Benefits of the physical exercise in the obstructive apnea syndrome of the sleep (sahos) and its comorbidities, recommendations in cardiopulmonary rehabilitation


ABSTRACT

In obstructive sleep apnea syndrome (OSAHS) airway obstruction is present in the upper airway, associated with desaturation, multisystemic involvement and deterioration of the quality of life. Usually the treatment is based only on continuous positive airway pressure (CPAP), the pathology is usually associated with other concomitant diseases that worsen the clinical picture. In specific cases of OSAHS, physical training in a complementary way to conventional treatments could benefit and improve the quality of life, physical condition and pulmonary and systemic affections of the disease and diseases coexisting with OSAHS. In view of the growing number of cardiopulmonary rehabilitation centers and fitness centers, it is necessary to gather recommendations for physical exercise and to demonstrate the potential benefits, it will serve as an important theoretical guide for the adequate prescription of physical exercise in this population with an association of other concomitant pathological conditions.

OBJECTIVES

- To show that the interaction between CPAP and physical exercise improves the systemic response to OSAHS pathological condition against CPAP as a single therapy.
- Confirm how combined CPAP/exercise therapy may cause regulation in the vasoconstriction of small arteries.
- To show in real percentages how much obesity affects the appearance of OSAHS.
- To show the present relationship between OSAHS and the prevalence metabolic syndrome.

BACKGROUND

Obstructive Sleep Apnea Syndrome (OSAHS) is a multifactorial pathological condition with excessive sleepiness, cognitive-behavioral, respiratory, cardiac, metabolic and inflammatory disorders secondary to repeated episodes of upper airway obstruction during sleep. These events produce inflammatory, cardiovascular, neurocognitive and metabolic responses, which increase patients' morbidity and mortality (1-7). The American Academy of Sleep Medicine (AASM) mentions that prevalence of OSAHS increases each year and is between 2 and 4% in the adult population (4).

The pathophysiology of OSAHS is still not entirely clear, but there is consensus among researchers that sleep during upper airway permeability is compromised by a decrease in neuromuscular activation, which tends to collapse during inspiration, airway permeability is dependent on the stabilizing capacity of the dilator muscles of the pharynx and other factors that can be improved through physical exercise (8,9).

This activation and tone of the pharyngeal musculature is highly related to the ability of the central respiratory center to maintain airway permeability, in OSAHS disorders have been found in the central control of ventilation and alterations in central chemoreceptors by the increase of chronic carbon dioxide (CO2) levels, altering the ventilatory response during sleep (10).

It is estimated that 40% to 60% of patients with OSAHS are obese and a 10% increase in body weight represents an increase of up to 30% in the apnea and hypoapnea index during sleep (11-14). When obesity is present, fat deposits exist between muscle fibers, reducing muscle contractility, exacerbating upper airway obstruction, and limiting the expansion of the thoracic cage by the weight of adipose tissue on the thorax causes the muscles to generate greater inspiratory force, increasing negative pressures and favoring collapse during inspiration (15-22).

Studies have found high levels of cytokines such as IL-1 and IL-6 that cause inflammation in the upper airway dilator muscles by altering their response during sleep (23).

Scientific evidence has associated heart disease and cardiovascular events with OSAHS, the appearance of vasoconstricting alterations of the sympathetic system, the hormonal renin - angiotensin - aldosterone system, and hypoxemia and chronic hypercapnia favor the appearance of arterial hypertension (24-28). Presence of cardiac arrhythmias, coronary diseases and hypertrophy of the cardiac chambers has been associated with an aggravation of chronic heart failure (11).

Studies have correlated hypoapnea apnea index (AHI) greater than 30, with a higher incidence of coronary disease and with a higher score on the Framingham scale for a cardiovascular event (18).

It is also estimated that 7% to 11% of cases of moderate to severe OSAHS suffer from the metabolic syndrome or diabetes mellitus (25) associated with a cognitive impairment which increases the risk of accidents and serious injuries (14).

DISCUSSION

Traditionally, airway positive pressure ventilation (CPAP) has been considered the best and sometimes only treatment, but there are reviews that analyze greater benefits with multidimensional treatments, associating CPAP therapies with physical exercise and better eating habits, showing greater health benefits and decreasing the severity of OSAHS in a more significant way than treatments with only CPAP (16).

Different studies with low-calorie diets and exercise programs showed a decrease of up to 7 points in body mass index, weight reduction has been shown to be an important factor allowing one to reduce the pressures of CPAP systems, minor disorders respiratory disorders such as snoring and a decrease in the apnea-hypopnea index (AHI) of up to 50%, with improvements in sleep quality and quality of life (3,15,20,21,24,27).

Different respiratory care societies recommend that patients with OSAHS participate in cardiopulmonary rehabilitation programs, they mention that after a supervised physical exercise program for at least 6 weeks and nutritional control, it is possible to reduce AHI, improve sleep quality, improve the affections on other physiological and pathophysiological aspects, increases life expectancy, improves cardiorespiratory health, regulates metabolic...

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processes, generates weight loss, improves muscle mass and skeletal muscle health, improves cardiac function, improves depression and improves quality of life (1,2,4,5,6,7,9).

It has also been shown that after an aerobic exercise period, the sensitivities of the respiratory chemoreceptors responded better to changes in carbon dioxide and oxygen, optimizing the respiratory pattern in patients with OSAHS, this improves the functioning of muscles stabilizers of the pharynx, which leads to a significant improvement in the levels of hypoxemia apnea index, without generating an excessive increase in inspiratory pressures (10). Patients who are overweight or have significant obesity, the factor limiting the thoracic expansion of the abdominal contents against the diaphragm when the patient is in the supine position, together with the increase of the adipose tissue on the rib cage, is reduced proportionally to the reduction of weight, also observed significant improvements in the patients’ perception regarding quality of life and daytime sleepiness (20,23).

With respect to OSAHS and cardiovascular comorbidities, OSAHS has been associated with the presence of heart failure and generalized inflammation; it has been documented that after physical exercise, improvements can be obtained in the levels of some pro-inflammatory cytokines in patients with insufficiency cardiaca, which means less systemic inflammation post physical exercise. Also, physical exercise per se produces an increase in the ejection fraction of the left ventricle by an improvement in the effectiveness of the heart; this in patients with congestive heart failure leads to a reduction of edema in the upper airway and thus to a decrease in upper airway occlusion at night. Some patients in the research also had a history of pre-hypertension, edema in the upper airway and thus to a decrease in upper airway occlusion. It improves the ventilatory response of the central respiratory control, which improves the tone of the muscles of the upper airway, preventing collapse. The chemoreceptor sensitivity of central ventilation control improves, regulating the respiratory pattern and improving apneas. It improves the ventilatory response of the central respiratory control, which improves the tone of the muscles of the upper airway, preventing collapse. Sleep architecture improves in patients, associated with an increase in cerebral and muscular irritation. A decrease in the severity of OSAHS symptoms has been observed, associated with decreased body weight and reduction of fat deposits in the upper airway.

Because overweight and obesity are a major and determinant risk factor, decreases in body weight translate into benefits in all aspects of OSAHS.

There are improvements in blood pressure due to vascular and nervous improvement, decrease in sympathetic activation and decrease in adrenaline release, decreasing generalized vasoconstriction.

There are also improvements in the renin - angiotensin - aldosterone system, reducing fluid retention and its vasoconstricting properties.

In patients with OSAHS and heart failure, the symptoms improve with a decrease in post-exercise generalized inflammation.

Improved myocardium through cardiovascular and pulmonary rehabilitation programs have been shown to increase ejection fraction, reduce peripheral edema in cases of cardiac congestion, and decrease edema in the upper airway.

Within the metabolic affections associated with OSAHS, improvements in glycemic control, insulin sensitivity, high density lipoproteins and triglycerides help to improve the symptoms associated with the disease and the generalized inflammatory factor due to increases in the circulating pro-inflammatory cytokines such as IL-1 and IL-6.

REFERENCES

Obstructive apnea syndrome of the sleep in cardiopulmonary rehabilitation


