Impacto do tratamento da apneia obstrutiva do sono nos sintomas de tontura

Artigo Original

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Resumo

Objetivo: Avaliar as alterações do equilíbrio em doentes com Apneia Obstrutiva do Sono (OSA) e o impacto do tratamento da OSA nestes sintomas.
Desenho do Estudo: Estudo de coorte prospetivo
Material e Métodos: Incluídos 226 doentes com idade entre 18-64 anos, com Índice de Apneia-Hipopneia (AHI) > 5, sob tratamento para a AOS há pelo menos 2 anos. Os dados foram obtidos através dos registos clínicos. Alterações do equilíbrio pré e pós-tratamento foram avaliadas por questionário. Análise estatística foi realizada por regressão logística e teste de McNemar.
Resultados: Pré-tratamento, 28,3% (64/226) referiram tonturas, mais prevalentes nas mulheres (42,7% vs 21,2%). O sexo feminino foi um preditor significativo de tonturas (OR=2,77, p=0,001) enquanto um AHI mais elevado correlacionou-se com menor probabilidade de desequilíbrio (ß = -0,014, p=0,038). Pós-tratamento, apenas 14% (9/64) mantiveram queixas (p>0,001).
Conclusões: Existe uma forte relação entre a OSA e alterações do equilíbrio, com melhoria destas queixas pós-tratamento.

Keywords: Apneia Obstrutiva do Sono, Desequilíbrio, Vertigem, Perturbações do Sono, Polissonografia

Introduction

Dizziness and vertigo are common presenting complaints in otorhinolaryngology, with a lifetime prevalence up to 30% for dizziness and 7% for vertigo, significantly impacting patients' quality of life.[1,2] These symptoms could cause a persistent fear of falling and less balance confidence, which prompts anxiety, depression and other mood disorders. These patients often adopt avoidance behaviors, limiting their daily activities and social interactions, thereby further impairing their overall well-being.[3] Obstructive Sleep Apnea (OSA), characterized by a complete or partial airway collapse leading to decreased oxygen saturation and/or respiratory effort-

related arousals, is the most prevalent sleep breathing disorder.[4] While the link between sleep disorders, including OSA, and various physical health issues is well-documented, the relationship between OSA and dizziness has received less attention.[5] Recent studies, however, are shedding light on this connection. Tsai et al. performed a nationwide cohort study that established OSA as an independent risk factor for vertigo, recommending physicians to be vigilant about vertigo in patients with OSA.[5] Additionally, research by Kaybasi et al. indicated that patients with moderate-to-severe OSA exhibit abnormal vestibular responses.[6] Although the mechanism behind OSA-related dizziness is still not fully understood, it has been suggested that hypoxic damage caused by OSA may impair the inner ear (Gallina et al.) (Fig.1).[7]

In this context, this study aims to identify the prevalence of dizziness symptoms in patients diagnosed with OSA and evaluate whether OSA treatment improves these symptoms.

Materials and Methods

Population and Study Design

A prospective study was conducted involving patients who underwent level 3 sleep study (level 3 uses portable monitors that allow sleep studies to be done at the patient's home and unlike level 1, it does not measure the number of arousals or sleep stages, and it cannot detect non respiratory sleep disorders) at Hospital Beatriz Ângelo in Loures (Portugal), from January 2020 to December 2021. The inclusion criteria for this study were as follows:

- Age range of 18-64 years
- Apnea-hypopnea index (AHI) >5
- Undergoing therapy for OSA for at least 2 years (with adherence to the treatment as reported by the patients)

Patients aged 65 or older were excluded to minimize the influence of age-related balance disorders that can be related to the aging in vestibular structures. The study was conducted in accordance with the ethical standards laid down in the Declaration of Helsinki guidelines. Participant confidentiality was maintained by pseudo-anonymizing all data. Patients participated voluntarily and after informed consent was obtained, the participants were asked to respond, via telephone, to six close-ended questions regarding their balance disorders (see Table 1).

All patient responses were recorded contemporaneously during the telephone interviews and documented immediately as they were provided. The six-question survey used in our study was developed specifically for this research by a multidisciplinary team of otorhinolaryngologists and pulmonologists at our hospital. Although it was not formally validated, the questions were structured to evaluate balance complaints before and after OSA treatment using simple and standardized response options to improve consistency. Five patients who were not included in the study responded to the survey, and minor linguistic adjustments were made based on their feedback.

For questions 2 to 4, responses of "Never" or "Rarely" were categorized as "No", considering that these individuals' quality of life was not significantly affected by dizziness symptoms. Conversely, responses of "Always" and "Often" were categorized as "Yes", reflecting that these participants' quality of life was adversely affected by dizziness symptoms.

The decision to dichotomize Likert-type responses into binary outcomes ("Yes" vs "No") was made to simplify the analysis and focus on the impact of dizziness symptoms in patients'

Figure 1
Proposed mechanism for balance disorders in patients with obstructive sleep apnea (Adapted from: Gallina et al. 2010)

Table 1
Questionnaire regarding balance complaints

Number Question	Subject	Answer Choices
Q1	Before starting OSA treatment, did you experience balance complaints?	Yes No
If "Yes", proceed to the next questions		
Q2	Before starting OSA treatment, how often did you usually experience balance complaints?	Always Often Rarely Never Do not answer/Do not know
Q3	After starting OSA treatment, how often do you experience balance complaints?	Always Often Rarely Never Do not answer/Do not know
Q4	After starting OSA treatment, did your balance complaints improve?	Always Often Rarely Never Do not answer/Do not know
Q5	Before starting OSA treatment, did you take any medication to treat balance complaints?	Yes No
Q6	After starting OSA treatment, if you previously took medication for balance disorders, do you still take it?	No Yes, but a lower dosage Yes, same dosage Yes, but an increased dosage

quality of life. This method was supported in pilot testing of patients not included in the final cohort, which indicated that this binary classification improved clarity and consistency of responses during telephone interviews.

Results

A total of 226 participants met the inclusion criteria and were included in the study. Among these, 151 participants (66,8%) were male. The mean age was 50,4 years (± 8,72 years) years with a minimum age of 26 and a maximum age of 64. The mean body-mass index (BMI) was 34,1 kg/m^2 (± 7,3) and the average AHI was 36,36 (± 25,9). Prior to OSA treatment, 64 (28,3%) of the patients reported dizziness symptoms, with a prevalence of 42,7% (32/75) among female patients and 21,2% (32/151) in male patients.

Our analysis explored potential associations between dizziness symptoms and several factors: gender, age, BMI and AHI. Logistic regression analysis revealed that gender was a statistically significant predictor of dizziness symptoms before starting OSA therapy (ß=1,018, p=0,001; odds ratio [OR] = 2.77, 95 % confidence interval [CI] 1.52–5.05). Females had approximately 2,77 times higher odds of reporting dizziness symptoms compared to males, indicating a notable association between gender and the likelihood of experiencing these symptoms.

Age was not a statistically significant predictor of dizziness symptoms before starting OSA therapy (ß=0,010, p=0,572; OR = 1.01, 95 % CI 0.98–1.04). The odds ratio of 1,010 suggest that each additional year increases the likelihood of dizziness symptoms by 1,0%, but this effect is not statistically significant.

When it comes to BMI, our analysis showed a positive coefficient (ß=0,013; OR = 1.01, 95 % CI 0.97–1.05), suggesting that a higher BMI was

associated with an increased likelihood of reporting dizziness symptoms, with an odds ratio of 1,013, indicating a 1,3% increase in odds for each unit increase in BMI. However, this effect was not statistically significant (p=0,518). Interestingly, a higher AHI was associated with a slightly reduced likelihood of reporting dizziness symptoms (ß = -0,014, p=0,038; OR = 0.99, 95 % CI 0.97–1.00), with each unit increase in AHI decreasing the odds of dizziness by 1.4%. While this effect is statistically significant, the magnitude of change is relatively small.

Regarding the treatment modalities, 96% of patients (217) were treated with positive airway pressure therapy and lifestyle measures, such as dieting; 5 patients (2,2%) were treated only with weight loss and 4 patients (1,8%) only underwent upper airway surgery.

Following the start of therapy, only 9 out of the 64 patients who initially reported dizziness continued to experience symptoms (14%), marking a significant reduction. McNemar's test confirmed this observation to be statistically significant ($\chi^2(1) = 53.0$, $p < 0.001$), indicating a strong correlation between OSA therapy and the improvement of dizziness symptoms.

Before initiating OSA treatment, 13 out of the 64 patients (20,3%) who reported dizziness used medication (Betahistine) for these symptoms. Of these, 7 (53,8%) reported a reduction in their dosage after initiating OSA therapy. Using McNemar's test, we found that there was no statistically significant correlation ($\chi^2(1) = 0.08$, p=0,773) between the start of OSA therapy and the reduction or cessation of Betahistine medication.

No harms or adverse events related to the treatment were reported by participants during the data collection process.

Discussion

To identify the prevalence of dizziness symptoms in patients diagnosed with OSA and evaluate whether OSA treatment improves these symptoms, 226 patients with diagnosed OSA, aged between 18 and 64, were screened for dizziness symptoms in this study.

In our study, we demonstrated an overall prevalence of dizziness in 28,3% of our patients. Although dizziness is one of the most common complaints in clinical practice, estimating its prevalence can be challenging due to different wordings of the questions inquiring about dizziness and variations in how dizziness is defined and perceived by different individuals.[8] Literature suggest that dizziness affects approximately 20-35% of the general population at some point in their lives.[8, 9] One study focusing on patients with OSA found a prevalence of dizziness or vertigo symptoms of 22,5% in a group of 512 patients, which is within a comparable range to our study.[10]

It is important to note that our study did not include a control group of non-OSA individuals. However, previous research that included control groups has consistently demonstrated a higher prevalence of dizziness symptoms in OSA patients compared to healthy individuals. For example, two studies specifically comparing the incidence of vertigo in OSA patients with that in the general population found a significantly higher incidence of these symptoms in the OSA group [5, 11]

In this study, our findings showed that being female nearly triples the likelihood of experiencing dizziness symptoms associated with OSA compared to being male. This finding aligns with existing literature, which shows a higher prevalence of dizziness and vertigo in women.[12, 13] It is believed that some factors contributing to this could include a higher incidence of migraines, hormonal cycle variations, and a greater tendency for women to seek medical care.[12, 13]

A wide range of published literature has established a relationship between aging and an increase in balance disorders. As individuals age, various sensory systems – vestibular, visual, proprioceptive and autonomic – undergo changes that can be influenced by disease or injury.[14] Other factors, such as changes in neurological, cardiovascular and musculoskeletal systems, can also contribute to dizziness. Age-related changes in the vestibular system are normal,

with most studies reporting a significant decline in vestibular hair cells starting after the age of 65. However, the onset and rate of degeneration can vary between individuals and among different sensory organs, cells or neurons, with one study reporting a gradual loss of neurons and sensory cells starting as early as 40 years of age.[15] Given these factors, our study focused on adults younger than 65 years of age to minimize the impact of age-related changes in sensory organs that could contribute to balance disorders. In our cohort, consistent with published studies, we found that each additional year of age increased the likelihood of dizziness symptoms, but this effect was not statistically significant.

When it comes to BMI, our study suggests a slight increase in the likelihood of experiencing dizziness symptoms with higher BMI values, although this effect was not statistically significant. Although research on the relationship between BMI and balance disorders is limited, some studies have provided important insights. For instance, one study comparing a group with chronic dizziness to a healthy control group found a significantly higher obesity rate among the patients.[16] Evidence also indicates that excess weight and obesity can negatively impact balance and postural stability.[17] Notably, one study demonstrated that weight loss in obese men led to improved balance control, with the extent of improvement directly correlated with the amount of weight lost.[18]

Interestingly, our findings suggest that a higher AHI was associated with a slightly reduced likelihood of reporting dizziness symptoms, although the effect size is very small. This finding is supported by a previous study that observed that 27% of patients with mild OSA reported dizziness.[19] While our findings may appear counterintuitive, studies have shown that AHI does not correlate with the hypoxic burden of OSA, as it fails to account for hypoxemia caused by obstructive respiratory events.[20, 21] So, two patients with a similar AHI may experience significantly different levels of hypoxic burden. These studies, along with our data, could suggest that the severity of OSA does not have a straightforward correlation with the presence of dizziness symptoms.

Our second primary objective was to identify the impact of OSA therapy on dizziness symptoms. Among the 226 participants, 64 (28,3%) initially reported balance disorders prior to beginning OSA treatment. Following a minimum of two years of therapy, only 9 participants continued to experience these symptoms. This substantial reduction indicates a strong correlation between OSA and the improvement of balance-related issues. While studies focusing of the impact of OSA therapy on dizziness are limited, recent research has demonstrated that such therapy can improve dizziness symptoms in patients with OSA. Two studies have shown an improved dizziness-related quality of life, as measured by the Dizziness Handicap Scale (DHI), within just three months of initiating continuous positive airway pressure (CPAP) therapy.[22, 23]

One of these studies reported significant postural improvements after 12 months of CPAP therapy, with reduced sway surface and power spectra values in posturography, especially under eyes-closed and foam-surface conditions, indicating better vestibular control. The same study also showed a slight increase in vestibulo-ocular reflex (VOR) gain after therapy, although it did not reach statistical significance. The improvement in these scores suggests that such changes may be due to oxidative restoration processes occurring along the cognitive and multisensory neural pathways involved in balance control.[22]

The success of CPAP in treating dizziness suggests that all patients with balance disorders, especially those who have failed traditional treatments, should be evaluated for a history of snoring and other symptoms of obstructive sleep apnea.[19]

Betahistine is often prescribed, including for cases of “unspecified dizziness”, where a patient with suspected vertigo does not meet the diagnostic criteria for a specific condition. In our study, 13 out of the 64 patients with dizziness symptoms (20,3%) were taking

Betahistine. Notably, more than half of these patients reduced their dosage or stopped taking it altogether after beginning sleep apnea therapy, which could suggest that OSA therapy may effectively alleviate their dizziness symptoms to the point where patients no longer feel the need for medication. However, our study found no statistically significant correlation between the start of sleep apnea therapy and the reduction or cessation of Betahistine. The reluctance to reduce or stop medication, even though the reported improvement in dizziness symptoms, might be influenced by patients' fear of symptom recurrence, since many people who experience relief from dizziness with the medication become anxious about discontinuing it.

The strengths in this study include the exclusion of individuals over 65 years of age, which minimized the impact of age-related balance disorders. Additionally, every participant had a confirmed diagnosis of OSA through sleep study, enhancing the validity of the findings. The requirement that patients undergo a minimum of two years of therapy is another strength, as it allows for a more accurate assessment of the long term-effects of OSA treatment on dizziness and balance disorders. This ensures that any observed improvements in symptoms are likely due to sustained therapy rather than short-term effects or fluctuations.

However, the present study has limitations. Some confounding variables that could influence dizziness symptoms, such as medication for other conditions and the presence of additional medical issues, were not accounted for in this study. Moreover, the assessment of dizziness symptoms was based on a non-validated questionnaire; therefore, the absence of prior validation should be considered when interpreting the results. Also, the fact that this study relied on patient's self-reported symptoms can introduce subjectivity since individual's perceptions of their balance disorders might differ.

This study did not focus on a specific pathology or how OSA and its treatment could affect it. Instead, we examined patients diagnosed with OSA and screened them for balance disorders based solely on their reported symptoms, without conducting diagnostic tests or identifying a specific underlying condition. We also assessed whether OSA therapy led to an improvement in these symptoms.

Future research, including comorbidities and vestibular instrumental tests, could better explore the link between OSA and balance disorders.

Conclusion

This study highlights the significant prevalence of dizziness symptoms among patients with OSA, reinforcing the growing evidence of a consistent association between OSA and balance disorders. Moreover, our study demonstrated that OSA treatment could positively impacts these symptoms. Given these results, it is important to consider screening for OSA in patients presenting with dizziness symptoms during otorhinolaryngology appointments. This study acknowledges its limitations and the need for further research, including the collection of additional data such as patient's comorbidities and diagnostic vestibular tests, to better understand the relationship between OSA and balance disorders.

Conflito de Interesses

Os autores declaram que não têm qualquer conflito de interesse relativo a este artigo.

Confidencialidade dos dados

Os autores declaram que seguiram os protocolos do seu trabalho na publicação dos dados de pacientes.

Proteção de pessoas e animais

Os autores declaram que os procedimentos seguidos estão de acordo com os regulamentos estabelecidos pelos diretores da Comissão para Investigação Clínica e Ética e de acordo com a Declaração de Helsínquia da Associação Médica Mundial.

Política de privacidade, consentimento informado e Autorização do Comité de Ética

Os autores declaram que têm o consentimento por escrito para o uso de fotografias dos pacientes neste artigo.

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Disponibilidade dos Dados científicos

Não existem conjuntos de dados disponíveis publicamente relacionados com este trabalho.

Declaração de IA generativa e tecnologias assistidas por IA no processo de redação

The authors acknowledge that the Generative Artificial Intelligence tool (ChatGPT) was used to improved spelling and grammar in this article. After using this tool, we reviewed and edited the content as necessary and take full responsibility for the content of this publication. No data analysis or interpretation was performed using artificial intelligence tools.

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