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CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) IN THE MANAGEMENT OF OBSTRUCTIVE SLEEP APNEA

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INTRODUCTION

Obstructive sleep apnea (OSA) is characterized by repetitive collapse of the upper airway during sleep. The resulting reduction (hypopnea) or cessation (apnea) of airflow (inspiratory flow limitation) produces dip in oxygen saturation, increases in inspiratory efforts against the obstructed airway, and sleep fragmentation[1].

These nocturnal physiological events lead to a variety of neurophysiological and cardiovascular complications, including daytime hypersomnolence, cognitive impairments, systemic and pulmonary hypertension, arrhytmias, myocardial infarction and stroke (Fig 1).

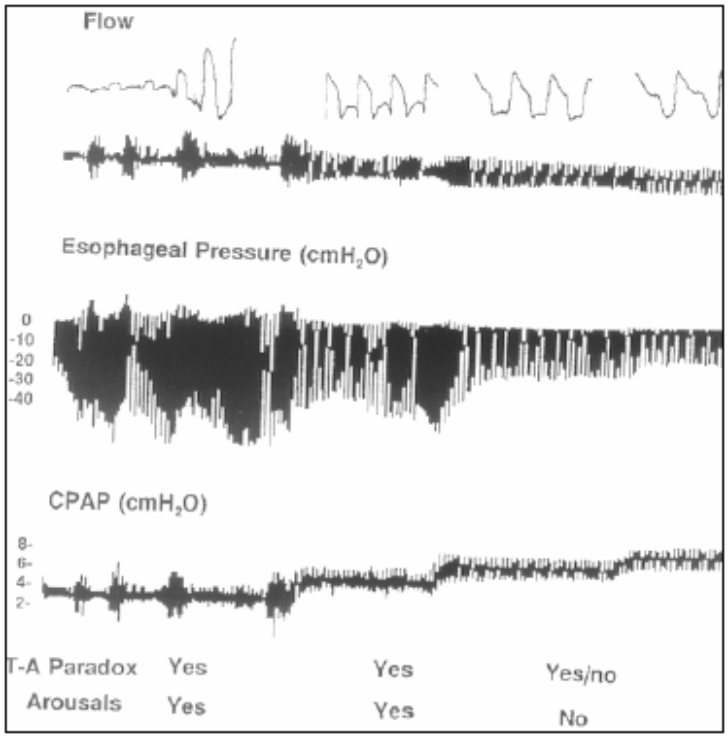

Figure 1.- nocturnal polysomnography in a patient with OSA

The prevalence of this disordere in the middle aged population is 24% in the men and 9% in women. However, only 4% and 2%, respectively, have

this degree of sleep disorder breathing in conjunction with daytime sleepiness and therefore met the criteria for the obstructive sleep apnea syndrome [2,3].

Twenty five years ago, OSA was considered to be a rare disorder that was confined to the grossly obese, but in this moment, OSA should be considered as a continuum of upper airway inestability, ranging from simple snoring to severe, continuous, complete airway closure.

Nasal CPAP therapy

The principle underlying the treament of sleep apnea is that therapy will be successful if one eliminates the cause of the sleep disruption. In order to achieve this, the airway must be stabilized, blood gas levels must be normalized, and inspiratory effort must be reduced.

Since its introduction in 1981 [4], nasal continuous positive airway pressure has become widely acceptes as the treatment of choice for obstructive sleep apnea.

CPAP equipment acts as a pneumatic splint, creating positive airway pressure throughout the respiratory cycle, and all potentially occluding segments are stabilized.

In order to determine what level of CPAP is appropiate for an individual, to be need pressure titration.

The patient is fitted with an appropriately sized nasal mask and sleeps overnight with the mask in place. While the patients sleeps, the pressure is increased incrementally until apneas, hypopneas, snoring and desaturation is stopping.

Recents improvents in CPAP technology have seen the development of "autotitrating" devices that use propiretary algorithms to automatically alter the pressure in the presence of upper airway inestability.

One such device, the Autoset, increases pressure in response to snore or flow limitation rather than waiting for hypopneas and apneas occur. The CPÀP pressure levels determined by this device have been shown to be comparable with manual titration in patients with uncomplicated OSA [5].

Education regarding the need for CPAP therapy, as well as an explanation of the purpose of the titration study, it can help alleviate some a patient´s uncertainties.

A period of time with the mask in place at a low level of pressure can be useful in preparing patients for the sensations they will experience while wearing a mask during sleep.

Minor side effects with nasal CPAP are common, with up 40%-50% of patients who begining therapy complaining of a lest one side effect.These problems can be to limit the use of therapy. Engleman et cols [6] found that CPAP use by patients who reported problems was about only 60% of that reported by patients who did not complain of problems with CPAP.

Pain and skin breakdown over the bridge of the nose was common, ocurring in up 30% of patients.

Mouth leaks are common and are rare responsible for a large number of uncomfortable side effects. The main problem is related to airway drying, which might be problematic enough to affect nasal CPAP use.

Complaints include rhinitis, nasal congestion moth dryness, and sore throat. Occasionally, patients complain of chest discomfort during or following therapy, the problem might be relieved by lowering the pressure for a period while the patient acclimatizes. Significant complications from CPAP therapy are rare (atrial arrhytmia, epistaxis etc.)

Among unselected OSA patients, acceptance of CPAP therapy has ranged between 50-90%. Studies of self reported data suggested that 75% of patients who use CPAP should do it for at least 6 hours a night.

Although not a universal finding, it seems that patients who are objetively sleepier at basaline are more likely to be better users of CPAP [7].

Effects of CPAP in the treatment of obstructive sleep apnea (OSA)

Obstructive sleep apnoea and its treatment has become the subject of intense debate due to the large potential public health impact of the disease and its economic implications. Clinical experience suggests CPAP is beneficial in reducing symptoms of sleepiness from OSA. There is a paucity of well designed randomised controlled trials to support this conclusion[8,9].

These studies compared CPAP to placebo with tablets as the control arm. The lack of comparability of the tablet placebo to a noisy machine and a tight fitting nasal mask of CPAP led to concerns the last time the validity of the results. However there were concerns ayer the ethics and safety of using sham CPAP and it was thought that the inconvenience of this without any benefit would tend to bias in favour of therapeutic CPAP.

Sham CPAP (subtherapeutic CPAP) has now been used successfully by Jenkinson 1999[10], Dimsdale 2000 [11]and Loredo 1999[12]. All three studies have highlighted the importance of including adequate placebos. Significant clinical effects were demonstrated not just in self-reported outcomes such as health status (SF-36) and sleepiness (Epworth Sleepiness Score), but also notably in physiological outcomes such as blood pressure, sleep architecture and sleep quality. Sensitivity analysis with exclusion of trials with inadequate controls was not possible because of the lack of comparable outcomes in these three trials.

Effectiveness of CPAP

When compared to placebo, the trial evidence shows benefit in favour of CPAP in terms of quality of life and mood indicators and improvement in objective and subjective measures of sleepiness. The improvement in Nottingham Health Profile, GHQ and SF 36 reflects an improvement in self-reported health status which may relate to a feeling of increased well being following treatment of sleepiness. Improvements in the Hospital Anxiety and Depression Scale may reflect a patient's reaction to the treatment of persistent somnolence.

Most of the improvements in outcome measures are relatively small and do not appear to reflect the dramatic changes noted in clinical practice. The large improvements in health status seen in the domains of the SF-36 more closely reflect the benefits reported by individuals in the sleep clinic and this may be a more sensitive outcome measure which could be adopted in future trials. The small but significant improvement in daytime oxygenation is interesting but uncertain clínical significance [13,14].

There are no data from these trials concerning the sustainability of health benefits or about night-to-night variability. Observation suggests that the benefits are short lasting once CPAP is withdrawn.

In review of the recent literature, studies have suggested that the risk of hypertension with an AHI ≥ 15 is palusible and clinically important. Three large population based studies have demostred the association hypertension and OSA (increased risk of hypertension raised by about 2 fold with wide confidence intervals). A dose response relationship between AHI and the risk of hypertension was also reported [15, 16, 17].

Two controlled-randomized studies shown that the treatment with CPAP improve hypertension arterial in patients with OSA [18,19].

The disposable evidence suggest that the CPAP decrease the risk of traffic accidents [20, 21].

In this setting a treatment and coverage threshold based on the AHÍ, two general situations may be considered: patients who do not have symotms and patients who have symptoms. For patients who haven´t symtoms of OSA, treatment with CPAP may still be a consideration given the increased risk for hypertension, related cardiovascular situations, and traffic accidents.

CPAP compared to other treatments

There are few studies that compare CPAP with other interventions. Two studies (Ballester 1999[22]; Lojander[23] compared CPAP to conservative treatment such as postural advice and weight. Effective methods of weight loss have not been included in these interventions and the adequacy of the components in these conservative treatment arms is doubtful.

CPAP has also been compared with mandibular advancement devices of a variety of type (Ferguson 1996[24] Ferguson 1997[25]; Clark 1996[26]. All have a similar mechanism of action in that all cause anterior displacement of the mandible thus increasing the diameter of the upper airway, however designs changes between devices. One of those studied allows the angle and degree of displacement to be varied to allow fine-tuning for each patient. The studies comparing these devices to CPAP have shown significant benefits in favour of CPAP in two out of five indicators of respiratory disturbance after a study period of four months. Despite this advantage however, patients preferred the oral appliance.

Consensus Statement

In 1990 the National Institutes of Health (NIH) [27] convened a consensus development conference and reported that "obstructive sleep apnea is a potentially reversible cause of daytime sleepiness, wich may be associated with comorbid conditions and even excess mortality".

At the present time, considerable reliance is made on clinical judgement to initiate a therapeutic trial or regimen.

In 1994, the American Thoracic Society (ATS) [28] published an official statement on the use of CPAP in sleep apnea syndromes. They reported that "CPAP is effective in the treatment of patients with clinically important obstructive sleep apnea syndrome" and that "CPAP is a safe, effective form of therapy with rare complications". ATS did not present specific diagnostic criteria but noted that "tipically patients with greater than 20 apneas or hypopneas /h have been selected for studies examing clinical responses to treatment".

In 1998, Monserrat et al (Spanish Society of Respiratory Diseases - SEPAR) [29] published a consensus statement and stated that "CPAP treatment is indicated in all patients with ≥ 30 AHI, with symptoms and cardiovascular disease"

The problem is the patient with ≥ 30 AHI, whitout symptoms, and the Spanish Society considered that in this patient not indicated the treatment with CPAP. Barbé and cols (2001) [30] a randomized controlled trial (CPAP versus placebo- subtherapeutic CPAP) shown that treatment with CPAP is not effective in patients with OSA whitout daytime sleepiness.

In 1999, Loube [31] and published a consensus statement and stated that "CPAP treatment is indicated for all OSA patients with Respiratory disturb index (RDI) ≥ 30 events/per hour of sleep, regardless of symptoms, based on the increased risk of hypertension evident from the Wisconsin sleep cohort data and Sleep Heart Health Study (SHHS).They futher stated that "treatment with CPAP is indicated for patients with an RDI of 5 to 30 events per hour accompanied by symptoms of excessive daytime sleepiness, impaired cognition, mood disorders, insomnia, or a documented cardiovascular diseases to include hypertension, ischemic heart disease or stroke".

The autors also reported that "treatment with CPAP doesn´t indicated for asymptomatic patients whitout cardiovascular diseases who demostrated mild OSA on diagnostic nocturnal polysomnography".

CONCLUSIONS

Despite limitations of studies, the data currently available demonstrates significant improvement in sleepiness and health status with CPAP when it´s compared with placebo. The best evidence of effectiveness is for patients with moderate to severe daytime sleepiness [32].

Further work is required to determine wich groups of patients are most likely to benefit (in terms of severity disease), how much benefit can be achieved, at what cost and how can these patients can be simply identified.

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Sleep apnea is a common disease, and interest about it keeps growing as strong evidence of high incidence and important associated morbidity.

In this comprehensive review from one of the leading groups of Sleep Apnea researchers in Spain, they present current state of the art on Continuous Positive Airway Pressure (CPAP) applied to obstructive Sleep Apnea (OSA).

CPAP is used in a wide variety of situations nowadays, mainly as treatment for acute and cronic respiratory insuficiency, either in the Intensive Care environment or outside it (with a widespread use in pneumologic wards in some centers). Ambulatory ventilation therapy is also a progresively accepted therapy in severely impaired patients, to avoid prolonged hospitalization, and CPAP is one of a wide spectrum of ventilatory strategies which can be used.

Rationale, practice, complications and scientific evidence of efficacy are reviewed thoroughly in this paper, where interested readers can find practical information to apply in common clinical situations, such as the management of patients with a disturbed sleep architecture but with no cardiovascular or neurophysiological symptoms.

Comment Reviewer Prof. Marta Sofía López Rodríguez Profesor Principal de Anestesia. Hospital Joaquín Albarrán. Ciudad de La Habana, Cuba.

Sleep apnea is a common disease of the middle age population, consists of absent nasal and oral airflow during sleep despite continuing respiratory effort. This is generally due to backward tongue movement and pharyngeal wall collapse (glossoptosis) secondary to interference with the normal coordinated contraction of pharyngeal and hypopharyngeal muscles. Enlargement of the tongue, tonsils and/or adenoids is often contributory.

It is diagnosed by finding at least 30 episodes of apnea (of duration at least 10 seconds) in a 7 hour study period. Many, but not all, patients are obese .During apneic episodes, bradycardia, atrioventricular block, premature ventricular contractions , and ventricular tachycardia may develop,possibly explaining the increased incidence of sudden death seen in patients with sleep apnea. Night time nasal continuous positive airway pressure (CPAP), 10-15 cm H2O is sometimes helpful.

This attractive rewiew demostrate the improvement in sleepiness and health status with CPAP treatment in patient with OSA.Other studies is requeried for available scientific evidence of this treatment.

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We read very carefully this manuscript and found it suitable for publication.

We could not find something written from the author's experiences on this matter, and we realize that it is not an updated and complete revision of the medical literature about this topic, nevertheless we consider that its context going to be useful for our readers. We also wish to make some comments about this issue.

Sleep apnea is an interruption of airflow for 10 seconds or more during the sleep, which can cause significantly lower oxygen levels in the bloodstream. Patients with sever apnea have 30 or more of these episodes per hour, while those with mild apnea stop breathing at least 15 times. In OSA the chest and the abdomen move normally, but a blocked airway prevents the patient from breathing. Central sleep apnea differs in that the patient's airway is not obstructed, but he body's breathing reflex is periodically interrupted so there is no chest and abdomen movement. Currently is clear-cut that sleep-breathing disorder may be a cause of heart failure (Circulation 2003:107:727-732) being another powerful reason for a proper treatment.

There are several mental impairments associated with OSA secondary to reduced oxygen to the brain and nighttime arousal. CPAP improves these problems, but may not restore them to normal (Sleep Medicine 1999;3(1):59-78).

Nasal obstruction as a risk factor for sleep apnea syndrome should be considered, and presence of OSA should be defined by the conservative criteria of 15 or more episodes of apnea or hypopnea per hour of sleep. (European Respiratory Journal, 2000;16:639-643).

We agree that traditional therapy for OSA includes nightly use of CPAP and as far we know it is the best treatment for severe OSA being safe and effective, even in children. However many problems should be solved because many patients still find the mask uncomfortable, claustrophobic, noisy or embarrassing, and they also complain of sensation of suffocation, nasal congestion, sore eyes, abdominal bloating, "dizziness", headache, sore or dry throat, chest muscle discomfort, epistaxis, and other side effects leading to poor compliant and stop the treatment causing a full return of OSA and related symptoms. In this group of patients (elderly ones) the mortally rates is higher because they also have a more extensive history of heart arrhythmias, heart attack, strokes, peripheral vascular disease, heart failure, respiratory illnesses, and neurological and

psychiatric problems. Noncompliance is a significant predictor of death. Everyone with sleep apnea, but especially those with these indicators of high mortality risk, should do their utmost to get treatment and continue treatment. Fortunately better equipments for diagnosis of OSA (Sleepscreen) will be marketed worldwide very soon (Biotech Equipment Update, Apr2003, p1, 1p) because a high number of peoples remain undiagnosed until the present moment.

Obesity is another associated problem that deserve a better attention by our research community.

We cannot claim enough expertise to comment on the author's criteria to select the papers for review, but we accept their contention that it has advantages over different managements used in previous studies. The essential conclusion of this review seems quite believable