apnea-hypopnea index, BMI = body mass index, MCP = maximal comfortable protrusion, ODI = oxygen desaturation index, TST = total sleeping time.

Agreement comparing jaw thrust and boil-and-bite MAD

Degree of obstruction in supine position

Agreement among observations in the supine position with regard to degree of obstruction was 60% (n = 36, κ = 0.41) at the level of the velum, 68.3% (n = 41, κ = 0.35) at the level of the oropharynx, 58.3% (n = 35, κ = 0.28) at the level of the tongue base, and 56.7% (n = 34, κ = 0.14) at the level of the epiglottis. An overview can be found in **Table 2**.

Degree of obstruction in lateral position

Agreement among observations in the lateral position with regard to degree of obstruction was 81.7% (n = 49, κ = 0.32) at the level of the velum, 71.7% (n = 43, κ = 0.36) at the level of the oropharynx, 90.0% (n = 54, κ = 0.23) at the level of the tongue base, and 96.7% (n = 58, κ could not be determined) at the level of the epiglottis. **Table 3** provides an overview of the agreement in degree of obstruction comparing jaw thrust and boil-and-bite MAD.

Configuration of collapse in supine and lateral positions

In the supine position, agreement with regard to the configuration of obstruction at the level of the velum was found in 20 of 29 patients (69.0%), with a κ of 0.41. In 7 patients, a concentric collapse was found when applying jaw thrust, which was modified to an A-P collapse with the boil-and-bite MAD in situ. In 2 patients, a lateral collapse was observed during jaw thrust, which changed to a concentric collapse with the boil-and-bite MAD in place. Agreement on configuration of obstruction in the lateral position was found in all patients (**Table 4** and **Table 5**).

Theoretical identification of suitable candidates for MAD treatment

Jaw thrust

Assuming that jaw thrust is a valid screening instrument for MAD treatment outcome, 30 patients would have been prescribed a MAD based on the effect of a manually performed jaw thrust. Of the 30 patients that would have been labeled as nonsuitable candidates for MAD treatment, this was caused by a complete residual retropalatal collapse in 24 patients. In 2 patients, a complete collapse at the hypopharyngeal level was observed, and in 4 patients, a residual multilevel collapse was present.

Boil-and-bite MAD

When the boil-and-bite MAD would have been used, 34 patients would have been selected for MAD treatment. In that case, 11 patients would have been identified as nonsuitable candidates because of a complete residual retropalatal collapse and 11 patients because of a complete residual hypopharyngeal collapse. In 3 patients, a persistent multilevel collapse was found.

A floppy epiglottis was present in only 1 patient when applying jaw thrust and in 5 patients with the boil-and-bite MAD in situ.

DISCUSSION

Currently, the use of DISE to predict MAD treatment outcome is controversial, and there is a lack in consensus on the use of a manually performed jaw thrust mimicking the real-life effect of a MAD. To the best of our knowledge, this is the first study to describe the use and comparison of 2 potential screening instruments during DISE—jaw thrust and a new-generation thermoplastic boil-and-bite MAD—to predict the effect of MAD treatment. The results of this study indicate that there is only a slight to moderate agreement on the degree of obstruction measured with jaw thrust and the boil-and-bite MAD, especially in the supine position. The latter is not surprising, because most patients were position dependent, with only few UA obstructions in the lateral position. Overall, jaw thrust seems to be more effective in resolving obstructions at hypopharyngeal level—tongue base and epiglottis—than the boil-and-bite MAD during DISE. In contrast, obstructions at the retropalatal level—velum and oropharynx—were more often improved with the boil-and-bite MAD in situ than when jaw thrust was applied.

When comparing the 2 screening instruments, 2 major differences can be identified. First, the degree of advancement of the mandible during jaw thrust is less precise than the preset degree of protrusion of the boil-and-bite MAD, which is set at

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Table 2—Agreement in degree of obstruction in the supine position comparing jaw thrust and the boil-and-bite MAD.

Level	Degree of Obstruction	Supine Position	Jaw Thrust (N)	MyTAP (N)	Overall Percentage of Agreement	κ	Interpretation κ
V	0	7	18	29	60%	0.41	Moderate
	1	9	22	16			
	2	44	20	15			
O	0	30	35	49	68.3%	0.35	Fair
	1	4	13	8			
	2	26	12	3			
T	0	18	43	28	58.3%	0.28	Fair
	1	16	12	23			
	2	26	5	9			
E	0	25	52	32	56.7%	0.14	Slight
	1	12	6	15			
	2	13	2	13			

0 = <50% of obstruction, 1 = 50–75% of obstruction, 2 = >75% of obstruction, E = epiglottis, MAD = mandibular advancement device, O = oropharynx, T = tongue base, V = velum.

Table 3—Agreement in degree of obstruction in the lateral position comparing the boil-and-bite MAD and jaw thrust.

Level	Degree of Obstruction	Lateral Position	Jaw Thrust (N)	MyTAP (N)	Overall Percentage of Agreement	κ	Interpretation κ
V	0	27	50	52	81.7%	0.32	Fair
	1	17	4	6			
	2	16	6	2			
O	0	21	44	42	71.7%	0.36	Fair
	1	9	10	10			
	2	30	6	8			
T	0	44	59	53	90%	0.23	Fair
	1	11	1	7			
	2	5	0	0			
E	0	51	60	58	96.7%	CND	NA
	1	8	0	2			
	2	1	0	0			

0 = <50% of obstruction, 1 = 50–75% of obstruction, 2 = >75% of obstruction, CND = could not be determined, E = epiglottis, MAD = mandibular advancement device, NA = not applicable, O = oropharynx, T = tongue base, V = velum.

the MCP. Second, jaw thrust does not take into account the thickness of a MAD and therefore does not include VO, which is generated by the boil-and-bite MAD.

The greater improvement of UA patency at the hypopharyngeal level with jaw thrust is slightly surprising, because the MCP used for the preset degree of protrusion for the boil-and-bite MAD was in general more than 65–75%. The degree of protrusion with jaw thrust was estimated to be 65–75%, whereas the degree of protrusion with the boil-and-bite MAD was on average 84.2% of the maximal protrusion during wakefulness. One would therefore expect to find greater improvement of UA patency with the boil-and-bite MAD in situ. In contrast, we assume that the estimated 65–75% protrusion of the mandible is probably an underestimation, which could explain the difference in results. Furthermore, we hypothesize that the maximum amount of mandibular protrusion during DISE is more pronounced compared with the awake state, because of the neuromuscular boundaries that patients experience when they are not sedated and one must keep in mind that the percentage of protrusion during determined during DISE is a subjective and estimated value, which is not objectively determined. These phenomena probably explain why the percentage of protrusion determined during the jaw thrust maneuver is an underestimate compared with the degree of protrusion as determined with the boil-and-bite MAD.

The difference in effect at retropalatal level is a novel finding. We hypothesize that the greater effect of the boil-and-bite MAD on UA patency at this level is probably caused by the VO of the mouth that is created with the oral device in place. By adding VO, stretching forces on the lateral wall of the pharynx increase, leading to a decrease in UA collapsibility and stabilization of

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Table 4—Agreement in configuration in the supine position comparing the boil-and-bite MAD and jaw thrust.

Level	Configuration	Jaw Thrust (N)	Boil-and-Bite MAD (N)	Overall Percentage of Agreement	κ	Interpretation κ
V	A-P	23	24	69.0%	0.41	Moderate
	Lateral	3	1			
	Concentric	16	6			
O	Lateral	25	11	100%	NA	NA
T	A-P	17	32	100%	NA	NA
E	A-P	8	28	100%	NA	NA
	Lateral	0	0			

A-P = anteroposterior, E = epiglottis, MAD = mandibular advancement device, NA = not applicable, O = oropharynx, T = tongue base, V = velum.

Table 5—Agreement in configuration in the lateral position comparing the boil-and-bite MAD and jaw thrust.

Level	Configuration	Jaw Thrust (N)	Boil-and-Bite MAD (N)	Overall Percentage of Agreement	κ	Interpretation κ
V	A-P	2	3	100%	1.00	Perfect
	Lateral	4	3			
	Concentric	4	2			
O	Lateral	16	17	100%	NA	NA
T	A-P	1	7	100%	NA	NA
E	A-P	0	2	CND	NA	NA
	Lateral	0	0			

A-P = anteroposterior, CND = could not be determined, E = epiglottis, MAD = mandibular advancement device, NA = not applicable, O = oropharynx, T = tongue base, V = velum.

the airway. If correct, this would also explain the differences in configuration of obstruction at palatal level. In 7 patients, a concentric collapse was observed when applying jaw thrust, which was altered to an A-P configuration with the boil-and-bite MAD in situ (ie, opening of the pharynx in the lateral but not A-P dimension).

Several studies in the literature focus on the effect of VO on MAD effectiveness and UA collapsibility. Unfortunately, the results vary among studies. Pitsis et al[22] concluded that VO of the mouth induced by a MAD does not significantly influence treatment efficacy, whereas Rose et al[23] found that MAD treatment was more effective with increased VO. In addition, Ferguson et al[24] concluded that the effect of VO on the efficacy of MAD remains undecided. The effect of VO on UA patency without a MAD in situ was previously studied by Vroegop et al.[25] Their results indicated that increased VO, without advancement of the mandible, had an adverse effect on pharyngeal dimensions in most patients at hypopharyngeal level.[25] Unfortunately, they did not report on outcomes with regard to obstruction at the retropalatal level, making adequate comparison with the results of this study difficult.

Limitations

DISE was performed by 1 experienced endoscopist (PV) but was not reassessed by a second observer. This could potentially have influenced interpretation of DISE. Nevertheless, by using only 1 observer, interobserver variability was avoided. In addition, most patients were diagnosed with mild to moderate position-dependent OSA, which might make the results of this study less applicable to patients with more severe nonpositional OSA.

Clinical implications and future research

The results of this study emphasize the need for an alternative to jaw thrust as a screening method and prediction tool for MAD treatment outcome used during DISE. Jaw thrust seems to be less effective in improving UA collapse at the retropalatal level than the boil-and-bite MAD, which was used in this study. In several patients, this could have led to an overestimation of assessment of not suitable for MAD treatment. Furthermore, advancement of the mandible using jaw thrust during DISE is probably greater than the MCP during wakefulness in most patients. Therefore, the MCP seems to be more representative when it comes to the expected advancement of the mandible that can be achieved when initiating MAD treatment.

CONCLUSIONS

The results of this study indicate that there is only a slight to moderate agreement in degree of obstruction measured with jaw thrust and a new-generation boil–and-bite MAD (MyTAP) during DISE. Overall, a greater improvement of UA patency at

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the hypopharyngeal level was observed when applying jaw thrust. In contrast, jaw thrust was less effective in improving UA obstruction at the retropalatal level than the MyTAP. There is still a need for an alternative to jaw thrust that can be used as a screening method and prediction tool for MAD treatment outcome during DISE. This is the first part of a 2-part study. In the second part of this study, the correlation between DISE findings and MAD treatment outcome will be evaluated to further unravel the predictive value on MAD effectiveness.

ABBREVIATIONS

AHI, apnea-hypopnea index
A-P, anteroposterior
BMI, body mass index
DISE, drug-induced sleep endoscopy
MAD, mandibular advancement device
MCP, maximal comfortable protrusion
OSA, obstructive sleep apnea
UA, upper airway
VO, vertical opening
VOTE, velum (V), oropharynx (O), tongue base (T), and epiglottis (E)

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