

Research Article

Obstructive sleep apnoea syndrome-Clinical diagnosis versus limited channel diagnostic nocturnal polysomnography

Rejee Ebenezer R^{*1}, Anand Job² and Rajiv Michael³

¹Professor and HOD of ENT, Dr SMCSI Medical College Hospital Karakonam, Trivandrum, Kerala state, India

²Professor and HOD ENT Unit I, Christian Medical College Vellore, India

³Professor of ENT Unit I, Christian Medical College Vellore, India

***Correspondence Info:**

Dr. Rejee Ebenezer R, MBBS, DLO, MS,
Professor and HOD of ENT,
Dr. SMCSI Medical College Hospital Karakonam,
Trivandrum, Kerala state, India
Email: rejee72@gmail.com

Abstract

Objective: To evaluate the efficacy of detailed history, clinical examination and Muller's manoeuvre compared to limited channel diagnostic nocturnal polysomnography in the diagnosis of obstructive sleep apnoea syndrome. To detect criteria, that will help to clinically identify and assess the severity of obstructive sleep apnoea syndrome.

Materials and methods: This is a prospective comparative study of 40 patients who attended outpatient department of ENT with snoring, in the age group of 30 to 60 years. All patients underwent detailed history, clinical examination, and Muller's manoeuvre using flexible nasopharyngolaryngoscopy followed by sleep study.

Results: 3 patients were clinically graded as no OSAS, out of which 2 patients (67%) had no OSAS by sleep study result. 3 patients clinically graded as mild, all had mild OSAS (100%). 6 patients who were graded as moderate, 2 (33%) had mild, 3(50%) had moderate and 1 (17%) had severe OSAS by sleep study results. 28 patients were clinically labelled as severe OSAS, of which 7 (25%) had mild, 5 (18%) had moderate and 16 (57%) had severe OSAS by sleep study results.

Conclusion: The grading of OSAS was possible in 60% (24/40) of patients compared with sleep study results although the presence or absence of OSA could be detected in 97.5 % (39/40) of patients using our grading criteria.

Keywords: Obstructive sleep apnoea syndrome (OSAS), Clinical diagnosis, Limited channel polysomnography, Apnoea Hypopnea Index (AHI).

1. Introduction

Obstructive sleep apnoea syndrome (OSAS) is a sleep disorder accompanied by snoring apneic episodes, disorganized sleep pattern and excessive day time sleepiness¹. Sleep apnoea was described in 1973 by Guillemin Ault, Eldridge and Dement. It is defined as 30 or more apnoeic episodes during 7 hour of sleep or an apnoea index i.e. the number of apnoeic episodes per hour of sleep equal or greater than 5 should be present before diagnosing sleep apnoea syndrome. Apnoea is defined as the cessation of airflow at the nostrils and mouth for at least 10 seconds. Gould *et al*² defined hypopnea as 50% reduction in thoracoabdominal movement lasting for 10 seconds in the presence of continued air flow. There are three types of sleep apnoea- obstructive sleep apnoea, central sleep apnoea and mixed sleep apnoea. Obstructive sleep apnoea is far more common¹. Most sleep laboratories consider apnoea and hypopneas to be physiologically equivalent in their ability to disrupt sleep. Thus these events are combined in a single value called Apnoea Hypopnea index (AHI). Obstructive sleep apnoea can be divided into 3 grades based on the AHI. Mild: 5-20 episodes/hour, Moderate: 21-40 episodes/hour, Severe: >40 episodes/hour³.

The prevalence ranges from 1-4% of adult population. It is more common in males than in females⁴. Olson *et al*⁵ in their study of 2202 subjects with snoring found the prevalence of OSAS to be 3.6%. Its prevalence in obese, older males may be higher. Obstructive sleep apnoea syndrome can lead to various complications like cardiac arrhythmias, systemic hypertension, pulmonary hypertension, cerebrovascular accidents, myocardial infarctions, psychological and intellectual changes and day time sleepiness causing road traffic accidents etc.^{1,6}.

Polysomnography is the gold standard investigation in the diagnosis of obstructive sleep apnoea¹. This is expensive and labor intensive. Man *et al*⁷ in their study assessed the sensitivity and specificity of a portable sleep monitor with standard polysomnography in 104 patients. They found sensitivity of 85.7% and specificity of 94.7% and an overall accuracy of 92.3%. The set time for the portable device is only 20 minutes compared to 60 minutes for standard polysomnography. The American sleep disorders association 1997 felt that airflow and respiratory effort measurement, oximetry, pulse rate and sleep position detector are the minimum requirements in sleep study for accurate diagnosis of obstructive sleep apnoea⁸. In our study, we selected the limited channel polysomnography which can assess oxygen saturation, heart rate, nasal and oral airflow, CPAP pressure, chest and abdominal movements and sleep position.

Attempts have been made to diagnose obstructive sleep apnoea syndrome with history and clinical examination as it would be more cost effective. However, the results have not been encouraging⁹⁻¹². Flexible nasopharyngolaryngoscopy is a widely available tool to evaluate the nasal passage, oropharynx, hypopharynx and vocal cords. Muller's maneuver can also be performed¹³. Muller's maneuver consists of asking the patient to perform a forced inspiratory effort against a closed mouth and occluded nose. The movements of pharyngeal walls during this maneuver replicates obstructive events occurring during sleep and therefore satisfactory assessment of the dynamics of obstruction of upper airway can be made out. In our study protocol we included the flexible nasopharyngolaryngoscopy with Muller's manoeuvre as well as history and clinical examination to aid in the diagnosis of obstructive sleep apnoea. Results obtained by history, clinical examination, endoscopy and Muller's manoeuvre are compared with sleep study results.

1.1 Aims and objectives

- 1) To evaluate the efficacy of detailed history, clinical examination and flexible endoscopy with Muller's manoeuvre in the diagnosis of obstructive sleep apnoea syndrome.
- 2) To correlate these clinical parameters with limited channel diagnostic nocturnal polysomnography.
- 3) To detect criteria that will help to clinically detect as well as assess the severity of obstructive sleep apnoea syndrome.

2. Materials and methods

Patients attending outpatient department of ENT with complaints of snoring, in the age group of 30 to 60 years were included in the study. Patients with age less than 30 and more than 60, those with history of surgery to the nose, nasopharynx or throat and those with neurological problems were excluded. Based on the previous studies, the prevalence of OSAS was found to be 3.6%⁵ with 5% level of significance and 0.6% precision, a sample of 40 patients were recruited for the study. A detailed history and general examination which included measurement of height, weight, chest, neck, waist and hip circumference were taken. ENT examination followed by Muller's manoeuvre using flexible nasopharyngolaryngoscopy was done (Table 1). Based on these findings a clinical diagnosis of No OSAS, mild, moderate or severe OSAS was made (Table 2). Then patients were sent to pulmonary medicine for sleep study where they were admitted at night and limited channel polysomnography was done. Data collected from sleep study was analyzed and the mean the AHI index was obtained. Patients were followed up in ENT and Pulmonary medicine OPD with suggestions of appropriate treatment options.

2.1 Statistical analysis

Data was entered and analyzed using SPSS/PC+ program. The data was clubbed into two. Student's t-test was done to compare the mean AHI calculated by the symptoms, clinical and endoscopic examination results. For analysis of more than two groups analysis of variance was used.

3. Results

Among the 40 patients studied 36 were males and 4 were females. Among the age group more than 50% were between 41-50 years. Of the symptoms, apnoeic episodes reported by bed partner, daytime fatigue and mouth breathing were statistically significant with a p value of 0.017, 0.024 and 0.004 respectively. Patients with the above symptoms had a mean AHI of >40 indicating that these symptoms are common in patients with severe OSAS (Table 3).

On analysis of variables by local examination, a low lying soft palate (p<0.007), high arched palate (p<0.007) and prominent lateral pharyngeal band (p<0.015) were statistically significant with a mean AHI of >40 indicating that these findings are common in patients with severe OSAS (Table 4)

Endoscopically, Muller's manoeuvre at soft palate and hypopharyngeal level was statistically significant. 32/40 patients had >50% collapse at soft palate level (mean AHI>40) whereas 13/40 patients had >50% collapse at hypopharyngeal level (mean AHI>40). (Table 5).

Three patients were clinically graded as no OSAS, out of which 2 patients (67%) had no OSAS by sleep study and 1 patient (33%) had mild OSAS, AHI of 7.1. Of the three patients who were clinically labelled as mild, all had AHI of <20 (100%). Out of 6 patients who were clinically labelled as moderate, 2 (33%) had mild, 3 (50%) had moderate and 1 (17%) had severe OSAS according to sleep study results. 28 patients were clinically labelled as severe OSAS, of which 7 (25%) had mild, 5 (18%) had moderate and 16 (57%) had severe OSAS according to sleep study results. Overall 24 out of 40 patients were clinically labelled accurately before sleep study. Clinical impression had an accuracy of 60%. However grading into presence or absence of OSAS the clinical accuracy increased to 95%. (Table 6)

Table 1: Grading of symptoms, clinical and endoscopic findings

SYMPTOMS	CLINICAL AND ENDOSCOPIC FINDINGS
Snoring(Nature) Never snored-0, Slightly louder than heavy breathing-1, As loud as talking-2, Louder than talking-3, Disturbs others in house-4, Extremely louder and can be heard through closed door-5 Snoring(Position) Supine-1, Semi reclining-2, Lateral-3 Frequency of snoring Never-1, Sometimes(3 to 4 days a week)-2, Always (every night)-3 Apnoeic episodes(Reported by bed partner) No-0, Yes-1 Day time sleepiness Never doze-0, Slight chance-1, Moderate chance-2, High chance-3 Day time fatigue, morning headache, irritability No-0, Yes-1 Mouth breathing, frothing in mouth No-0, Yes-1 History of weight gain <5 kg-1, 5-15kg-2, >15 kg-3	Neck circumference: <43cm -0, >43cm -1 Waist hip ratio : <1-0, >1-1, BMI : <27.8-0, >27.8-1 ORAL CAVITY AND OROPHARYNX Size of the tongue: Normal-1, Enlarged-2 Uvula : Normal-1, Elongated and touching base of tongue-2, Thick and elongated, touching base of tongue-3 Soft palate: Normal-1, Low lying-2 Hard palate: Normal-1, High arched-2 Anterior pillar: Normal-1, Narrowing of anterior pillar-2 Tonsils: Within the fossa-0, Up to anterior pillar-1, Just beyond anterior pillar-2, Beyond anterior pillar-3, Kissing tonsils-4 Posterior pillar: Normal-1, Narrowed-2 Lateral pharyngeal band: Hidden behind posterior pillar-1, Partly seen-2, Midline-3 Muller's Manoeuvre (Collapse assessed at soft palate level (LEVEL I), tongue base level (LEVEL II), hypo pharyngeal level (LEVEL III)) 1+ minimal collapse, 2+ collapse decreasing cross sectional area by 50%, 3+ collapse decreasing cross sectional area by 75%, 4+ obliteration of airway.

Table 2: Clinical grading of OSAS

Symptoms, general examination, local examination and endoscopic findings	Grade
1 major symptom/normal BMI/normal oropharynx/minimal collapse at soft palate OR 2 major symptoms/normal BMI/normal oropharynx/ no collapse at soft palate in Muller's manoeuvre	MILD OSAS
3 symptoms (at least 2 major)/ BMI overweight /narrow oropharynx/50% collapse at level I or II	MODERATE OSAS
>3 symptoms / BMI overweight or obesity/narrow oropharynx/ >75% collapse at more than one level	SEVERE OSAS

Table 3: Mean AHI score by symptoms

Symptoms	No. of cases	Mean AHI	SD	t value	p value
Snoring Mild 1,2,3=1 Severe 4,5=2	5 35	18.4 40.5	20.6 25.1	1.87	0.07
Apnoeic episode No(0) Yes(1)	7 33	17.3 42.1	22.3 24.2	2.49	0.017
Excessive day time sleepiness No(0) Yes(1) (1,2,3)	6 34	27.6 42.1	24.7 25	1.68	0.10
Day time fatigue No(0) Yes(1)	11 29	23.2 43.3	22.9 24.5	2.35	0.024
Mouth breathing No(0) Yes(1)	6 34	11 42.5	6.8 24.6	3.11	0.004
History of weight gain <5kg-1 >5kg-2	17 23	34 39	27.7 23.7	0.60	0.55

Table 4: Mean AHI score by local examination

Local examination	No. of cases	Mean AHI	SD	t value	p value
Size of the tongue: Normal-(1) Enlarged-(2)	17 23	33.3 41	27.2 24.1	0.94	0.35
Uvula Normal-1 Elongated and thick uvula touching base of tongue-2(2,3)	7 33	24.6 40.5	27.5 24.5	1.53	0.14
Soft palate: Normal-1 Lowlying-2	7 33	14.8 42.6	17.9 24.3	2.85	0.007
Hard palate: Normal-1, High arched-2	34 6	33.3 62.7	24.4 17.5	2.83	0.007
Anterior pillar: Normal-1, Narrow-2	30 10	34.5 47.3	24.4 27.5	1.39	0.17
Tonsils: 1- (0,1) 2 - (2,3,4)	19 21	30.7 44.1	24.3 25.4	1.7	0.09
Posterior pillar: Normal-1 Narrowed-2	8 32	24.6 41	25.6 24.7	1.66	0.10
Lateral pharyngeal band: 1=1(not seen) 2=2,3(seen beyond posterior pillar and mid line)	8 32	18.5 42.5	23.4 24	2.55	0.015
IDL: 1=1 2=(2,3,4)	20 20	33.2 42.2	24.6 26	1.11	0.27
Malampatti grading: 1=1 2=(2,3,4)	5 35	21.4 40.1	20.7 25.5	1.56	0.13

Table 5: Mean AHI score by endoscopic findings (Muller's manoeuvre)

Muller's manoeuvre	No. of cases	Mean AHI	SD	t value	p value
Soft palate collapse -upright &supine 0-Normal 1-minimal collapse 2-(2+,3+,4+ collapse)	6 2 32	16.5 14.5 43.1	19 13.8 24.4	4.24	0.02
Tongue base level collapse upright &supine 0-Normal 1-minimal collapse 2-(2+,3+,4+ collapse)	15 4 21	27.2 33.4 46.1	18.5 27.1 27.4	2.66	0.08
Hypo pharyngeal level collapse - upright &supine 0-Normal 1-minimal collapse 2-(2+,3+,4+ collapse)	23 4 13	29.4 57.1 46.4	21.2 14.3 29.8	3.55	0.04

Table 6: Clinical impression compared with sleep study results

Clinical impression	No of cases	Sleep study results							
		<5		5-20		21-40		>40	
		No of cases	%	No of cases	%	No of cases	%	No of cases	%
No OSA	3	2	67.0	1	23.0	-	-	-	-
Mild OSA	3	-	-	3	100.0	-	-	-	-
Moderate OSA	6	-	-	2	33.0	3	50.0	1	17.0
Severe OSA	28	-	-	7	25.0	5	18.0	16	57.0

4. Discussion

This prospective study was performed to see whether a clinical diagnosis of OSAS can be made by history taking, local examination and flexible endoscopy with Muller's manoeuvre. Kapunian *et al*¹⁴ in 1988 found that cessation of breathing and loud snoring was 100% effective in diagnosing sleep apnoea cases with AHI>40 whereas the sensitivity was 70 to 76% with an overall clinical accuracy of 88% in cases with AHI >5. In a study by Kump *et al*¹¹ in 1995 the intensity of snoring, roommate observed choking and fallen asleep during driving were important predictors of OSAS. In a study by Flemons *et al*¹⁰ in 1994, the neck circumference, snoring and bed partner report of nocturnal choking were important predictors of OSAS. Crocker *et al*¹² in 1990 found apnoea observed by bed partner, BMI, observed apnoea was most predictive of OSAS. In our study we found that history of apneic episodes reported by bed partner, daytime fatigue and mouth breathing were important predictors of severity of OSAS and were statistically significant with AHI >40.

There are various other studies showing strong correlation between OSAS, neck circumference and BMI^{10,15,16,17}. In our study they were not statistically significant. Freidman *et al*¹⁸ in 2002 predicated the severity of OSAS using palate position, tonsillar size and BMI. Sterlzow *et al*¹⁹ by cephalometry found that people with OSAS had low lying soft palate. In our study we found patients with low lying soft palate had mean AHI>40 which was statistically significant. The other observation was prominent lateral pharyngeal band common in people with moderate and severe OSAS and was statistically significant.

In OSAS, upper airway collapse during sleep often occurs at multiple levels²⁰. There are various methods like fluoroscopy, CT scan, cephalometry and endoscopy. We used flexible endoscopy and Muller's manoeuvre. In Terris *et al*²¹ study in 2000 they assessed collapse at soft palate, base of tongue and lateral pharyngeal wall by Muller's manoeuvre which was simple to perform. They found grade 3 and 4 collapse to be valid in assessing severity of OSAS with a correlation of 72%. In our study collapse at soft palate and hypo pharyngeal level were statistically significant.

Viner *et al*⁹ in 1991 hypothesized that clinical history, examination of pharynx and overall subjective impression by specialist might serve as a sensitive screening test for diagnosing OSAS. They compared this with sleep study result and found an accuracy of 63%. In our study out of 40 patients 24 patients were accurately diagnosed and clinically graded as mild, moderate and severe OSAS before sleep study with clinical accuracy of 60%.

Using clinical grading the diagnostic accuracy in each category compared with sleep study were no OSAS -2/3 (67%), mild OSAS 3/3 (100%), moderate OSAS -3/6 (50%), and severe OSAS -16/28(57%). The diagnostic accuracy was poor in the moderate and severe group. Dean *et al*²² in their study found that 9 patients with strong clinical suspicion of OSAS had initial negative sleep study but subsequent sleep study revealed 2 patients had mild and 7 had severe OSAS. This initial negative study could be due to reduction in sleep time, sleep efficacy, sleep posture and quality of sleep. In another study by Meyer *et al*²³ they concluded that initial negative sleep study is insufficient to exclude OSAS in patients at risk on clinical grounds to have OSAS. Hence in our study, of the 28 patients with strong clinical suspicion of severe OSAS, 7 patients were labelled as mild and 5 as moderate according to sleep study and this could be due to the severity of illness decreasing the quality of sleep which could have underestimated the severity of illness.

5. Conclusion

The advantage of history taking, clinical examination and endoscopy are the exact site of obstruction can be found out which cannot be detected by sleep study. Identifying the site of obstruction is important in the management of OSAS which could only be done by clinical examination¹. In our study clinical grading into no OSAS, mild, moderate and severe had an accuracy of only 60%. However clinical grading into no OSAS or presence of OSAS compared with sleep study results the clinical accuracy increased to 97.5%. This clinical grading will help in the clinical diagnosis of OSAS.

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