Management of Patients with Obstructive Sleep Apnea: Which Way to Go?

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Key words: obstructive sleep apnea, polysomnography, respiratory disturbance index

IMAJ 2004;6:699–700

In the current issue of *IMAJ*, Tarasiuk and Reuveni [1] review the literature regarding the diagnostic options of obstructive sleep apnea and propose an optimal diagnostic strategy in the era of a dramatic increase in demand for sleep studies. Based on a cost-effective analysis [2], they conclude that currently there is no good alternative for in-laboratory, multichannel physiologic sleep monitoring, i.e., polysomnographic sleep study as the optimal diagnostic strategy to detect OSA, and that the best way to spend a given budget for sleep evaluation is by performing PSG or attended partial sleep monitoring (focusing on respiratory parameters). In addition, they estimate that the demand for diagnosis of obstructive sleep apnea syndrome will continue to increase more than 20-fold the current volume of diagnostic studies in Israel, as in other industrialized countries. In order to meet this demand and avoid reduced access to PSG, the number of beds and sleep specialists should increase substantially. They therefore urge decision-makers in Israel to consider an increase in the volume and availability of beds for PSG studies [1].

OSAS is considered to be a major public health problem. The prevalence of OSAS is estimated to be 2% and 4% for adult women and men respectively, most of whom are undiagnosed and untreated [3]. These in turn can result in increased morbidity and mortality [4], including, predominantly, cardiovascular consequences and car and work accidents. Adequate treatment is simple and cost-effective for both patients and society, and improves quality of life.

The in-lab sleep PSG study is considered the gold standard for OSAS diagnosis [5]. The severity of the disorder is expressed as the respiratory disturbance index, which is the number of apneas plus hypopneas per hour of sleep. However, the high cost of in-lab full-night PSG, together with long waiting lists for sleep studies, have led to the commonly used procedure of "split-night" for OSAS patients, in which diagnosis and treatment trial are performed during the same night [6]. During the first half of the night the patient sleeps for diagnosis purposes, and if the RDI reaches a certain threshold (usually 20/hour) the patient is awakened after 2 hours and is given a continuous positive airway pressure trial for the rest of the night. While theoretically this approach saves time, there are several limitations that prevent it from being widely performed. First, the diagnosis is frequently not accurate enough based on the first 2 hours of sleep [7]. Second, the time remaining in the rest of the night is often insufficient to determine optimal CPAP pressure [7]. This, in turn, can result in the patient's decreased satisfaction and confidence in the treatment, and subsequently decreased compliance with the CPAP therapy [8]. Thus, this approach should be limited to certain types of patients, keeping in mind that it has the potential to increase the number of patients who remain untreated.

Another approach, which was developed in an attempt to beat the cost and long waiting list for in-lab PSG, is the use of a variety of ambulatory sleep study systems to be performed in the home. These include simple devices such as ambulatory pulse-oximetry, more complex devices such as several-channel recorders (Night-Watch, MESAM 4, and others), and even full ambulatory PSG. The American Academy of Sleep Medicine has classified sleep study systems into four categories [5]:

- Level 1: in-laboratory attended standard PSG
- Level 2: unattended-home sleep study with comprehensive portable devices incorporating the same channels as the in-lab standard PSG
- Level 3: unattended devices, which measure at least four cardiorespiratory parameters
- Level 4: unattended devices, recording one or two parameters.

While Level 2 devices are relatively accurate, they are complex and cumbersome. Level 4 devices, on the other hand, are frequently not accurate enough. Thus, many times patients who undergo ambulatory home studies need to repeat a sleep study in the lab, which led Reuveni et al. [2] to conclude that this approach is not cost-effective.

In this regard, the novel Watch-PAT100 ambulatory system to diagnose sleep apnea should be mentioned. This is an Israeli development of a four-channel recorder, which monitors actigraphy, pulse rate, peripheral arterial tonometry and oximetry. This level 3 device has been shown to be accurate in diagnosing OSA [9] and a simple easy-to-use device with a relatively low failure rate [10]. However, a cost-effective analysis of this device has not yet been performed.

Finally, in order to both shorten time to treatment and save

OSA = obstructive sleep apnea
PSG = polysomnography
OSAS = obstructive sleep apnea syndrome
RDI = respiratory disturbance index
CPAP = continuous positive airway pressure

costs, CPAP devices with automatically changeable pressures during the night have been proposed. Although these cannot make the diagnosis, they can potentially save the need for the second (titration) night in the lab. Furthermore, in patients who need different pressures at different times during the night (such as in supine related OSA or rapid eye movement-related OSA), these can even be medically advantageous over the conventional constant pressure treatment. However, in those who need a constant pressure the automatic pressure changes during the night can lead to awakenings and sleep fragmentation. In a recent multicenter prospective study that examined the efficacy and cost of conventional nasal CPAP initiated at the sleep laboratory versus auto-nCPAP initiated at home, the authors concluded that treatment of OSAS with auto-nCPAP initiated at home is effective and reliable, and reduces the time from diagnosis to therapy as well as the cost of treatment [11]. Thus, it appears that in some cases the approach of a diagnostic study in the lab and an autotitrating study in the home may be optimal.

In their review, Tarasiuk and Reuveni claim that in Israel up to 90% of patients with clinically significant OSA are undiagnosed and untreated [1], which can substantially adversely impact both the individuals and society. They estimate that about 540 additional PSG studies per 100,000 people per year are required. Based on their previous sophisticated cost-effectiveness analysis they propose to substantially increase the availability of sleep laboratory diagnostic beds [1].

As in other industrialized countries, a multidisciplinary task force is required in Israel to establish a cost-effective comprehensive guideline strategy toward awareness of sleep disorders in general, and diagnosis and treatment of OSAS in particular. Such a task force should examine how to increase the level of awareness among physicians and patients to sleep disorders, to allocate resources to early diagnosis and treatment, and to evaluate the current co-payment policy for CPAP purchasing – a barrier to treatment. In addition, this task force should examine the impact of the potential strategies on Israeli society in terms of preventing and reducing accidents, improving individuals' quality of life, and saving scarce resources in the healthcare market. A comprehensive approach by policy makers in Israel is essential. It is reasonable to assume that such an approach, which would determine policy, define technologies, guide education and set priorities, will be of benefit to society as a whole.

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Capsule

Weight displacement activity

As all dieters know, the key to weight loss is altering the balance between energy intake and energy expenditure. At the molecular level, one of the major regulators of energy balance is PGC-1, a nuclear protein that stimulates the transcription of genes involved in diverse metabolic processes such as glucose production in the liver and mitochondrial function in fat and muscle. A new study of PGC-1-deficient mice by Lin et al. confirms the protein's central role in metabolic control but also reveals some surprises. Rather than being prone to weight gain, as predicted by earlier cell culture studies, the mutant mice stayed lean, even when on a high fat diet. This effect was due, at least in part, to increased energy expenditure. Mice lacking PGC-1 were profoundly hyperactive, showing a 40% increase in random movements as compared to control mice. The mutant mice also showed behavioral disturbances and had brain lesions reminiscent of those seen in certain neurodegenerative disorders, such as Huntington's disease. Interestingly, these brain disorders have been linked previously to defects in mitochondria, whose function is known to be regulated by PGC-1 in other tissue types.

Cell 2004;119:121

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