

AN OVERVIEW OF SLEEP APNEA SYNDROME

*Hoang Anh Tien, Nguyen Nhat Quang, Nguyen Huu Duc
Hue University of Medicine and Pharmacy*

Summary

Sleep apnea syndrome is a sleep disorder that patients have at least 5 periods of apnea-hypopnea for at least 10 seconds during sleep. In Asia, a frequency of approximately 4.1% - 7.5% in men and 2.1% - 3.2% in women, similar to the European-American. Airway narrowing associated with reduced nerve impulses leading to the upper respiratory during sleep and the onset of apnea, can cause sudden respiratory closed in part or entirely. As recommended by the American Academy of Sleep Medicine, sleep apnea syndrome is diagnosed by polysomnography (like Alice 5) or can be diagnosed by portable polysomnography (like Stardust II). All patients with overweight and obesity was diagnosed with obstructive sleep apnea syndrome were encouraged weight loss. Continuous positive airway pressure is the first choice for the treatment of patients with obstructive sleep apnea syndrome.

Key words: *Sleep apnea syndrome, polysomnography*

1. DEFINITION

Sleep apnea syndrome is a sleep disorder that patients have at least 5 periods of apnea-hypopnea for at least 10 seconds during sleep [8], [10].

Sleep apnea syndrome also referred to as apnea – hypopnea syndrome because people tend to have decreased breath. Hypopnea similar to apnea but

instead of completely apnea for at least 10 seconds, decreased breathing just air flow fell 25% - 50% of the time for at least 10 seconds, combined O₂ desaturation at least 4% or lower air flow over 50% combined reduction in O₂ saturation of 3% or awake. Hypopnea is equivalent clinical consequences of apnea [8].

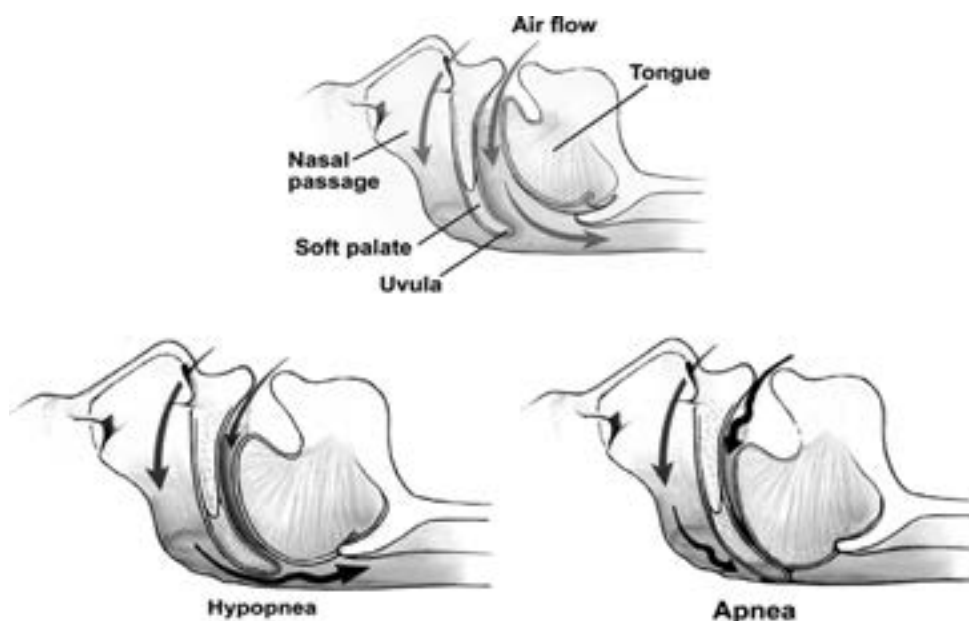


Figure 1.1. Hypopnea and Apnea [3]

2. SLEEP APNEA SYNDROME CLASSIFICATION

Sleep apnea syndrome has three types:

Obstructive sleep apnea syndrome: Expression of air traffic stopped due to upper airway obstruction but the thoracic and abdominal movements are maintained [8].

Central sleep apnea syndrome: Airflow is stalled due to lack of respiratory exertion of the chest and abdomen. The cause of this type is the lack of signals from the central nervous system, and so no respiratory effort [8].

- Corresponding author: Hoang Anh Tien, email: bsanhtien@gmail.com
- Received: 28/4/2014 * Revised: 16/6/2014 * Accepted: 25/6/2014

DOI: 10.34071/jmp.2014.1e.7

Mixed sleep apnea (including the above two types): The first component of apnea is central apnea. The first, no breathing effort in chest and abdominal stopped making stops airflow. Next, breathing effort in the chest and abdominal recovery, but the flow of air through the nose cannot be recovered due to airway obstruction [8].

Of the three types, obstructive sleep apnea is the most common [8], [11].

3. OBSTRUCTIVE SLEEP APNEA SYNDROME

3.1. Epidemiology

This is a common disease in developed countries and in developing countries. In Asia, a frequency of approximately 4.1% - 7.5% in men and 2.1% - 3.2% in women [1], similar to the European-American [1], [2].

An estimated 26% of adults at high risk of suffering from OSA. The rate of OSA in the general population is approximately 20% as determined threshold of AHI higher than 5 times / hour. (AHI is the average number of apnea, hypopnea in 1 hour of sleep).

3.2. Mechanism of Sleep Apnea Syndrome

Centers in the brain stem control of body movements ventilation of the upper respiratory tract, chest wall and diaphragm muscle [5]. These nerve impulses are emitted in the breath (inhale, exhale), including increasing cycles and reduced ventilatory muscle activation, resulting in respiratory chain creates breathing. Breathing with irregular or uneven, or short, long, depending on the respiratory center conditioning.

3.3. Clinical symptoms of Sleep Apnea Syndrome

Table 1.1. Symptoms and clinical signs [2]

Symptoms	Clinical signs
- Loud habitual snoring. - Excessive daytime sleepiness - Choking/open mouth breathing during sleep. - Sleep is not restful. - Tired during the day. - Difficulty concentrating at work.	- Obesity (especially upper body). - Reducing the jaw / lower jaw. - Narrow throat. - Large tongue or tonsils - Obstruction of the nose and throat, larynx. - Families of people with sleep apnea syndrome.

Epworth sleepiness scale:

8 described the situation after a questionnaire. Each situation is given from 0-3 points (0: never doze, 1: little asleep, 2: average fell asleep, 3: severe drowsiness)

- + Is sitting reading a book.
- + Is watching television.
- + Is sitting in a public place, do not work.
- + Is sitting in the car about 1 hour, non-stop driving.
- + Is a rest after lunch, no alcohol.
- + Lie down to rest in the afternoon in the situation allows.

The opening through the upper airway is maintained by bone and cartilage structure ray of the nasopharynx, plus 12 pairs skeletal muscles (rhabdomyolysis). Patients with OSA often have reduced upper airway size due to excess soft tissue around the airway and no pressure to win. Airway narrowing associated with reduced nerve impulses leading to the upper respiratory during sleep and the onset of apnea, can cause sudden respiratory closed in part or entirely. Results and cause blockages caused mixed apnea. Slammed the trend of the upper respiratory tract caused by the pressure caused mostly closed.

Sleep apnea occurs, at least in part as the process usually loop (loop gain). That is: apnea occurs when the lower threshold trigger respiratory muscle activation inhale and lower thresholds to maintain open communication of the upper airways during sleep. Because respiratory apnea should be increased to overcome the threshold created inhaled breath. If there is hyperventilation will cause reduction of CO₂ concentration, reduce subthreshold stimulation inhalation. Thus leading to apnea occurs due to respiratory effort apnea offset times before. In fact, in these patients, the upper airway becomes narrow as they slept, but when I woke up, the airway dilator will run higher than normal, thus ensuring the normal ventilation. And sleep, tone of these muscles will decrease, and the airways become narrow, patients may exhibit symptoms of snoring before airway becomes blocked completely, and apnea condition will occur. Apnea and hypopnea will cease when the patient was awakened while sleeping transient [1].

- + Sitting and talking to someone.
- + Is sitting in cars while waiting at the traffic station a few minutes.

Thus total Epworth scale from 0-24 points, Epworth > 10 points are suggested patients with more daytime sleepiness [4]. With the score the higher the level of sleep-related and more.

3.4. Sleep apnea syndrome detective devices

3.4.1. Portable polysomnography StarDust II

Stardust II is a portable polysomnography 3rd generation is designed to measure and record five parameters: SpO₂ (via sensors mounted fingertip), heart rate (from O₂ sensors), the breathing (via pressure sensor of O₂ nasal wire), respiratory activity (pressure sensor in the middle of the chest belt), body posture (posture sensor with built-in mercury Stardust II). Stardust II use 9 V batteries and gather continuous information for 10 hours. Data is collected and stored in the internal memory of the device. The data is then downloaded into a computer and analyzed by software automatically Stardust Host, Respiroic, Inc., USA. The doctor can evaluate and check the results that were analyzed automatically. Hypopnea was recorded as a reduction of 50% or breathing line by visual assessment lasts more than 10 seconds with a decrease of 3% SpO₂. Apnea is recognized when the the patient stop breathing in 10 seconds (regardless of central obstructive apnea or mixed) [13]. As recommended by the American Academy of Sleep Medicine (2009) evaluated the results from portable polysomnography (like Stardust II) need to be monitored by a doctor specializing in sleep disorders) [3].



Figure 1.2 StarDust II

3.4.2. Full option polysomnography Alice 5

Full option polysomnography provide the standard criteria for diagnosing sleep apnea syndrome.



Figure 1.3 Polysomnography Alice 5

3.4.3. The invention of SASD-07

SASD-07 (Sleep Apnea Syndrome Detective 2007) has been accepted through provincial research TTH.2001-KC07. Compact and economical, highly screening for sleep apne syndrome



Figure 1.4 SASD-07

3.5. Diagnose of central sleep apnea

Central sleep apnea is condition off reducing ability to breathe due to the central nervous system. This disease also occurs in normal people, especially at the beginning of sleep, and REM stage of sleep, and usually increases with altitude. CSA is repeated frequently in patients with heart failure or neurological diseases, particularly in stroke patients.

In the syndrome of alveolar hypoventilation origin central nervous system, patients will increase CO₂ in the blood by CSA accompanied

with apnea. Indeed, patients with idiopathic CSA with normal CO₂ concentrations usually have a normal or low arterial PCO₂ when the patient wakes up, this is because patients have an increased transiently ventilatory response to increasing CO₂ in blood. This combination will lead to the unstable ability to control the ventilation, the patient will breath with low threshold of PCO₂ while sleeping, and then increasing ventilatory status when the patient wakes up, reducing blood CO₂, creating a vicious cycle.

3.5.1. Clinical symptoms

Patients may exhibit prolonged insomnia, is a common symptom of OSAS. Daytime sleepiness can occur.

3.5.2. Laboratories

Many cases are diagnosed central apnea syndrome because there was no movement of the chest and abdomen when patients sleep, but in fact it is due to obstruction, furthermore the detection of this movement is also very difficult especially in obese patients. Therefore, the CSA can only be diagnosed with certainty with measurements of esophageal pressure or EMG examination of the respiratory muscles showed loss of muscle tonus when the patients in apnea period.

3.5.5. Classification of SAS type

3.5.3. The criteria for diagnosing obstructive sleep apnea syndrome

OSAS = Criteria A and / or criteria B + criteria C [3].

Criteria A: daytime sleepiness with inexplicable reasons.

Criteria B: ≥ 2 the following standards that can not be explained by other causes:

- The feeling of shortness of breath or gasping during sleep.
- Waking up during the night several times.
- Sleep does not recover.
- Tired during the day.
- Reduced ability to concentrate.

Criteria C: on polysomnography.

+ AHI (Apnea-hypopnea index) ≥ 5 events / hour during sleep

AHI is the total number of apnea or hypopnea period for 1 hour. All events must last at least 10 seconds. Be used to diagnose sleep apnea syndrome and to assess the severity of SAS.

3.5.4. Classification of OSAS severity

A grading of severity of OSAS based on the frequency of abnormal respiratory events during sleep:

Mild: 5–15 events/hour of sleep

Moderate: 15–30 events/hour of sleep

Severe: More than 30 events/hour of sleep [10]

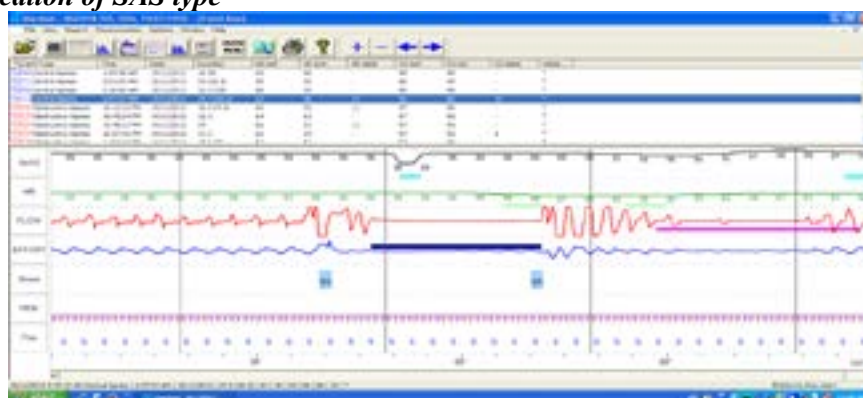


Figure 1.5. Central Sleep Apnea Syndrome



Figure 1.6. Obstructive Sleep Apnea Syndrome

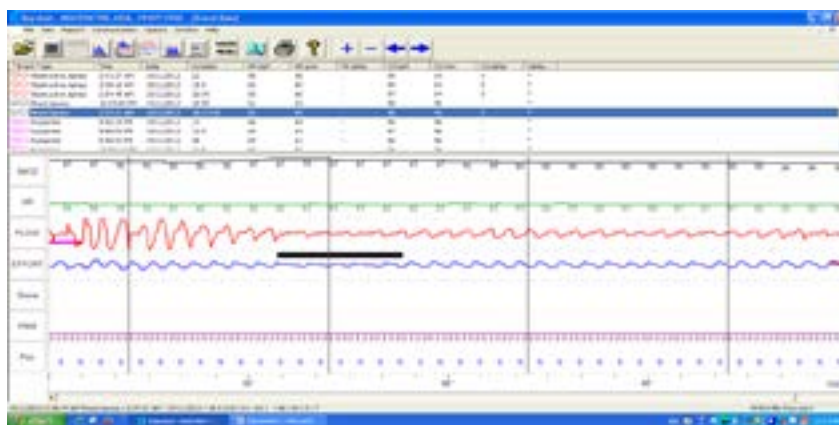


Figure 1.7. Mixed Sleep Apnea Syndrome

3.6. Treatment of obstructive sleep apnea syndrome

3.6.1. Medical treatment

- Reduce weight:
 - + Successful diet will reduce the AHI index in patients with sleep apnea syndrome with obesity.
 - + Diet weight loss should be combined with the treatment of primary sleep apnea syndrome.
 - + Gastrectomy can be a coordinated method in the treatment of obstructive apnea in patients with obesity.

- Posture therapy:

Keep patients in the recumbent posture, an effective secondary therapy to combine with primary sleep apnea syndrome, especially in patients with low AHI non-supine position.

- Provide O2:

A method of treating secondary obstructive sleep apnea syndrome, no indication for treatment of primary obstructive sleep apnea syndrome.

- Use nasal Corticosteroids

Use local Corticoids nasal can improve AHI in patients with obstructive sleep apnea syndrome accompanied by rhinitis and may be effective in combination therapy with primary sleep apnea syndrome.

- Modafinil, Amodafinil

Modafinil, Amodafinil been recommended for using in the treatment of daytime sleep in patients with sleep apnea obstructive form despite treatment with continuous positive airway pressure and could not find the cause drowsiness during the other days. [12]

3.6.2. Mandibular Repositioning Splints (MRS)

Aims to make wider the throat during sleep, and are indicated in patients with moderate and severe OSAS with no response to treatment with continuous positive airway pressure (CPAP). Trained dentists made this device.

Also known under the name of simply jaw tooling. MRS works by keeping the lower jaw and

the tongue of the patient to be pushed forward, so it get easy to ventilate in oropharyngeal airway. MRS was demonstrated in randomized controlled trials are likely to increase breathing during sleep in patients with OSAS, improve daytime sleepiness and hypertension. Because there are too many of these types of devices with different designs on the market, so the results of these tests are not applicable to all devices MRS. The report on the use of this equipment for long periods of the patients had significant reductions in the rate of improvement of the symptoms mentioned above.

3.6.3. Otorhinolaryngology surgery

The purpose is enlarging the oropharynx in patients with throat abnormalities.

There are 4 types of surgical method in OSAS, but need to keep in mind that patients with this disease are at high risk when surgery.

- Bariatric surgery can help patients treat obesity.

- Surgery amydal is highly effective in children, but has little effect in adults.

- Open the airway, it also has a therapeutic effect but is rarely used because it has a high risk; however, should also be considered in severe cases.

- Surgery of jawbone, especially cutting upper and lower jaw - also very effective in patients with shifting backward of lower jaw and should be considered in patients skinny and young. No credible evidence suggests that in oropharyngeal surgery (including uvulopalatopharyngoplasty) using a scalpel, laser or heat can treat OSAS.

3.6.4. Continuous positive airway pressure (CPAP)

Method is optimal in the case of severe OSAS with purpose to prevent the phenomenon of the upper respiratory tract to collapse during sleep. The success of CPAP depend on pressure and proper training patients how to use better.

CPAP therapy is the way of pumping continuous gas into the airway to keep it open during sleep, usually with a pressure of about 5-20 cmHg. CPAP has been shown in randomized controlled trials that improving the state of breathing during sleep, improving sleep quality, sleepiness during the day, blood pressure, ability attention, cognitive status, driving ability, as well as the quality of life in patients with OSAS.

However, this is a therapy that can cause discomfort, so it should be carefully explained to the patients as well as the family members of the patients, we need to support patients in a positive way when they perform therapy, including providing information over the phone and be regularly monitored. The first important thing is to find a comfortable and suit mask from many different vendors, and should be tested before 30 minutes during the day before using at night. It is necessary to conduct a CPAP trial in the laboratory to determine the suitable pressure can keep the patient's airway unobstructed at night. However, along with the development of the CPAP machine, the capable of changing to suitable pressures in the laboratory becomes unnecessary.

In the early days, CPAP therapy should be conducted in an environment of maximum support. After that, patients can be treated with a CPAP machine with a fixed pressure or a CPAP machine that can adjust the pressure, which is known as intelligent CPAP device.

The main side effects of this therapy are drying the airways, which we can fix by using the tools moistened. The use of CPAP therapy and other treatment, and is not 100% perfect, but 94% of patients with severe OSAS continued use of this therapy after 5 years.

3.6.5. Clinical Guideline for the Evaluation, Management and Long-term Care of Obstructive Sleep Apnea in Adults (2013):

- All patients with overweight and obesity was diagnosed with obstructive sleep apnea syndrome were encouraged weight loss.

- Continuous positive airway pressure is the first choice for the treatment of patients with obstructive sleep apnea syndrome.

- Tools offer lower jaw forward method can replace methods continuous positive airway pressure to treat patients with obstructive sleep apnea syndrome. [5]



Figure 1.8. Treatment of OSAS patient in Sleep Apnea Unit in Hue University Hospital

3.7. Treatment of central sleep apnea

Patients with underlying cardiac failure should have their failure treated appropriately. CPAP may improve outcome but is difficult to initiate and has not been shown to improve survival. Patients with spontaneous normocapnic CSA may be successfully treated with acetazolamide. In a minority of patients, CPAP is effective, perhaps because in some patients with OSAHS, pharyngeal collapse initiates reflex inhibition of respiration, and these episodes are prevented by CPAP. Oxygen and nocturnal nasal positive/pressure ventilation may also be tried.

REFERENCE

1. Nguyễn Bích Xuân Huyền. (2011), *Hội chứng ngưng thở lúc ngủ tại Châu Á*, J Fran Viet Pneu, 2(5), tr. 56-59.
2. Hội phổi Pháp-Việt. (2010), *Bệnh lý về giấc ngủ*, Sách chuyên đề. Hội nghị khoa học bệnh viện bạch mai. Hội nghị khoa học bệnh viện Bạch Mai, tr. 65-69.
3. American Academy of Sleep Medecine. (2009), *Clinical Guideline for the Evaluation, Management and Long-tem Care of Obstructive Sleep Apnea in Adults*, Journal of Clinical Sleep Medicine, 5(3), tr. 263-276.
4. Banerjee D. (2007), *The Epworth sleepiness Scale*, Occupational Medecine, 57(3), tr. 232.
5. Clete A. Kushida Alejandro Chediak, Richard B. Berry, Lee K. Brown, David Gozal, Conrad Iber, Sairam Parthasarathy, Stuart F. Quan, James A. Rowley, (2008), *Clinical Guidelines for the Manual Titration of Positive Airway Pressure in Patients with Obstructive Sleep Apnea*, Journal of Clinical Sleep Medicine, 4(2), tr. 157-171.
6. Dan Longo Anthony Fauci, Dennis Kasper, Stephen Hauser, J. Jameson, Joseph Loscalzo (2012), *Harrison's Principles of Internal Medicine*, 18th ed, McGraw-Hill Professional.

7. Fogel R.B. Malhotra A. et al. (2004), *Sleep 2: Pathophysiology of obstructive sleep apnea/hypopnea syndrome*, Thorax, 59, tr. 159-163.
8. K.G. van Houwelingen R. van Uffelen and A.C.M. van Vliet. (1999), *The sleep apnoea syndromes*, European Heart Journal, 20, tr. 858–866.
9. Manuel Sánchez-de-la-Torre Ferran Barbé. (2013), *Obstructive sleep apnoea and cardiovascular disease*, The Lancet Respiratory Medicine, 1(1), tr. 61 – 72.
10. McNicholas WT Water TM. (2008), *Diagnosis of Obstructive Sleep Apnea in Adults*, Proc Am Thorac Soc, 5, tr. 154-160.
11. Naresh M. Punjabi (2008), *The Epidemiology of Adult Obstructive Sleep Apnea*, Proc American Thoracic Society, 5, tr. 136-143.
12. Richard B. Berry. (2012), *Obstructive Sleep Apnea Syndromes: Definitions, Epidemiology, Diagnosis and Variants*, in *Fundamentals of Sleep Medicine* Elsevier.
13. Wenner J.B. Cheema R., Ayas N.T. et al., (2009), *Clinical Manifestations and Consequences of Obstructive Sleep Apnea*, Journal of Cardiopulmonary Rehabilitation and Prevention, 29, tr. 76-83.