Abstract Title: The effect of sedating agents on drug-induced sleep endoscopy findings

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Abstract

Objective: Drug-induced sleep endoscopy (DISE) has gained interest for upper airway evaluation in patients with snoring and obstructive sleep apnea (OSA), and different drugs have been used to induce sedation. Nevertheless, all drugs have presented specific advantages and disadvantages with differential effects on respiratory physiology. This study evaluated and compared the effects of midazolam, propofol and dexmedetomidine on DISE findings, O_2 nadir, and bispectral index (BIS) in the same sample of patients.

Study Design: Case series prospective study.

Methods: Consecutive patients who elected to undergo surgery for OSA treatment and were intolerant to conservative therapies underwent DISE with propofol, dexmedetomidine, and midazolam between July 2015 and July 2016.

Results: Fifty-two patients were analyzed, and 43 (82.7%) were men. Agreement among drugs for both degree and patterns of obstruction was excellent at all sites (velum, oropharynx, and epiglottis) except for the tongue base. Dexmedetomidine had the least complete collapse sites and highest O_2 nadir and was the only drug for which apnea severity and obstruction levels (upper, lower, or combined) were correlated. The variability among drug treatments for the BIS index was considerable, and propofol had the lowest variability and average value.

Conclusion: Drug selection had a relevant influence in DISE findings. Compared with dexmedetomidine, midazolam and propofol presented higher incidence of tongue base collapse, lower O_2 levels, and lower BIS index values. Propofol resulted in an O_2 nadir that most resembled that observed during polysomnography. The BIS index variability differed among drugs, and its use was considered relevant for sedation orientation.

Key Words: Dexmedetomidine, drug-induced sleep endoscopy, obstructive sleep apnea, midazolam, propofol.

Table 1 Baseline characteristics of patients

Variables	Min	Max	Mean	SD	Median
Age	24	64	44.2	11.3	45
BMI, kg/m^2	24.1	34.9	28.9	3.5	28.5
ESS	3	22	12.3	4.2	12
NC, cm	32	47	39.8	2.8	40
AHI, events/h	12	70	32	15.7	30
AI, events/h	4	57	23.9	16.8	18
HI, events /h	2	42	12.1	10.7	12
REM, %	0	26.4	14.9	6.1	14.5
ODI, events/h	0	35.5	13.2	9.1	12.5
O_2 nadir, %	50	91	78.9	8.1	80.5

Min, minimum; Max, maximum; BMI, body mass index; ESS, Epworth sleepiness scale; NC, neck circumference; AHI, apnea-hypopnea index; AI, apnea index; HI, hypopnea index; REM, rapid eye movement; ODI, oxygen desaturation index; O_2 nadir, lowest oxygen saturation.

Table 2 Association between degree and collapse pattern in different sites with three drugs

Drug		Degree, n								*P*-value
Midazolam		0+1				2				
Propofol		0 + 1		2		0 + 1		2		
Dexmedetomidine		0+1	2	0+1	2	0+1	2	0+1	2	
Site	Pattern									
V (Mid)	C	1							19	0.96*
	AP	3						1	14	
	L								14	
V (Prop)	C	1						1	19	
	AP	3							14	
	L								14	
V (Dex)	C	1						1	19	
	AP	3							16	
	L								12	
O	L	28		1		2		4	17	0.83**
T	AP	25		1		12		8	6	<.001**
E (Dex)	AP	32				2	1	2	6	0.84*
	L				1	1		1	6	
E (Prop)	AP	32				2	1	2	6	
	L				1	1		1	6	
E (Dex)	AP	32				2	1	2	6	
	L				1	1		1	6	

Degree of obstruction: (0) no obstruction (no vibration, 0-50%); (1) partial obstruction (vibration, 50-75%); (2) complete obstruction (collapse, 75-100%). Mid, midazolam; Prop, propofol; Dex, dexmedetomidine; V, velum; O, oropharynx; T, tongue base; E, epiglottis; C, concentric; AP, anterior-posterior; L, lateral. *, statistical analysis by Fisher exact; **, Wilcoxon rank-sum test. Statistically significant as $P < 0.05$.

Table 3 Agreement between drugs for different DISE findings

Site	Combination	*K*[†]	Lower CI[‡]	Upper CI[‡]
Velum degree	Midazolam x Propofol x Dexmedetomidine	0.84	0.70	0.98
	Midazolam x Propofol	0.87	0.64	1.00
	Midazolam x Dexmedetomidine	0.76	0.48	1.00
	Propofol x Dexmedetomidine	0.88	0.65	1.00
Velum pattern	Midazolam x Propofol x Dexmedetomidine	0.73	0.61	0.84
	Midazolam x Propofol	0.74	0.58	0.90
	Midazolam x Dexmedetomidine	0.74	0.58	0.89
	Propofol x Dexmedetomidine	0.71	0.54	0.87
Oropharynx degree	Midazolam x Propofol x Dexmedetomidine	0.74	0.62	0.85
	Midazolam x Propofol	0.78	0.64	0.93
	Midazolam x Dexmedetomidine	0.67	0.50	0.83
	Propofol x Dexmedetomidine	0.76	0.61	0.91
Tongue base degree	Midazolam x Propofol x Dexmedetomidine	0.29	0.17	0.40
	Midazolam x Propofol	0.34	0.17	0.52
	Midazolam x Dexmedetomidine	0.16	0.04	0.29
	Propofol x Dexmedetomidine	0.48	0.29	0.66
Epiglottis degree	Midazolam x Propofol x Dexmedetomidine	0.76	0.61	0.90
	Midazolam x Propofol	0.76	0.60	0.93
	Midazolam x Dexmedetomidine	0.71	0.52	0.90
	Propofol x Dexmedetomidine	0.80	0.64	0.96
Epiglottis pattern	Midazolam x Propofol x Dexmedetomidine	1.00	1.00	1.00
	Midazolam x Propofol	1.00	1.00	1.00
	Midazolam x Dexmedetomidine	1.00	1.00	1.00
	Propofol x Dexmedetomidine	1.00	1.00	1.00

[†]Fleiss' or Cohen's Kappa. [‡]Confidence interval 95%. The coefficient of agreement and the results were interpreted as either slight (k<0.20), fair (0.21–0.40), moderate (0.41–0.60), substantial (0.61–0.80), or almost perfect (0.81–1.0) agreement.

Table 4 Correlation between OSA severity and obstruction level according to drug used

Drug / AHI	Obstruction Level n(%)		*P*-value*
	U	L + C	
Midazolam			
≤30	7 (53.8)	23 (59.0)	0.75
>30	6 (46.2)	16 (41.0)	
Propofol			
≤30	14 (60.9)	16 (55.2)	0.89
>30	9 (39.1)	13 (44.8)	
Dexmedetomidine			
≤30	23 (69.7)	7 (36.8)	0.04
>30	10 (30.3)	12 (63.2)	

AHI, apnea-hypopnea index; U, upper level (velum and/or oropharynx); L, lower level (tongue base and/or epiglottis); C, combined (upper and lower levels); *, statistical analysis by Chi-square test. Statistically significant as $P < 0.05$.

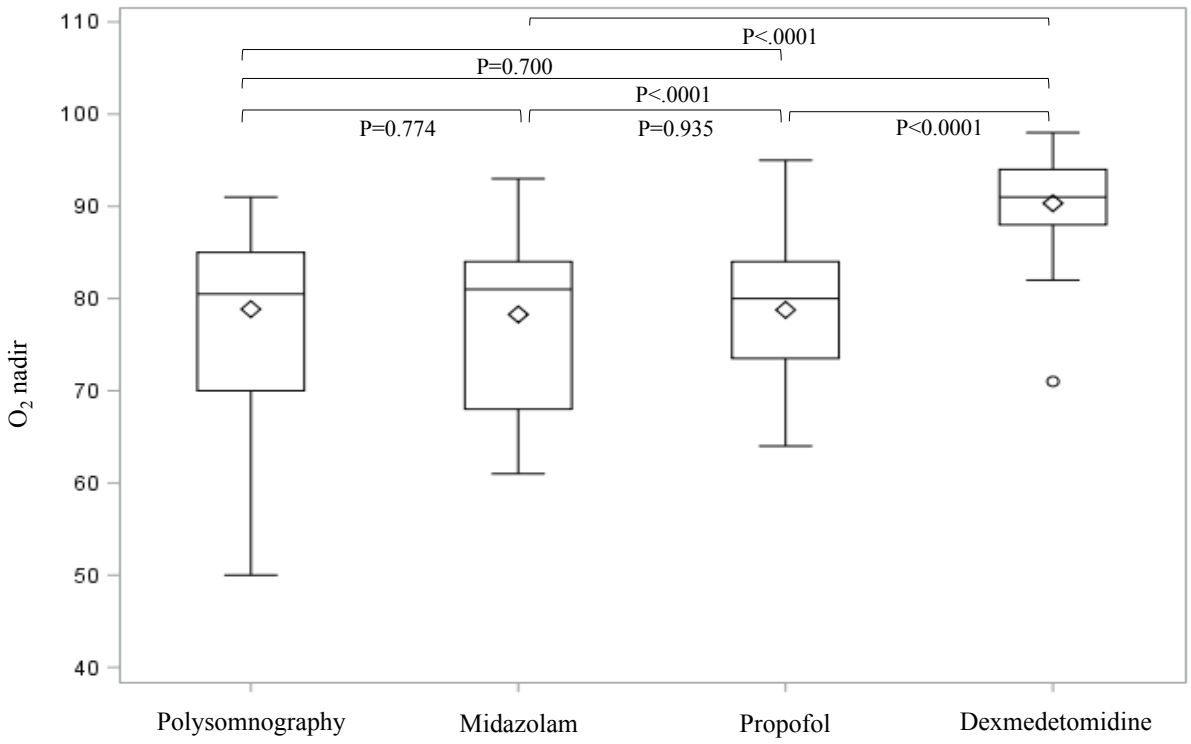


Figure 1 O2 nadir comparison during polysomnography and drug-induced sleep endoscopy according to drugs. O2 nadir = lowest oxygen saturation.

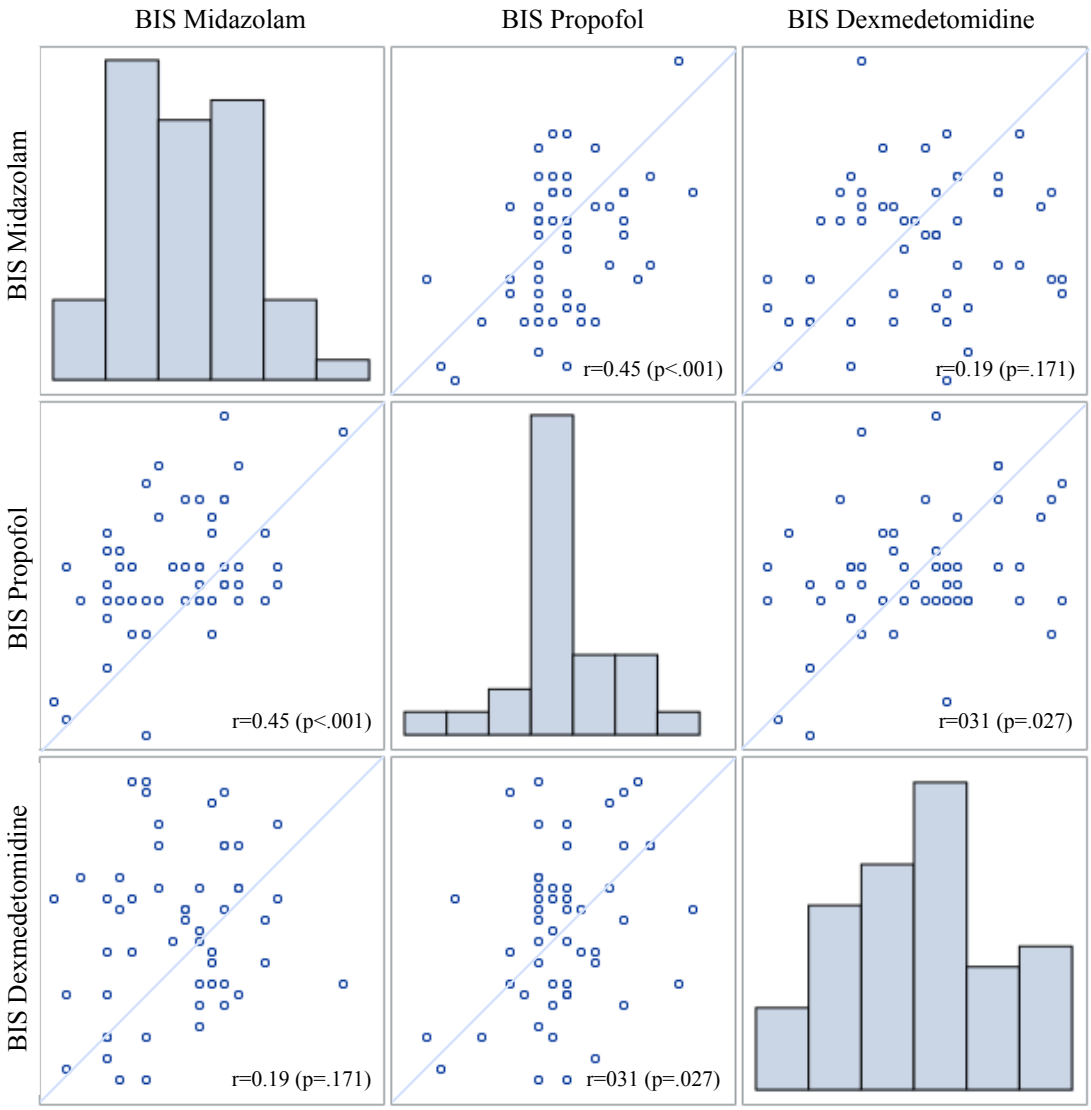
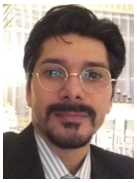


Figure 2. BIS correlation during the drug-induced sleep endoscopy according to drugs. BIS midazolam had a significant positive correlation with BIS propofol (r = 0.45, P < 0.001). Although the correlation had been positive for the other combinations, the P value was not significant. BIS = bispectral index.

Professional Biography

Alonço Viana holds a PhD from the Federal University of the State of Rio de Janeiro (UNIRIO, 2018). His research is sleep medicine, and during 2017 he was Visiting Researcher at the Sleep Surgery Division at Stanford University. He tutors medical residents at the Otorhinolaryngology Department of Naval Hospital Marcílio Dias (HNMD) and directs the Interface Clinic. He has published papers in well-known journals, such as Journal of Clinical Sleep Medicine and European Archives of Oto-Rhino-Laryngology.



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