

Acupuncture in obstructive sleep apnea/hypopnea syndrome: a case report with fifteen months of follow-up

Acupuntura na síndrome da apneia/hipopneia obstrutiva do sono. Quinze meses de acompanhamento - relato de caso

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ABSTRACT

This study aimed to investigate the efficacy of acupuncture for the treatment of patients with obstructive sleep apnea/hypopnea syndrome (OSAHS). The present work describes a clinical case study of a male patient who was clinically and polysomnographically diagnosed with mild OSAHS. There was a significant reduction in the apnea/hypopnea index (AHI) from 13.1 to 0.5 after 10 weeks of treatment and to 3.3 at 15 months after treatment. In addition, there was a reduction of respiratory events from 90 to 3 after 10 weeks and to 9 after 15 months. Acupuncture was effective in treating mild OSAHS; however, treatment for this disease should be initiated immediately after diagnosis to prevent progression.

Keywords: acupuncture, acupuncture points, sleep apnea syndrome.

RESUMO

O objetivo deste estudo foi investigar a eficácia da acupuntura no tratamento em pacientes portadores da Síndrome da Apneia/Hipopneia Obstrutiva do Sono (SAHOS). O presente trabalho mostra o estudo de um caso clínico em paciente do sexo masculino, previamente diagnosticado clinicamente e polissonograficamente com SAHOS leve. Houve redução significativa do índice da apneia/hipopneia (IAH) de 13,1 para 0,5 após 10 semanas e 3,3 após 15 meses do tratamento, bem como uma redução dos eventos respiratórios de 90 para 3 após 10 semanas e para 9 após 15 meses. A acupuntura mostrou-se eficaz no tratamento da SAHOS leve; contudo, recomenda-se que o tratamento desta doença deve ser iniciado imediatamente após o diagnóstico, para evitar sua progressão.

Descritores: acupuntura, pontos de acupuntura, síndrome da apneia do sono.

INTRODUCTION

In recent decades, the search for alternative treatments has allowed acupuncture to be incorporated into the therapeutic arsenal of Western medicine by the recognition of the need to treat the whole individual and not just a portion⁽¹⁾. Currently, acupuncture is being used to treat various pathological conditions⁽²⁾.

According to the NIH Consensus Development Panel on Acupuncture (1998), scientific studies using rigorous methodology have demonstrated the applicability of this therapeutic intervention with positive results in several clinical situations^(3,4).

Acupuncture increases melatonin secretion and reduces insomnia⁽⁵⁾ and anxiety at night⁽²⁾. Melatonin secretion over a 24-hour period is accepted as a measure of circadian activity in humans, which is interrupted by insomnia. Melatonin deficiency may be the key to the anxiety associated with insomnia, as acupuncture acts by promoting the increase of melatonin in the pineal gland and the hippocampus⁽²⁾. Acupuncture is also effective in the treatment of bruxism^(3,5), which is a sleep-related disorder^(4,6) involving an elevated muscle tone of the masseter and the anterior temporal muscles that causes clenching and grinding of the teeth during sleep⁽⁶⁾. In this case, acupuncture increases the release of serotonin, which acts in the cerebral cortex to decrease feelings of stress and anxiety⁽¹⁾.

In patients with OSAHS, there is a collapse of the side walls of the oropharynx, a drop of the tongue on the palatal veil, and a concentric closing of the hypopharynx during sleep⁽⁶⁾, causing decreased pharyngeal airspace. The functioning of the upper airway (UA) depends on the dynamic equilibrium between the expansion forces, the tonic and phasic activity of pharyngeal dilators, and the collapse forces⁽⁷⁾. Recent research has shown a rupture of the UA sensory nerve and a reduction of the excitatory unit from the serotonergic caudal raphe neurons that are responsible for the excitatory opening of the upper airway muscles, leading to worsening of the pharyngeal collapse⁽⁸⁾. Acupuncture acts to treat OSAHS through an increase in serotonin in the caudal raphe nucleus in the endogenous opioid system (such as endorphins and enkephalins) and also through the involvement of the sympathetic nervous system^(3,4,8).

CASE REPORT

A 65-year-old male with a body mass index (BMI) of 28.40 kg/m² and a neck circumference of 45 cm was referred by a neurologist with complaints of difficulty concentrating, memory loss, and excessive daytime sleepiness to assess the possibility of OSAHS treatment with acupuncture. The basal polysomnography (PSG; Table 1) exam indicated the following: an apnea/hypopnea index (AHI) of 13.1; apnea index (AI)

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Table 1. Basal polysomnography values prior to treatment.

Date	Type	AHI	AI	HI	SaO ₂ maximum	SaO ₂ minimum	Sleep efficiency	% REM	TTS
09/22/09	Basal	13.1	3.2	9.9	98%	86%	88.6%	17.8%	413

AHI: apnea/hypopnea index; AI: apnea index; HI: hypopnea index; SaO₂: oxygen saturation; REM: rapid eye movement; TST: total sleep time.

of 3.2; hypopnea index (HI) of 9.9; minimum oxygen saturation (SaO₂) of 86%; sleep efficiency of 88.6%; and REM sleep of 17.8%. The patient's Epworth Sleepiness Scale (ESS) was 11. Intraoral examination revealed a Grade 2 tongue, a Grade 4 Mallampati, a normal palate, and the absence of tonsils. A lateral cephalometric radiography with a report for apnea was requested to evaluate the airway dimensions⁽⁹⁾ (Table 2).

Table 2. Lateral Cephalometry.

Analysis	Value mm	Normal
Anterior skull base	74.95	80.00 ± 2.00
Maxillary length	56.42	62.50 ± 4.00
Mandibular length	70.44	84.50 ± 5.00
Upper pharyngeal space	14.18	26.00 ± 4.00
PAS - Posterior airspace	9.64	15.50 ± 3.50
IAS - Inferior airspace	8.79	17.50 ± 4.00
Hyoid distance - mandibular plane	21.57	19.00 ± 6.00

Disposable, stainless steel, coil cord, sterilized acupuncture needles of 25/30 mm (Dongbang) were used. This experiment used points in the oropharyngeal region that are relevant to sleep apnea disturbance^(3,4,8,10,11) (Figures 1 and 2) and distant points that function in systemic toning, the harmonization of the upper and lower energy centers, the activation of energy flow (Qi), and as general energy regulators^(3,4,8,10) (Figure 3). The location and depth of insertion were based on traditional texts⁽¹⁰⁾. Systemic and auricular acupuncture were used concomitantly^(10,12). The auricular pavilion is innervated mainly by the spinal nerves of the brachial plexus such as the great auricular nerve and the lesser occipital nerve and by cranial nerves such as the auriculotemporal, facial, glossopharyngeal, vagus, and sympathetic branches^(10,12,13).

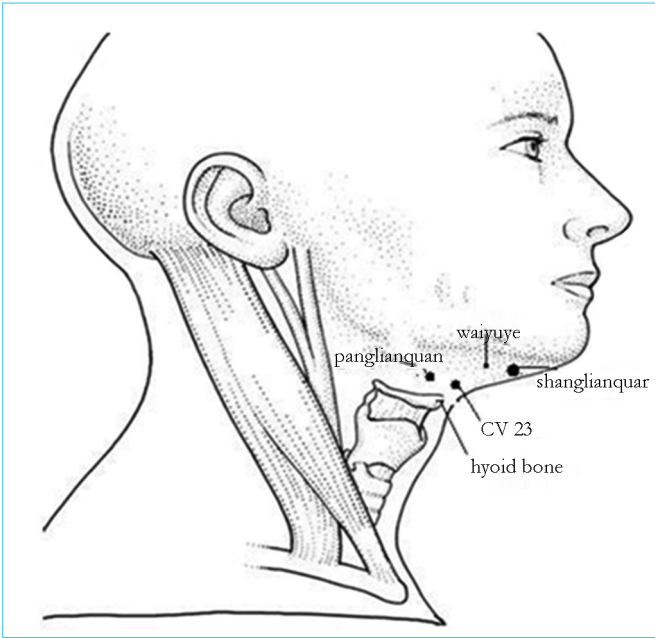


Figure 1. Extra points (neck).

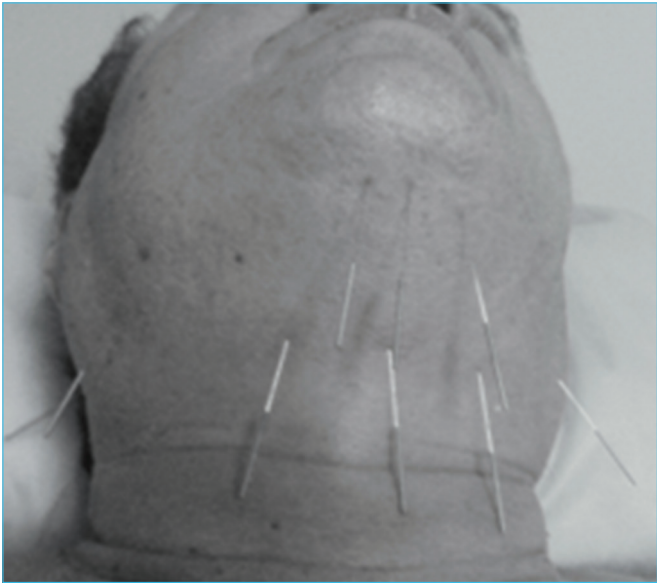


Figure 2. Needle application at the selected points in the neck (extra).

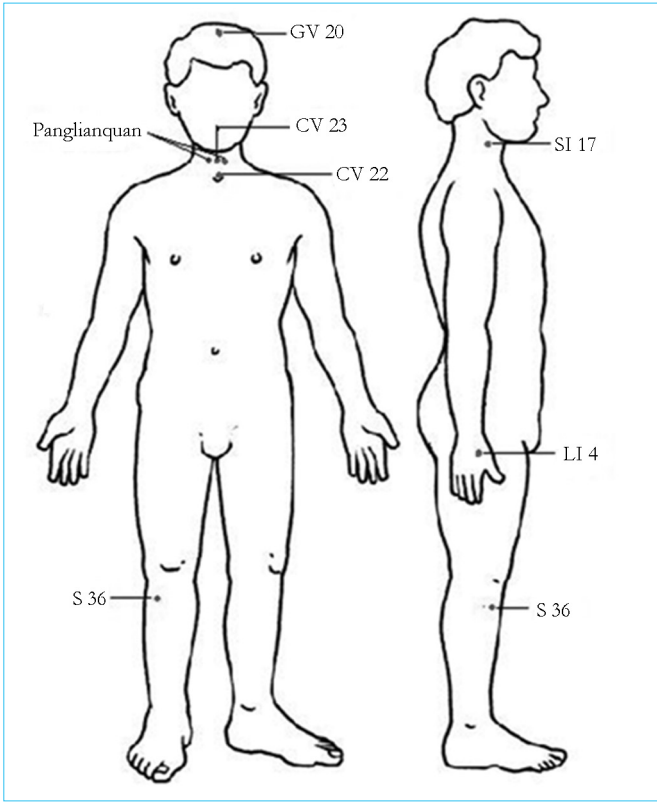


Figure 3. Points selected.

The points used in this study included the following: GV 20 (Bahui), at 7 tsun (tsun or cun is the distance used in acupuncture to locate the points corresponding to the size of the thumb at the height of the patient's inguinal matrix) above the hair insertion on the nape; CV 22 (Tiantu), at half tsun above the jugular notch; CV 23 (Lianquan), above the upper border of the hyoid bone; LI 4 (He Gu), in the middle of the second metacarpal bone of the radial side; SI 17 (Tianrong), below the angle of the mandible; and S 36

(Zusanli), at 3 tsun below the lateral depression of the patella and 1 tsun lateral to the anterior margin of the tibia. The extra points, which are outside the standard meridians, included the following: Shanglianquan, at 1 tsun above the prominence of the thyroid cartilage, between the mandible and the hyoid bone; Panglianquan, at half tsun lateral to the Lianquan point; Jinjin (left side); and Yuye (right side), at half tsun lateral to the Shanglianquan, on the lingual frenulum^(10,11) (Figures 1 and 2; Table 3). The treatment continued for a period of 10 weeks with weekly applications. After 3 months from the beginning of the treatment and at 15 months after the completion of the applications, a PSG evaluation was performed to evaluate the acupuncture treatment efficacy (Table 4). This report was approved by the research ethics committee of Plataforma Brazil under reference 02676312.5.0000.0109.

Table 3. Selection of the acupuncture points used.

Single points	Bilateral points (leg and hand)	Extra points (neck)
GV 20	LI 4	Jinjin
CV 22	S 36	Yuye
CV 23	SI 17	Shanglianquan Panglianquan

GV: governing vessel; CV: conception vessel; LI: large intestine; S: stomach; SI: small intestine.

RESULTS

The comparison between the basal PSG values and the values after 10 weeks of acupuncture treatment and 15 months after the end of treatment shows the efficacy of acupuncture use in a patient with mild to moderate OSAHS (Table 4). At the first evaluation, after 10 weeks of acupuncture treatment, there was a significant improvement in the following indices: 96.4% for AHI; 93.75% for AI; 96.97% for HI; and an increase of 87.20% for REM sleep.

With an interruption of the acupuncture treatment after the first evaluation, another PSG exam was performed 15 months later. A split-night PSG was performed (comparative between acupuncture and IOA, not used for this study) with the following results: 74.8% improvement in AHI; 100% for AI; 66.6% for HI; and a REM sleep increase of 89.33%. The Epworth Sleepiness Scale (ESS) showed a 66% improvement at the first evaluation and 80% at 15 months, with the report of subjective symptoms such as snoring, nocturnal awakenings, excessive daytime sleepiness, and memory loss virtually eliminated.

DISCUSSION

The present study showed strong evidence for the efficacy of acupuncture in a patient with mild to moderate OSAHS^(2,4,8). The acupuncture treatment effects continued even after a period

without treatment^(14,15) as measured by PSG examination. According to Han et al. (1984), the possible prolonged effect is due to the mesolimbic loop^(14,15). The influence of the tongue muscle activity strongly correlates with the causal factors of OSAHS. In this work, the acupuncture points were applied mainly in the oropharyngeal region from the point above the hyoid bone extending to the base of the mandible and over the digastric muscle including the mylohyoid and geniohyoid muscles. The function and basic action of these acupoints are to alleviate throat distension, difficulty swallowing, and speech difficulty and to increase tongue mobility^(10,11,16). The acupuncture mechanism of action is based on the activation of the nerves being stimulated by the needles. These nerves send messages to the CNS, especially to the reticular formation⁽¹⁵⁾, which is involved in the actions of sleep and wakefulness cycles, filtering of sensory stimuli, regulation of breathing, pupillary opening, swallowing, and somatic motor activities⁽¹⁵⁾. The reticular formation nuclei include the hypoglossal nuclei, whose fibers and neurons innervate the muscles that move the tongue. The neurochemicals released in the reticular formation include endorphins, serotonin, monoamines, or cortisol that would be responsible for the clinical effects of acupuncture at both the segmental and intersegmental levels⁽¹⁵⁾.

The segmental level, known as dermatomes, are symmetrically arranged in the human body and are the cutaneous distribution territory for the sensory and motor nerve roots that originate from a dorsal root ganglion^(13,15). These dermatomes have no specific limits, and their neighboring roots overlap one another⁽¹⁵⁾. For this reason, in acupuncture, it is possible to use distant points to treat certain disorders (such as using a point situated at the foot for treating an ocular disorder). Therefore, an afferent impulse caused by acupuncture stimulation travels from the periphery to the spinal cord, ascends through the spinal cord to the reticular formation, from which the effector impulses responsible for the therapeutic effects of acupuncture originate. In this case, we can consider acupuncture as a reflex treatment involving a complex reflex called somatotrophic, from a nociceptive stimulation, to optimize the adaptive capacity of the body to stressors⁽¹⁵⁾.

CONCLUSIONS

This study determined that a patient with mild OSAHS under weekly acupuncture treatment obtained a better quality of life with changes in sleep patterns, particularly of REM sleep, and with a significant reduction in OSAHS (AHI from 13.1 to 0.5 at 3 months and to 3.3 after 15 months).

Thus, this study provides the basis for investigating the clinical efficacy of acupuncture in patients with severe OSAHS. However, this particular study should be continued, as it is not possible to determine the duration of the acupuncture effect on the body.

Table 4. Comparative polysomnography values before treatment, at 3 months after the beginning of acupuncture treatment, and at 15 months after completion of treatment.

BASAL, IOA ACUPUNTURE	Date	AHI	AI	HI	SaO ₂ max	SaO ₂ min	Sleep effic.	TST minutes	% REM	BMI
Basal	9/22/09	13.1	3.2	9.9	98%	86%	88.6%	413	17.8%	28.41
Acupuncture	6/01/10	0.5	0.2	0.3	97%	83%	81.3%	394.5	22.8%	28.41
Split night	9/06/11									
Acupuncture		3.3	-	3.3	96%	88%	69.2%	163	19.0%	26.94
IOA*		2.0	-	2.0			83.0%	210.5	21.1%	26.94

AHI: apnea/hypopnea index; AI: apnea index; HI: hypopnea index; SaO₂ max: maximum oxygen saturation; SaO₂ min: minimum oxygen saturation; Sleep effic: sleep efficiency; TST: total sleep time; REM: rapid eye movement; BMI: body mass index; IOA: intraoral appliance (*was not compared in this study).

REFERENCES

1. Dallanora LJ, Faltin PP, Inoue RT, Santos VMA. Avaliação do uso de acupuntura no tratamento de pacientes com bruxismo. *RGO (Porto Alegre)*. 2004;52(5):333-9.
2. Spence W, Kayumov L, Chen A, Lowe A, Jain U, Katzman MA, et al. Acupuncture increases nocturnal melatonin secretion and reduces insomnia and anxiety: a preliminary report. *J Neuropsychiatry Clin Neurosci*. 2004;16(1):19-28.
3. Freire AO. Tratamento da síndrome de apnéia/hipopnéia obstrutiva do sono pela acupuntura [Tese de doutorado]. São Paulo: Universidade Federal de São Paulo; 2004.
4. Freire AO, Sugai GC, Togeiro SM, Mello LE, Tufik S. Immediate effect of acupuncture on the sleep pattern of patients with obstructive sleep apnoea. *Acupunct Med*. 2010;28(3):115-9.
5. American Academy of Sleep Medicine. ICSD - International classification of sleep disorders, revised: Diagnostic and coding manual. American Academy of Sleep Medicine. 2001.
6. Dal-Fabro C, Chaves Junior CM, Bittencourt LRA, Tufik S. Clinical and polysomnographical assessment of Obstructive Sleep Apnea Syndrome treatment with BRD appliance in the treatment of obstructive sleep apnea syndrome. *Dental Press J Orthod*. 2010;15(1):107-17.
7. Reimão R. Sono: Estudo Abrangente. 2ª ed. São Paulo: Atheneu; 1996.
8. Freire AO, Sugai GC, Chrispin FS, Togeiro SM, Yamamura Y, Mello LE, et al. Treatment of moderate obstructive sleep apnea syndrome with acupuncture: a randomised, placebo-controlled pilot trial. *Sleep Med*. 2007;8(1):43-50.
9. Salles C, Campos PSF, Andrade NA, Daltro C. Obstructive sleep apnea and hypopnea syndrome: cephalometric analysis. *Braz J Otorhinolaryngol*. 2005;71(3):369-72.
10. Yamamura Y. Acupuntura tradicional: a arte de inserir (2ª ed). São Paulo: Roca; 2001.
11. Gumenick N. Using the spirits of the points: the small intestine meridian, part two. *Acupuncture Today*. 2004;5(8). Disponível em: <http://acupuncturetoday.Com/mpacms/at/article.php?id=28503>
12. Wang SM, Peloquim C, Kain ZN. The use of auricular acupuncture to reduce preoperative anxiety. *Anesth Analg*. 2001;93(5):1178-80.
13. Chaitow L. O tratamento da dor pela acupuntura. São Paulo: Manole; 1984. p.10.
14. Pereira FAO. Evidências científicas da ação da acupuntura. *Perspectivas*. 2005;4(7):88-105.
15. Xia Y, Cao X, Wu G, Cheng J. Acupuncture therapy for neurological diseases: a neurobiological view. Beijing: Springer; 2009. p.94-9.
16. Dumitrescu IF. Acupuntura científica moderna. São Paulo: Andrei; 1996. p.55-65, 190-3, 236-44.