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

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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 al4 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 common.5 Most sleep laboratories consider apnoea and hypopnoeas 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/hour.

The prevalence ranges from 1-4% of adult population. It is more common in males than in females4. Olson et al5 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.6,7

Polysomnography is the gold standard investigation in the diagnosis of obstructive sleep apnoea7. This is expensive and labor intensive. Man et al8 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 apnoea7. 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 efficency of detailed history, clinical examination and flexible endoscopy with Muller’s manoeuvr for 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% 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 including measurement of 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 OSAS, 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 1: Grading of symptoms, clinical and endoscopic findings

| SYMPTOMS | CLINICAL AND ENDOSCOPIC FINDINGS |
|----------|----------------------------------|
| Snoring(Nature) | Neck circumference: <43 cm -0, >43 cm -1 |
| 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) | Waist hip ratio: <1-0, >1-1, BMI: <27.8-0, >27.8-1 |
| Supine-1, Semi reclining-2, Lateral-3 |
| Frequency of snoring | ORAL CAVITY AND OROPHARYNX |
| Never-1, Sometimes(3 to 4 days a week)-2, Always (every night)-3 | Size of the tongue: Normal-1, Enlarged-2 |
| Apnoeic episodes(Reported by bed partner) | Uvula : Normal-1, Elongated and touching base of tongue-2, Thick and elongated, touching base of tongue-3 |
| No-0, Yes-1 | Soft palate: Normal-1, Low lying-2 |
| Day time sleepiness | Hard palate: Normal-1, High arched-2 |
| Never doze-0, Slight chance-1, Moderate chance-2, High chance-3 | Anterior pillar: Normal-1, Narrowing of anterior pillar-2 |
| Day time fatigue, morning headache, irritability | Tonsils: Within the fossa-0, Up to anterior pillar-1, Just beyond anterior pillar-2, Beyond anterior pillar-3, Kissing tonsils-4 |
| No-0, Yes-1 | Posterior pillar: Normal-1, Narrowed-2 |
| Mouth breathing, frothing in mouth | Lateral pharyngeal band: Hidden behind posterior pillar-1, Partly seen-2, Midline-3 |
| No-0, Yes-1 | Muller’s Manoeuvre(Collapse assessed at soft palate level (LEVEL1), tongue base level(LEVEL II), hypo pharyngeal level (LEVELIII) |
| History of weight gain | 1+ minimal collapse, 2+ collapse decreasing cross sectional area by 50%, 3+ collapse decreasing cross sectional area by 75%, 4+obliteration of airway. |
| 0-5 kg: 1, 5-15 kg:2, >15 kg:3 |

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 | MILDE OSAS |
| 2 major symptoms/normal BMI/normal oropharynx/ no collapse at soft palate in Muller’s manoeuvre | |
| 3 symptoms (at least 2 major)/ BMI overweight/narrow oropharynx/50% collapse at level I or II | MELDIE 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                                 |              |          |     |         |         |
| Mild1,2,3=1                             | 5            | 18.4     | 20.6| 1.87    | 0.07    |
| Severe 4,5=2                            | 35           | 40.5     | 25.1|         |         |
| Apnoeic episode                         |              |          |     |         |         |
| No(0)                                   | 7            | 17.3     | 22.3| 2.49    | 0.017   |
| Yes(1)                                  | 33           | 42.1     | 24.2|         |         |
| Excessive day time sleepiness           |              |          |     |         |         |
| No(0)                                   | 6            | 27.6     | 24.7| 1.68    | 0.10    |
| Yes(1), (1,2,3)                         | 34           | 42.1     | 25  |         |         |
| Day time fatigue                        |              |          |     |         |         |
| No(0)                                   | 11           | 23.2     | 22.9| 2.35    | 0.024   |
| Yes(1)                                  | 29           | 43.3     | 24.5|         |         |
| Mouth breathing                         |              |          |     |         |         |
| No(0)                                   | 6            | 11       | 6.8 | 3.11    | 0.004   |
| Yes(1)                                  | 34           | 42.5     | 24.6|         |         |
| History of weight gain                  |              |          |     |         |         |
| <5kg-1                                   | 17           | 34       | 27.7| 0.60    | 0.55    |
| >5kg-2                                   | 23           | 39       | 23.7|         |         |

### 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)           | 17           | 33.3     | 27.2| 0.94    | 0.35    |
| Enlarged-(2)                             | 23           | 41       | 24.1|         |         |
| Uvula                                    |              |          |     |         |         |
| Normal-1                                 | 7            | 24.6     | 27.5|         |         |
| Elongated and thick uvula touching base  | 33           | 40.5     | 24.5|         |         |
| of tongue-2(2,3)                         |              |          |     |         |         |
| Soft palate: Normal-1                   | 7            | 14.8     | 17.9|         |         |
| Lowlying-2                               | 33           | 42.6     | 24.3|         |         |
| Hard palate: Normal-1                   | 34           | 33.3     | 24.4|         |         |
| High arched-2                            | 6            | 62.7     | 17.5|         |         |
| Anterior pillar: Normal-1                | 30           | 34.5     | 24.4|         |         |
| Narrow-2                                 | 10           | 47.3     | 27.5|         |         |
| Tonsils: 1- (0,1)                        | 19           | 30.7     | 24.3|         |         |
| 2 - (2,3,4)                              | 21           | 44.1     | 25.4|         |         |
| Posterior pillar: Normal-1               | 8            | 24.6     | 25.6|         |         |
| Narrowed-2                               | 32           | 41       | 24.7|         |         |
| Lateral pharyngeal band: 1=1(not seen)   | 8            | 18.5     | 23.4|         |         |
| 2=2,3(seen beyond posterior pillar and   | 32           | 42.5     | 24.5|         |         |
| mid line)                                |              |          |     |         |         |
| IDL: 1=1                                 | 20           | 33.2     | 24.6|         |         |
| 2=2(3,4)                                 | 20           | 42.2     | 24.6|         |         |
| Malampatti grading: 1=1                  | 5            | 21.4     | 20.7|         |         |
| 2=2(3,4)                                 | 35           | 40.1     | 25.5|         |         |

### 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                                 | 6            | 16.5     | 19  |         |         |
| 1-minimal collapse                       | 2            | 14.5     | 13.8|         |         |
| 2-(2+,3+,4+ collapse)                    | 32           | 43.1     | 24.4|         |         |
| Tongue base level collapse upright & supi|              |          |     |         |         |
| 0-Normal                                 | 15           | 27.2     | 18.5|         |         |
| 1-minimal collapse                       | 4            | 33.4     | 27.1|         |         |
| 2-(2+,3+,4+ collapse)                    | 21           | 46.1     | 27.4|         |         |
| Hypo pharyngeal level collapse -upright  |              |          |     |         |         |
| & supine 0-Normal                        | 23           | 29.4     | 21.2|         |         |
| 1-minimal collapse                       | 4            | 57.1     | 14.3|         |         |
| 2-(2+,3+,4+ collapse)                    | 13           | 46.4     | 29.8|         |         |

### 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 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.18 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.1 in 1995 the intensity of snoring, roomate observed choking and fallen asleep during driving were important predictors of OSAS. In a study by Flemons et al.19 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. Using clinical grading the severity of OSAS using palatal position, tonsillar size and BMI. Stelzow et al.36 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 ad severe OSAS and was statistically significant.

In OSAS, upper airway collapse during sleep often occurs at multiple levels.20 There are various methods like fluoroscopy, CT scan, cephalometry and endoscopy. We used flexible endoscopy and Muller’s manoeuvre. In Terris et al21 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.27 in 1991 hypothesized that clinical history, examination of pharynx and over all 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.28 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.29 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, 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 examination. In our study grading into no OSAS, mild, moderate and severe had an accuracy of only 60%. However clinical grading into no OSAS or presence of OSAS by sleep study. Identifying the site of obstruction is important in the management of OSAS which could only be done by clinical examination

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