

Safety and Feasibility of Hypnosis-induced Sleep Endoscopy in Obstructive Sleep Apnea Patients: Our Experience.

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Key Points:

- Hypnosis is an effective approach in patient with sleep apnea syndrome for the sleep endoscopy.
- The difficulty to perform nasofibroscope was associated with lower muscle relaxation during hypnosis and difficulty in consciousness step.
- Both otolaryngologist and hypnosis practitioner reported adequate outcomes in the realization of sleep endoscopy staging (VOTE scoring) and hypnosis steps in office.
- There were no adverse effects or complication during the procedures, and the nasofibroscope examination was well-tolerated in 95% of cases, with low levels of stress during the HISE.
- Future controlled studies are needed to assess the cost reduction, advantages and disadvantages of hypnosis-induced sleep endoscopy vs drug-induced sleep endoscopy.

Key words : Sleep; Apnea; Hypopnea; Syndrome; Endoscopy; Hypnosis; Otolaryngology; Head Neck.

Introduction

Obstructive sleep apnea syndrome (OSAS) is a prevalent disorder affecting 2% to 7% of U.S. adult population [1,2]. OSAS is associated with cardiovascular, cognitive, stroke disorders, and death [2,3]. The identification of the upper airway collapse site may be performed by drug-induced sleep endoscopy (DISE), which provides useful information for the treatment strategy [1]. The classical DISE method involves the use of continuous propofol infusion in operating room [1]. This approach is usually performed in ambulatory and requires the patient monitoring after the anesthesia. In this preliminary study, we assessed the feasibility, safety and patient satisfaction of hypnosis-induced sleep endoscopy (HISE).

Methods

Patient setting

From January to July 2021, adults with moderate or severe OSAS at the polysomnography (PSG) [4] were recruited from the Sleep Center of Poitiers Elsan Polyclinic. The local ethics committee approved the study protocol (Elsan Ethics Committee, 20.11.13.75306/ CPP2020-12-103a/2020-A02419-30L, Elsan). Reporting guidelines for prospective studies (CONSORT Statements) have been respected. Patients consented to participate. Patients completed a comprehensive diagnostic sleep study. OSAS severity was scored according

to the report of the American Academy of Sleep Medicine based on the patient's apnea hypopnea index (AHI): mild (5-14 events/hour); moderate (15-30 events/hour); or severe (>30 events/hour) [4]. PSG examinations were read and interpreted by a board-certified otolaryngologist (FB). The exclusion criteria included mental health disorders, smoking, alcoholism, heart or neurological severe disorders, history of head and neck cancer or radiation, chronic rhinosinusitis or 1-month history of upper aerodigestive tract infection.

Hypnosis protocol

Prior to the HISE, patients benefited from 3 hypnosis sessions to prepare the patient to the HISE. The hypnosis session was performed in a soundproof room with softened lighting and ambient temperature respecting the recommendations of French hypnosis society. The first, second, and third hypnosis sessions were performed in seated, half-seated and supine positions, respectively. The traditional steps of the conversational hypnosis protocol included induction, dissociation, hypnotic trance, confusion-metaphor relaxation, suggestion and re-association [5]. The following steps were added in the last session after the relaxation: explanation and introduction of the portable nasofiberscope (Xion®[®], 3.7mm, Xion inc., Germany) into the patient upper aerodigestive tract and an evaluation of the acceptance of the procedure. The otolaryngologist did not use nasal/local anesthesia before the nasofibroscopy in both hypnosis session and HISE. The light of the nasofiberscope was turned on after the introduction of the fiberoscope to avoid the light-related wake up of the patient. To proceed with sensitivity, the otolaryngologist stopped the fiberoscopy progression in the nasopharynx a few seconds without touching the soft palate. The muscle relaxation was assessed at this time through the observation of the soft palate relaxation or vibration in case of snoring. The next step of the procedure consisted of the assessment of the pharyngeal cavity through the velum oropharynx tongue base epiglottis (VOTE) classification system [6].

Hypnosis, sleep and satisfaction outcomes

Otolaryngologist assessed the feasibility of the procedure through a physician-reported outcome questionnaire. The otolaryngologist and hypnosis practitioner evaluated the compliance of patient, HISE feasibility and performance. The overall score of the patient/practitioner reported outcome questionnaire ranged from 20 (low satisfaction) to 80 (high satisfaction; Figure 2).

The micro-awakenings/annoyance/pain were assessed during the procedure as well as their cause (anatomical location). The patient compliance to hypnosis was evaluated by the hypnosis practitioner who determined the compliance after the first, second or third sessions.

The otolaryngologist reported the findings of the VOTE system for each patient. The VOTE classification encompasses the most usually involved structures and assess the degree of obstruction and configuration of the obstruction. The configuration of obstruction can be described as antero-posterior, lateral or concentric. Antero-posterior obstruction consists of anterior structures moving posteriorly against the posterior wall of pharynx, while lateral obstruction is laterally located structures moving towards the center of the airway. The combination of two previous obstruction is described as concentric [6]. The score of each anatomical region ranges from 0 (no obstruction) to 2 (complete collapse). The otolaryngologist proposed a therapeutic strategy depending on the clinical and HISE findings.

The patient fulfilled a reported-outcome questionnaire assessing hypnosis acceptance, stress, anxiety, pain or discomfort during the nasofibroscopy.

Statistical methods

Statistical analyses were performed using the Statistical Package for the Social Sciences for Windows (SPSS version 27.0; IBM Corp, Armonk, NY, USA). The association between outcomes was investigated with multivariate analysis. A level of significance of $p < 0.05$ was used.

Results

Twenty-four patients were recruited (16 males; figure 1). From them, one patient did not complete the evaluation and was excluded. The OSAS features of patients were described in Table 1. The mean patient

age was 50.8 yo. The mean body mass index was 26.6. The hypnosis was ineffective in one patient because important septal deviation and pain during the third hypnosis session (4.3%). Another patient adhered to hypnosis after the second session. Most patients had moderate OSAS at the PSG (Table 1). The patient satisfaction outcomes were reported in Table 1. The nasofibrosopic examination was well-tolerated, while the level of stress during the HISE was low. Otolaryngologist adequately completed the VOTE scoring in 23 patients (95.7%; Table 2). The most common anatomical region of obstruction were velum and oropharynx. The satisfaction of otolaryngologist was high. Otolaryngologist reported patient reaction during the hypnosis process when the fiberscope touched the soft palate in 45% of cases (N=11), but that was not associated with wake-up or an inability to continue the examination. The hypnosis practitioner reported adequate satisfaction outcomes, with better results for trance compliance (Table 1). There were no adverse effects or complications throughout the process of study.

The multivariate analysis reported a negative association between the percentage of snoring and the consciousness state of hypnosis ($r_s=-0.527$; $p=0.012$). The level of patient pain during the first nasofibrosopic examination was positively associated with the following outcomes: level of stress during the HISE ($r_s=0.581$; $p=0.004$), the VOTE scoring ($r_s=0.421$; $p=0.046$), the adherence of the first hypnosis session ($r_s=0.517$; $p=0.012$) and the overall satisfaction of hypnosis practitioner ($r_s=0.675$; $p=0.001$). There were significant positive associations between the level of difficulty to perform nasofibrosopy and related VOTE scoring and the following outcomes: level of patient stress during HISE ($r_s=0.492$; $p=0.017$), and during trance ($r_s=0.691$; $p=0.001$). At most the nasofibrosopic examination was difficult to perform, at most the muscle relaxation ($r_s=0.440$; $p=0.036$) and the consciousness ($r_s=0.604$; $p=0.002$) steps were difficult.

Discussion

The usefulness of hypnosis in sleep disorders was previously investigated in pediatric [7,8] and adult [9] populations in the management of insomnia, acclimatization of noninvasive positive pressure ventilation or in weight loss of obese OSAS patients. To the best of our knowledge, this preliminary study is the first investigation reporting safety and feasibility of HISE in patients with moderate-to-severe OSAS. In this study, we proposed and evaluated a step-by-step protocol, which is easy to apply in daily practice.

According to our protocol, most patients adhered to hypnosis (95%), while the sleep endoscopy was successfully achieved in 95% of cases, leading to proposition of sleep therapy. HISE is a cost-effective approach, which is probably its most important advantage. Indeed, the use of drugs, the occupation of the operating room and the requirement of the anesthesiologist team are all costs [10] that we may avoided using HISE. Moreover, HISE may be interesting for patients with drug contraindication. Our study highlights that the selection of patients is an important point. Indeed, the adherence to hypnosis requires the lower level of pain during the examination. In our study, we observed that at most the nasofibrosopy was difficult to perform (major septal deviation/turbine hypertrophy), at most the efficacy of hypnosis (level of consciousness) was low. In that way, it is important to prepare the patient to the procedure through 3 hypnosis sessions in which practitioners assess the hypnosis adherence, the stress/anxiety of patient regarding procedure and the nasal permeability in nasofibrosopy. The importance of the preparation to HISE was strengthened by the significant positive associations between the level of difficulty to perform nasofibrosopy, the possibility to adequately perform the VOTE scoring, the levels of patient stress during HISE and trance.

This study is a feasibility study, meaning that we aimed to explore the feasibility and safety of HISE before conducting controlled large-cohort investigation. Indeed, the main limitation of the present preliminary report is the lack of control group (cross-over study), and the lack of brain monitoring (BIS system), which is important to observe the effects of anesthetic or alternative sedative approaches on cerebral function. Moreover, the HISE involves the participation of an experienced hypnosis practitioner, who has a key role in the success of the procedure.

Conclusion

HISE is a feasible and safe approach for the management of patients with moderate-to-severe OSAS. Future cross-over/controlled studies are needed to compare the effectiveness of HISE *versus* DISE and to investigate

the cost-effectiveness of both strategies.

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Table 1: Clinical features of Patients.

Outcomes	m ± SD/N (%)
<i>Age</i>	50.8 ± 11.7
<i>BMI</i>	26.6 ± 4.2
<i>Gender (F/M)</i>	7/16
<i>Apnea (PSG)</i>	26.2 ± 15.3
Moderate (AHI: 5-30)	19 (83)
Severe (AHI>30)	4 (17)
<i>Snoring %</i>	23.8 ± 17.7
<i>VOTE score</i>	18.8 ± 2.0
<i>Patient satisfaction</i>	
Nasofibroscope annoyance score	18.9 ± 0.9
<i>Nasal pain</i>	3.5 ± 0.8
<i>Foreign body sensation</i>	3.6 ± 0.6
<i>Throat clearing</i>	3.9 ± 0.3
<i>Cough</i>	3.9 ± 0.2
<i>Nausea</i>	3.9 ± 0.2

Outcomes	m ± SD/N (%)
Stress total score	18.8 ± 2.0
<i>Stress prior HISE</i>	3.5 ± 0.7
<i>Stress during HISE</i>	3.7 ± 0.7
<i>Trance stress</i>	3.9 ± 0.3
<i>Nasal fibroscopy related-stress</i>	3.7 ± 0.5
<i>Otolaryngologist satisfaction</i>	
Nasal fibroscopy	3.7 ± 0.7
Throat fibroscopy	3.9 ± 0.5
Fibroscopy position maintaining	3.8 ± 0.7
Muscle relaxation	3.6 ± 0.7
<i>Hypnosis practitioner satisfaction</i>	
Introduction session compliance	3.5 ± 0.8
Hypnosis adherence	3.8 ± 0.5
Trance compliance	4.9 ± 5.7
Consciousness state	3.8 ± 0.7
Muscle relaxation	3.6 ± 0.7
Hypnosis total score	19.5 ± 4.0

Table 1 footnotes : Abbreviations: AHI=apnea hypopnea index; BMI=body mass index; HISE=hypnosis induced sleep endoscopy; PSG=polysomnography; VOTE=velum, oropharynx, tongue base, epiglottis.

Table 2: Velum Oropharynx Tongue (base) and Epiglottis scoring of patients .

		N (%)	N (%)	N (%)
VOTE scores	Mean ± SD	Complete	Partial	No
Velum				
<i>anterio-posterior</i>	1.6 ± 0.7	16 (69)	5 (22)	2 (9)
<i>lateral</i>	0.2 ± 0.5	1 (4)	2 (9)	20 (87)
<i>concentric</i>	0.2 ± 0.6	2 (9)	1 (4)	0 (0)
Oropharynx				
<i>lateral</i>	0.1 ± 0.2	0 (0)	1 (4)	22 (96)
<i>concentric</i>	0.1 ± 0.4	1 (4)	0 (0)	22 (96)
Base of tongue				
<i>anterio-posterior</i>	0.3 ± 0.6	2 (9)	4 (17)	17 (74)
Epiglottis				
<i>anterio-posterior</i>	0.0	0 (0)	0 (0)	23 (100)
<i>concentric</i>	0.0	0 (0)	0 (0)	23 (100)

Table 2 footnotes : Abbreviations: N=number; SD=standard deviation.

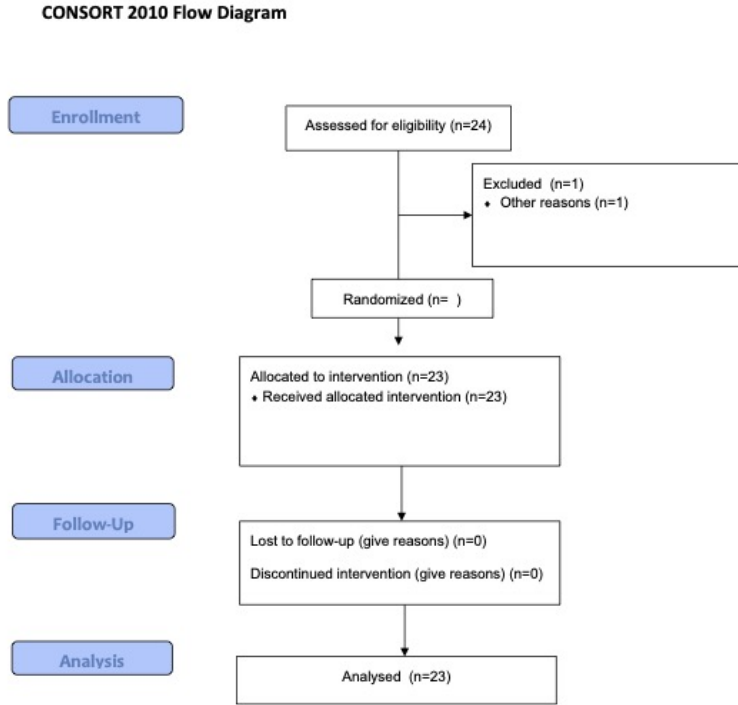
Figure 1: Consort chart flow.

Figure 1 footnotes: -.

Figure 2 footnotes : Figure 1: Comfort and satisfaction scale for patient, otolaryngologist and hypnosis practitioner .

Figure 2 footnotes : Each item was assessed with a Likert-scale ranging from 1 (low satisfaction) to 4 (high satisfaction). For each person (patient, otolaryngologist, hypnosis practitioner) the score ranged from 5 to

20. The total score of scale ranged from 20 to 80. Abbreviations: HISE=hypnosis induced sleep endoscopy; VOTE=velum, oropharynx, tongue base, epiglottis.



Outcomes	Level of satisfaction			
	Poor (1)	Mild (2)	Moderate (3)	High (4)
Patient symptoms during HISE				
1 Nasal or throat pain				
2 Globus sensation				
3 Throat clearing or dysphagia				
4 Cough				
5 Nausea				
Overall symptom feeling				
Patient psychological feeling during HISE steps				
6 Stress or anxiety sensation before hypnosis				
7 Stress or anxiety sensation during hypnosis				
8 Stress or anxiety sensation during trance				
9 Stress or anxiety sensation during HISE				
10 Stress or anxiety sensation after trance				
Overall psychological feeling				
Otolaryngologist comfort during HISE				
11 Nasalfibroscopy (nasal step)				
12 Nasalfibroscopy (throat step)				
13 Maintaining of nasofibroscopy in the throat				
14 Evaluation of muscle relaxation				
15 Rating of VOTE score				
Overall assessment of otolaryngologist				
Hypnosis practitioner comfort				
16 Compliance of patient for session 1				
17 Compliance of patient for session 2				
18 Compliance of patient for trance step				
19 Consciousness level during trance step				
20 Muscle relaxation during hypnosis steps				
Overall assessment of hypnosis practitioner				
Total score				