13. ANEXOS
Anexo 1 – Artigo original publicado:

METHODS TO INCREASE MUSCLE TONUS OF UPPER AIRWAY TO TREAT SNORING

Systematic review

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Abstract – Background: Snoring is the noise caused by vibration during the in-breath; and which structure actually vibrates depends on many factors. Objective: The treatment of snoring with methods to increase muscle tonus of upper airway has been controversial, and poorly supported, thus a review of evidence is necessary to evaluate the effectiveness of these methods. Method: A review of randomized or quasi-randomized, double blind trials on snoring treatment that have employed any method to increase muscle tonus of upper airway like phonotherapy or physical therapy among others. Outcomes: decrease or complete stop of snoring, sleep quality, quality of life, and adverse events. Results: Three eligible trials were potentially analyzed, but none of them could provide good scientific evidence favoring the intervention. The objective analyses of one study showed improvement of snoring, although the objective sub-analyses and subjective analyses showed controversial results. The adverse events were not reported. Conclusion: There is no enough evidence to support the recommendation of methods to increase muscle tonus of upper airways in treatment of snoring. Well designed randomized clinical trials are needed to assess the efficacy of such methods, and a standard and worldwide accepted method for snoring assessment would be useful for future researches.

KEY WORDS: snoring, sleep disorders, treatment, review.

Métodos para aumentar a tônus muscular da via aérea superior no tratamento do ronco: revisão sistemática

Resumo – Contexto: O ronco é o ruído causado pela vibração durante a inspiração, cujas estruturas vibratórias, dependem atualmente de vários fatores. Objetivo: O tratamento do ronco com métodos para aumentar a tônus muscular da via aérea superior tem sido controverso e pouco relatado, portanto uma revisão de evidências é necessária para avaliar a efetividade destes métodos. Método: Revisão sistemática de ensaios clínicos randomizados ou quasi-randomizados, duplo-cegos para o tratamento do ronco, com métodos visando o aumento da tônus da via aérea superior, tais como fonoterapia e fisioterapia. Desfechos: diminuição ou cura do ronco, qualidade do sono, qualidade de vida e efeitos adversos. Resultados: Três estudos elegíveis foram potencialmente analisados, porém nenhum deles demonstrou evidência científica de qualidade favorecendo a intervenção. As análises subjetivas em um estudo mostrou melhora do ronco, entretanto as sub-análises objetivas demonstram resultados controversos. Os efeitos adversos não foram relatados. Conclusão: Não existe evidência científica suficiente para sustentar a recomendação de métodos para aumentar o tônus muscular da via aérea superior no tratamento do ronco. Ensaios clínicos randomizados bem elaborados são necessários para avaliarmos a eficácia de tais métodos e uma padronização de métodos para intervir no ronco mundialmente aceitos se tornariam úteis em pesquisas futuras.

PALAVRAS-CHAVE: ronco, distúrbios do sono, tratamento, revisão.

Snoring is caused by vibration during the in-breath, which structure actually vibrates depends on many factors, few of which are well understood. Estimates of prevalence of habitual snoring range from 24% to 50% for men and from 14% to 30% for women14. Most commonly, the soft palate is assumed to be the primary noise generator, although other structures, such as tongue base, epiglottis or pharyngeal mucosa, may also vibrate to a greater or lesser extent, in any one individual14. Immediately before each in-breath, the muscles of

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the upper airway, including the palatal muscles, should tighten to maintain patency of upper airway. This muscle tone is necessary to withstand the negative pressure from the lungs as they draw in air, and, by keeping the airway wide and clear, keeps the air pressure moderate. In sleep, tension is lost from these muscles, and whilst non-snokers retain sufficient tone in their upper airway to resist the air-flow and maintain patency, snorers do not. Without this muscle tension any relaxed tissue collapses into the throat where it may cause turbulence and vibration (snoring) or completely block off the airway (sleep apnea). Snoring is known to worsen with age, gender, obesity (collar size, Body Mass Index), alcohol ingestion, cigarette consumption, and nasal obstruction; and it results in significant social disability, contributing to relationship disharmony, and social ostracism. In addition, snoring has been implicated in the etiology of more morbidity, such as: hypertension, ischemic heart disease, cerebrovascular accident, increased morbidity and mortality from road traffic and work related accidents.

Treatment for snoring can be divided into two approaches. One approach aims to affect the force of the breath, and the other approach aims to affect the tone and/or size of the soft palate and/or upper throat. The treatment could also be divided in: nonsurgical (weight reduction, reduction of alcohol intake, pharmacological treatment of coincident nasal obstruction), Continuous Positive Airway Pressure (CPAP) appliance, Mandibular Advancement Oral Appliances, and surgical (surgery for coincident nasal obstruction, uvulopalatopharyngoplasty, palatal stiffening techniques, palatal shortening techniques). Based on these approaches, methods to increase muscle tone of upper airway, such as singing exercises, misophonic therapy, instrumental therapy (music), and electrical stimulation have been used as an alternative treatment for snoring. We know much more now about the pathogenesis of snoring and obstructive sleep apnea (OSA), and some studies brought us evidences that the muscles in the pharynx are affected, showing fiber disproportion. Based on such information, would be interesting to search for studies that have treated patients aiming to interfere with a diseased upper airway through out any sort of physical intervention to increase muscle tone.

The aim of this systematic review is to evaluate if methods to increase muscle tonus of the upper airway is effective and safe for treatment of snoring based on accepted scientific evidence.

**METHOD**

**Inclusion criteria**

*Study design:* Parallel and cross-over randomized and quasi-randomized controlled trials; **Participants:** Patients who meet any clinical criteria for snoring; **Exclusion criteria:**

Studies predominantly recruiting subjects with obstructive sleep apnea, physical obstruction in nose or throat, abnormally large tonsils, uncorrected deviated septum, drug/alcohol abuse, smoking, depression disease, previous treatment for snoring (surgical or nonsurgical), neurological or psychiatric disorders, pregnancy or lactation, use of drugs acting on neuromuscular system, diabetes mellitus, serious cardiac arrhythmias, wearing of a cardiac pacemaker or cardioverter and defibrillator, trauma and cutaneous lesions were excluded. **Types of interventions:** All methods to increase muscle tonus of upper airway in the treatment of snoring were included; **Comparison groups:** include: placebo, no intervention, and other alternative treatments; **Outcomes:** Primary outcomes: decrease or completely stop of snoring marked on a validated scale. Secondary outcomes: subjective sleep quality, sleep quality measured by night polysomnography, quality of life measured by subjective measures, adverse events associated with the treatments were described in terms of the number of patients relating any side effect associated with interventions.

**The electronic search**

The search strategies were ran on September 2007 using the following terms and their synonyms: snoring, snore, noisy breathing, respiratory sound, breathing sounds, ronchi, rhonchi, stridor, crackle, wheezing. The search for trials was carried out through The Cochrane Library, Medline, Pubmed, Lilacs, Embase and Scielo. Besides the most traditional electronic databases, other sources were also considered: thesis indexed at BIREME/PAHO/WHO (Biblioteca Regional Medicina/Panamerican Health Organization of the World Health Organization); reference list of all recovered trials; additional information asked for the authors of primary studies by electronic mail. There was no restriction of neither origin nor language of publications.

**Methodological quality of included studies**

As to the randomization, the studies were judged according to the allocation concealment based on the following criteria:

- **Adequate:** Randomization method described that would not allow investigator/participant to know or influence intervention group before eligible participant entered in the study.
- **Unclear:** Randomization stated but no information on method used is available.
- **Inadequate (quasi-randomized controlled trials):** Method of randomization used such as alternate medical record numbers or unsealed envelopes; any information in the study that indicated that investigators or participants could influence intervention group.
- **Non-randomized controlled trials.**
The included studies were also judged according to the other sources of risk of systematic error (bias) as related below:

- **Performance bias:** Were the participants and researchers blinded as to the allocation?
  - Yes: low risk of systematic error
  - No: high risk of systematic error
  - Not stated: moderate risk of systematic error.
- **Detection bias:** Were the outcome assessors blinded as to the allocation?
  - Yes: low risk of systematic error
  - No: high risk of systematic error
  - Not stated: moderate risk of systematic error.

All doubts about methodological issues were discussed by electronic mail with authors of the study.

**RESULTS**

Only one trial was related to increase muscle tonus of upper airway in treatment of snoring (Ojay), and it was not included in this review for it was not randomized (D). But the search strategy also found two ongoing randomized clinical trials (MWE Elliot, submitted; M Puhan, submitted).

The Ojay trial used a specific method to increase muscle tonus consisting of “singing exercises” to decrease snoring, under an open label design, in 20 patients. The authors had found some improvement on the mean value of recorded snoring per hour slept (pre-treatment, 6.1±1.8 minutes versus post-treatment, 5.1±2.6 minutes; mean reduction 17.6%) post-exercise (95% CI, p=0.04).

Despite the side effects were not reported, the authors mentioned three withdrawals in which the causes were not specified.

**DISCUSSION**

The Ojay trial was the only study selected by our search strategy for this systematic review (clinical condition and intervention). However, such study was a case-series design, and showing promising results. Unfortunately, the insufficient methodological qualities of this available evidence ask for further researches.

Before any decision-making can be done in this regard, it is advisable to wait for results from two ongoing randomized controlled trials: 1) Elliot is a study testing for over-tone singing as a treatment for snoring randomized fashion one, with objective measures of snoring, and 2) Puhan is a study testing for didgeridoo playing on snoring, measured by Epworth scale, Pittsburgh Sleep Quality Index, SF-36, proxy evaluation and apexa-hypopnea-index. Because they included adequate methods to exercise muscles tonus of upper airway, under a good methodological quality, we hope they will support evidences on these methods.

The muscle is made up of both Type I and Type II fibers (Type I having endurance and Type II having speed capabilities). Snoring is OSA patients have a prevalence of Type II fiber, probably because of inflammatory trauma promoted by vibration, affecting and decreasing the myofunction of upper airway.

Improvement of muscle tonus by physical training has been shown on several studies, and they were based on exercises for endurance and strength properties. This improvement was associated with increases in the proportion of Type I fiber and in the size of Type II fiber, demonstrated by muscle biopsy samples. Methods to increase muscle tonus of the stomatognathic system are based on gain of endurance and strength properties either, so we considered this option as a possibility to increase the proportion of fiber Type I, resulting in decrease of snoring and clinical symptoms.

Trials on methods to increase muscle tonus of the stomatognathic system in the treatment of snoring definitely need randomized controlled designs, and should follow internationally published guidelines for reporting trials.

In conclusion, based on our systematic review, there is no sufficient evidence about increasing muscle tonus of the stomatognathic system for treatment of patients with snoring. There are some few and poor quality trials assessing these interventions, and our recommendation for practice to clinicians can be done based on their own experience to improve oropharyngeal muscle tonus, that is not supported by scientific evidence yet.

**REFERENCES**

Methods for increasing upper airway muscle tonus in treating obstructive sleep apnea: systematic review

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Abstract

Objective Treatment of obstructive sleep apnea (OSA) using methods for increasing upper airway muscle tonus has been controversial and poorly reported. Thus, a review of the evidence is needed to evaluate the effectiveness of these methods.

Design The design used was a systematic review of randomized controlled trials.

Data sources Data sources are from the Cochrane Library, Medline, Embase and Scielo, registries of ongoing trials, those indexed at Biblioteca Regional de Medicina/Pan American Health Organization of the World Health Organization and the reference lists of all the trials retrieved.

Review methods This was a review of randomized or quasi-randomized double-blind trials on OSA. Two reviewers independently applied eligibility criteria. One reviewer assessed study quality and extracted data, and these processes were checked by a second reviewer. The primary outcome was a decrease in the apnea-hypopnea index (AHI) of below five episodes per hour. Other outcomes were subjective sleep quality, sleep quality measured by night polysomnography, quality of life measured subjectively and adverse events associated with the treatments.

Data synthesis Three eligible trials were included. Two studies showed improvements through the objective and subjective analyses, and one study showed improvement of snoring, but not of AHI while the subjective analyses showed no improvement. The adverse events were reported and they were not significant.

Conclusions There is no accepted scientific evidence that methods aiming to increase muscle tone of the respiratory system are effective in reducing AHI to below five events per hour. Well-designed randomized controlled trials are needed to assess the efficacy of such methods.

Keywords Review · Obstructive sleep apnea · OSA treatment

Introduction

Obstructive sleep apnea (OSA) has the potential to cause serious long-term health consequences, including cardiovascular disease, hypertension, stroke and reduced quality of life [1–7].

The pathogenesis of airway obstruction in patients with OSA remains incompletely understood [8]. The primary defect is probably an anatomically small or collapsible pharyngeal airway in combination with a sleep-induced decrease in upper airway muscle activity [2]. However,
there is no doubt that the pharyngeal muscles play a significant role in maintaining pharyngeal airway patency on the basis of both anatomical considerations and physiological findings from studies [9, 10]. The muscles of primary importance fall into three groups: (1) muscles influencing the hyoid bone position (genioglossus and sternohyoid), (2) the muscles of the tongue (genioglossus) and (3) the muscles of the palate (tensor palatini and levator palatini) [10].

The treatments for OSA can be divided into (1) nonsurgical methods: weight reduction, reduction of alcohol intake, pharmacological treatment of coincident nasal obstruction [11, 12], continuous positive airway pressure (CPAP) [13] and oral appliances for mandibular advancement [14, 15] and (2) surgical methods: surgery for coincident nasal obstruction [16], uvulopalatopharyngoplasty, uvulopalatal flap, laser-assisted uvulopalatoplasty, hyoid advancement, genioglossus advancement, maxillo-mandibular advancement and maxillomandibular expansion [17]. The results from some trials have given rise to controversy relating to compliance with the treatment involved or to efficacy and safety. Based both on anatomical considerations and on treatment approaches that have been used, methods for increasing upper airway muscle tone among patients who have been demonstrated but have not been fully proven. Such methods, including singing exercises, oropharyngeal exercises, instrumental therapy (music) and electrical stimulation, could provide alternative treatments for OSA [18].

The aim of the present systematic review was to evaluate whether such methods for increasing upper airway muscle tone are effective and safe for treating OSA based on accepted scientific evidence.

Methods

Inclusion criteria

Study design The researchers made use of the parallel and crossover randomized and quasi-randomized controlled trials (quasi-randomized controlled trials were defined as trials using inadequate allocation assignment such as date of birth, by the day of the week or month of the year, by a person's medical record number or just allocating every alternate person).

Participants Study participants were patients who meet any clinical criteria for OSA [19].

Exclusion criteria The study predominantly recruited subjects with physical obstruction in the nose or throat, abnormally large tonsils, uncorrected deviated septum, drug/alcohol abuse, smoking, depression disease, previous treatment for OSA (surgical or nonsurgical), neurological or psychiatric disorders, pregnancy or lactation, use of drugs acting on central nervous/neuromuscular system, diabetes mellitus, serious cardiac arrhythmias, wearing of a cardiac pacemaker or cardioverter or defibrillator, traua and cutaneous lesions were excluded.

Types of interventions All methods to increase muscle tone of upper airway in the treatment of OSA were included, comparison groups include placebo, no intervention and other alternative treatments.

Outcome Primary outcomes: A decrease in apneas/hypopneas index (AHI) of below five episodes per hour was observed [19]. Secondary outcomes: A decrease in AHI compared to baseline, subjective sleep quality, sleep quality measured by night polysomnography, quality of life measured by subjective measures and adverse events associated with the treatments were described in terms of the number of patients relating any side effect associated with interventions.

The electronic search

The search strategies were run on January 2010 using the following terms and their synonyms: sleep apnea syndrome, sleep-disordered breathing, sleep disordered breathing, sleep apnea, sleep apneas, sleep hypopnea, sleep hypopneas, hypopneas with periodic respiration, mixed central and obstructive sleep apnea, mixed sleep apneas, mixed sleep apneas, obstructive sleep apnea syndrome, upper airway resistance sleep apnea syndrome, central sleep apneas, central apneas, central sleep apnea, central sleep apnea syndrome, central sleep disordered breathing, central sleep disordered breathing, central sleep-disordered breathing, central sleep-disordered breathings, primary central sleep apnea, secondary central sleep apnea. The search for trials was carried out through the Cochrane Library, Medline, Pubmed, Lilacs, Embase and Sciel. Besides the most traditional electronic databases other sources were also considered: thesis indexed in the Biblioteca Regional Medicina/Panamerican Health Organization of the World Health Organization and reference list of all recovered trials. There was no restriction of neither origin nor language of publications.

Data extraction

Both tasks were undertaken by one reviewer and checked for accuracy by a second reviewer. Disagreements were resolved by discussion and with a third reviewer if
necessary. When information was missing, additional information was requested from the authors of primary studies by means of electronic mail.

Methodological quality of included studies

With regard to the randomization, the studies were judged according to the allocation concealment based on the following criteria:

A. Adequate - Randomization method described that would not allow investigator/participant to know or influence intervention group before eligible participant entered in the study.

B. Unclear - Randomization stated but no information on method used is available.

C. Inadequate (quasi-randomized controlled trials) - Method of randomization used such as alternate medical record numbers or unsealed envelopes; any information in the study that indicated that investigators or participants could influence intervention groups.

D. Non-randomized controlled trials

The included studies were also judged according to the other sources of risk of systematic error (bias) as related below:

- **Performance bias**: Were the participants and researchers blinded as to the allocation?
  - Yes: low risk of systematic error
  - No: high risk of systematic error
  - Not stated: moderate risk of systematic error.

- **Detection bias**: Were the outcome assessors blinded as to the allocation?
  - Yes: low risk of systematic error
  - No: high risk of systematic error
  - Not stated: moderate risk of systematic error.

- **Attrition bias**: No systematic difference between comparison groups including withdrawals.
  - Yes: low risk of systematic error
  - No: high risk of systematic error
  - Not stated: moderate risk of systematic error.

Results

Trial design

We identified 11 published trials (ten in English and one in Chinese) relating to the interventions that aimed to increase upper airway muscle tonus in treating OSA. Eight trials were excluded because they were not randomized (six case series trials [20–25] and two non-randomized controlled trials [26, 27]). Three randomized clinical trials were included in this review since they fulfilled the inclusion criteria [28–30] (Table 1).

Population

A total of 86 patients were randomized in studies with parallel designs. They received specific muscle tonus stimulation and were compared with subjects who received placebo (Table 1).

Interventions

We found three types of intervention aimed at increasing muscle tonus: (1) intraoral electrical neurostimulation [28], (2) didgeridoo playing [29], and (3) oropharyngeal exercises [30].

Outcomes

We found that seven subjective measurement methods (Epworth Sleepiness Scale (ESS), Pittsburgh Quality of Sleep Index, partner rating of sleep disturbance, attention test, Functional Outcomes of Sleep Questionnaire, 39–36 and modified Berlin Questionnaire) and one objective method (Polysomnographic Measurement) were used in these studies, as described below.

1. **Intraoral electrical neurostimulation** [28]: Sixty-seven patients were treated with intraoral electrical neurostimulation or placebo (33 treated and 34 placebo; 10 dropouts: one treated and nine placebo), in a study of parallel design over an 8-week period.

   (a) **Polysomnographic measurements**: Comparing intraoral electrical neurostimulation with placebo, there was no improvement in AHI after training in either group (p = not significant; pre/post AHI: from 24.7 ± 8.6 to 25.3 ± 16.6, intervention group; from 27.4 ± 6.3 to 27.9 ± 9.9, placebo group). The number of snoring episodes decreased in the intervention group (p < 0.05; snoring: from 63.9 ± 23.1 to 47.6 ± 31.2, intervention group; from 62.4 ± 26.1 to 62.1 ± 23.8, placebo group)

   (b) **ESS and attention test**: There were no differences observed in either group (pre/post ESS: from 10.2 ± 4.9 to 9 ± 4.3, intervention group; from 10.5 ± 5.1 to 9.4 ± 4.7, placebo group)

   (c) **Functional outcome of sleep questionnaire**: Similar increases in balance from before to after training were observed in the two groups regarding the score of the functional outcome of sleep questionnaire.

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<table>
<thead>
<tr>
<th>Study</th>
<th>Allocation concealment</th>
<th>Method</th>
<th>Participants</th>
<th>Interventions</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>Randerseth 2004</td>
<td>A</td>
<td>Double-blind, randomized, placebo-controlled, parallel study</td>
<td>N=67 Treated; 33 Placebo; 34 males, 33 females; mean age: 52 years</td>
<td>Intracranial electrical neuromodulation or placebo, 12 months, 20 min twice a day</td>
<td>SDB, Epworth scale, attention test, functional outcome of sleep questionnaire, OBD, PSG measures</td>
</tr>
<tr>
<td>Putnam 2006</td>
<td>A</td>
<td>Double-blind, randomized, placebo-controlled, parallel study</td>
<td>N=25 Treated; 14 Placebo; 11 males, 4 females; mean age: 48 years</td>
<td>Doloridocaine play or placebo, 4 months, 20 min/day; 5 days/week</td>
<td>SDB, Epworth scale, Pittsburgh quality of sleep index, patient rating of sleep disturbance, SF-36, OBD, PSG measures</td>
</tr>
<tr>
<td>Guimondes 2009</td>
<td>A</td>
<td>Double-blind, randomized, placebo-controlled, parallel study</td>
<td>N=31 Treated; 16 Placebo; 15 males, 5 females; mean age: 50 years</td>
<td>Upper respiratory exercises or placebo, 3 months, 30 min/day</td>
<td>SDB, Epworth scale, Pittsburgh quality of sleep index, clinical global impression, OBD, PSG measures</td>
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SDB: Subjective, OBS: Objective, PSG: Polysomnography
Intention-to-treat analysis

There were no dropouts from the dilatogoodo study [29] and this was the only study in which an intention-to-treat analysis was reported. In the neurostimulation study [28], there were 10 dropouts (one in the intervention group and nine in the placebo group) out of the 77 patients included (12.9%). In the study with oropharyngeal exercises [30], there were eight dropouts (three in the intervention group and five in the control group) out of the 39 participants analyzed (20.5%).

Quality of the studies included

Overall, the methodological quality of the studies was considered to be adequate (A), as confirmed by e-mail with the authors. Two studies included [28, 29] were classified as "low risk" with regard to the systematic error from all sources of risk. However, one of the trials [30] did not fully address two sources of risk (masking of the researchers and assessors); only the participants were blinded, because the researcher who applied the intervention and placebo was the same professional. The other criteria relating to systematic error were judged to be "yes", "no" or "not stated" (see methodological quality of studies included).

Discussion

We found that three studies had related methods for increasing upper airway muscle tons in treating OSA. However, they were heterogeneous and assessed different outcomes, and for this reason, a meta-analysis was produced.

The study involving neurostimulation [28] showed results that favored the group of patients who snored, but there was no improvement in AHI. This study was carried out with adequate randomization and allocation concealment and with low risk of bias relating to systematic error.

In the dilatogoodo study [29], the results favored the intervention group with improvement in the AHI. However, the index still remained greater than five events per hour, and there were controversial results regarding the subjective measurements. There were significant improvements in daytime somnolence and partner rating of sleep disturbance, although there was no improvement in the Pittsburgh Quality of Sleep Index or SF-36. This study was carried out with adequate randomization and allocation concealment and with low risk of bias relating to systematic error.

The study involving oropharyngeal exercises [30] showed improvement in the AHI, although the AHI did not go down to below five events per hour. All subjective measurements showed significant improvement. Although the randomization of the groups in this study was reported as adequate, this study presented high risks of performance and detection bias relating to systematic error.

Summarizing this review, it included two studies [29, 30] showing improvements in the objective and subjective analyses and one study [28] showing improvement of snoring but not of AHI, while its subjective analyses showed no improvement. These results can be presumed to be controversial because the interventions and the areas manipulated by training were different; whereas, the trial that used a more focused intervention method (electrical neurostimulation) involving just the muscles of the tongue showed improvement of snoring, but no improvement of AHI. The other two trials using different functional methods that manipulated the entire upper airway (using the dilatogoodo, i.e. a muscular instrument or using oropharyngeal exercises involving phototheraphy) showed better results in general.

We only found three randomized controlled trials and this seemed to be not enough to provide definitive evidence regarding the treatment of OSA because none of them were able to reduce AHI to below five episodes per hour and they used different interventions with controversial results. We also have some concerns about treatments that only reduce the AHI, keeping the patients in a range of risks for a serious comorbidity like stroke [7]. Thus, we were limited to comparing other possibilities for increasing muscle tons and their influence on OSA treatment. Moreover, there are no data on long-term treatment with regular follow-up. This would be needed in order to establish evidence regarding these secondary treatments.

Conclusion

Implications for practice

Based on the results from the study by Guimenes, oropharyngeal exercises could be an alternative for supporting moderate OSA patients' treatment [30]. Nonetheless, although the results from this study showed a decrease in AHI, this index did not go down to below five events per hour, which was thus incompatible with our primary outcome.

The complexity of the oropharyngeal exercises and the need for long-term follow-up with a well-trained professional caused dropouts, as mentioned in the paper, and these individuals were not included in the statistical analyses. The method for controlling body position during overnight polysomnography was not mentioned, and the trial was done with a small sample size. It needs to be taken into consideration that there were some possibilities for bias to occur in this trial and, therefore, further trials using oropharyngeal exercises need to be undertaken in order to compare data.
Didgidojo playing was a good option as a complementary treatment, especially in cases of poor compliance with CPAP therapy [29]. One of the challenges in treating sleep disorders is poor compliance and possible new interventions need to be not only effective but also methods that patients are motivated enough to use. However, it is important to remember that this study aimed to analyze daytime somnolence as the primary outcome and not AHI.

Implications for research

Trials on methods for increasing upper airway muscle tonus in treating OSA definitively need to have adequate sample sizes, double-blind placebo-controlled randomized parallel designs and clinically relevant outcome measurements, such as AHI less than five events per hour. Subjective measurements need to be made using internationally validated scales that have been defined by means of a consensus. Future trials should follow specific guidelines concerning the inclusion criteria and control over adverse events and should follow internationally published guidelines for reporting on trials. Well-designed randomized controlled trials are needed in order to assess the efficacy and safety of methods for increasing upper airway muscle tonus in treating OSA.

From the available data, the present authors recommend and strongly encourage clinical researchers to perform well-designed trials to assess the efficacy and safety of these methods, especially those involving training of the entire upper airway, such as didgidojo and otopharyngeal exercises, because they are functional exercises.

Conflict of interest The authors declare that they have no conflict of interest.

References


Anexo 3 - Aprovação do Comitê de Ética

Ref. Projeto de pesquisa intitulado: “Tratamento multifuncional para os transtornos respiratórios do sono: Baseado em evidências”.

CARACTERÍSTICA PRINCIPAL DO ESTUDO: Revisão sistemática.

RISCOS ADICIONAIS PARA O PACIENTE: Sem risco, sem contato com paciente.

OBJETIVOS: Avaliar a efetividade e a segurança dos métodos que visam o aumento do tônus da via aérea superior no tratamento dos transtornos respiratórios do sono.

RESUMO: Revisão sistemática de ensaios clínicos randomizados e quasi-randomizados, realizado de acordo com o Manual de Revisão Sistemática da Colaboração Cochrane. A amostragem será realizada em acordo com o número de estudos disponíveis nas bases de dados e com a lista de referências de estudos relevantes, incluindo revisões narrativas e diretrizes. Serão incluídos ensaios clínicos randomizados e quasi-randomizados, publicados ou não, que compararam o tratamento dos transtornos respiratórios do sono com outros tratamentos ou placebo. Não haverá limitações quanto ao idioma da publicação. Os participantes serão adultos que preencham os critérios clínicos e polissonográficos para os transtornos respiratórios do sono (ronco primário e síndrome da apneia obstrutiva do sono). Para identificar os ensaios clínicos relevantes serão usadas nestes estudo as seguintes bases de dados eletônicos: MEDLINE, EMBASE, LILACS, The Cochrane Controlled Trials Database.

FUNDAMENTOS E RACIONAL: Dentro das opções clínicas propostas para o tratamento dos transtornos respiratórios do sono, métodos que visam o aumento do tônus muscular da via aérea superior têm sido recentemente relatados, mas nunca foi realizada uma análise crítica de forma sistemática da efetividade e segurança de tais métodos, justificando a necessidade da realização desta revisão sistemática.

MATERIAL E MÉTODO: Estão descritos os procedimentos do estudo.

TCLE: Não se aplica.

DETALHAMENTO FINANCEIRO: Sem financiamento externo - R$ 1750,00.

CRONOGRAMA: 24 meses.

OBJETIVO ACADÊMICO: Doutorado.

ENTREGA DE RELATÓRIOS PARCIAIS AO CEP PREVISTOS PARA: 3/7/2011 e 2/7/2012.
O Comitê de Ética em Pesquisa da Universidade Federal de São Paulo/Hospital São Paulo ANALISOU e APROVOU o projeto de pesquisa referenciado.

1. Comunicar toda e qualquer alteração do projeto e termo de consentimento livre e esclarecido. Nesta circunstância a inclusão de pacientes deve ser temporariamente interrompida até a resposta do Comitê, após análise das mudanças propostas.

2. Comunicar imediatamente ao Comitê qualquer evento adverso ocorrido durante o desenvolvimento do estudo.

3. Os dados individuais de todas as etapas da pesquisa devem ser mantidos em local seguro por 5 anos para possibilidade auditoria dos órgãos competentes.

Atenciosamente,

Prof. Dr. José Osmar Medina Pestana
Coordenador do Comitê de Ética em Pesquisa da
Universidade Federal de São Paulo/Hospital São Paulo

09/10
Anexo 4 – Estratégias de busca

Quadro 1: LILACS (ronco)

("mh ronco [Palavras] or (tw snore or tw ronquido) and (ronco or ronquido or snore) [Palavras] and respiração ruidosa$ or respiração pesada$ [Palavras]")

Quadro 2: LILACS (SAOS)

("mh sindrome da apneia obstrutiva do sono [Palavras] or (tw syndrome or tw sindrome) and (apnea or apneia or apnea) [Palavras] and Síndromes de la Apnea del Sueño$ or Síndromes da Apneia do Sono$ or Hipersonia com Respiração Periódica$ or Respiração Desordenada Durante o Sono$ or Apnea del Sueño or (Central$ or Obstructive$) [Palavras] or Hipoventilação Alveolar Central$ or Síndrome de Ondine$ or Síndrome de Apneia do Sono por Resistência das Vias Aéreas Superiores$ [Palavras]")

Quadro 3: The Cochrane Controlled Trials Database (ronco)

"#1 Snore
"#2 (Snore or Snoring)
"#3 (noisy next breathing*)
"#4 (Respiratory next sound*)
"#5 (Breathing next Sound *)
"#6 (Rhonchi or Rhonchus)
"#6 (Stridor or Crackles or Wheezing)
"#7 (#1 or #2 or #3 or #4 or #5 or #6)