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ORIGINAL ARTICLE

Evaluation of peripheral auditory pathways and brainstem in obstructive sleep apnea☆

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KEYWORDS
Obstructive sleep apnea;
Hypoxia;
Auditory brainstem response;
Hearing test

Abstract
Introduction: Obstructive sleep apnea causes changes in normal sleep architecture, fragmenting it chronically with intermittent hypoxia, leading to serious health consequences in the long term. It is believed that the occurrence of respiratory events during sleep, such as apnea and hypopnea, can impair the transmission of nerve impulses along the auditory pathway that are highly dependent on the supply of oxygen. However, this association is not well established in the literature.
Objective: To compare the evaluation of peripheral auditory pathway and brainstem among individuals with and without obstructive sleep apnea.
Methods: The sample consisted of 38 adult males, mean age of 35.8 (±7.2), divided into four groups matched for age and Body Mass Index. The groups were classified based on polysomnography in: control ($n = 10$), mild obstructive sleep apnea ($n = 11$) moderate obstructive sleep apnea ($n = 8$) and severe obstructive sleep apnea ($n = 9$). All study subjects denied a history of risk for hearing loss and underwent audiometry, tympanometry, acoustic reflex and Brainstem Auditory Evoked Response. Statistical analyses were performed using three-factor ANOVA, 2-factor ANOVA, chi-square test, and Fisher's exact test. The significance level for all tests was 5%.
Results: There was no difference between the groups for hearing thresholds, tympanometry and evaluated Brainstem Auditory Evoked Response parameters. An association was observed between the presence of obstructive sleep apnea and changes in absolute latency of wave V ($p = 0.03$). There was an association between moderate obstructive sleep apnea and change of the latency of wave V ($p = 0.01$).

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Conclusion: The presence of obstructive sleep apnea is associated with changes in nerve conduction of acoustic stimuli in the auditory pathway in the brainstem. The increase in obstructive sleep apnea severity does not promote worsening of responses assessed by audiometry, tympanometry and Brainstem Auditory Evoked Response.

PALAVRAS-CHAVE
Apneia obstrutiva do sono;
Hipóxia;
Resposta auditiva do tronco encefálico;
Exame auditivo

Avaliação da via auditiva periférica e do tronco encefálico na apneia obstrutiva do sono

Resumo
Introdução: A Apneia Obstrutiva do Sono provoca modificações na arquitetura normal do sono, fragmentando-o de forma crônica com hipóxias intermitentes levando, a longo prazo, a sérias consequências na saúde. Acredita-se que a ocorrência de eventos respiratórios durante o sono como apneia e hipopneia pode prejudicar a transmissão de impulsos nervosos ao longo da via auditiva que são altamente dependentes do fornecimento do oxigênio. Contudo, essa associação não se encontra bem estabelecida na literatura.
Objetivo: Comparar os achados da avaliação da via auditiva periférica e no tronco encefálico entre indivíduos portadores e não portadores de apneia obstrutiva do sono.
Método: A casuística foi composta por 38 adultos do sexo masculino, média de idade de 35,8 (±7,2); divididos em quatro grupos experimentais pareados por idade e índice da massa corpórea. Os grupos foram classificados com base na polissonografia em: controle (n = 10), apneia obstrutiva do sono leve (n = 11), apneia obstrutiva do sono moderada (n = 8) e apneia obstrutiva do sono grave (n = 9). Todos os sujeitos do estudo negaram história pregressa de risco para perda auditiva e foram submetidos à audiometria, timpanometria, pesquisa dos reflexos acústicos e Potenciais Evocados Auditivos de Tronco Encefálico. As análises estatísticas foram realizadas por meio de ANOVA 3-fatores, ANOVA 2-fatores, teste de Qui-quadrado e teste exato de Fisher. O nível de significância adotado para todos os testes foi de 5%.
Resultados: Não houve diferença entre os grupos para os limiares auditivos, timpanometria e parâmetros avaliados do Potenciais Evocados Auditivos de Tronco Encefálico. Observou-se associação entre a presença da apneia obstrutiva do sono e alteração da latência absoluta da onda V ($p = 0,03$). Observou-se associação entre apneia obstrutiva do sono de grau moderado e alteração da latência da onda V ($p = 0,01$).
Conclusão: A presença de apneia obstrutiva do sono está associada à presença de alteração na condução nervosa do estímulo acústico na via auditiva em tronco encefálico. O aumento do grau de severidade da apneia obstrutiva do sono não promove piora das respostas avaliadas pela audiometria, timpanometria e Potenciais Evocados Auditivos de Tronco Encefálico.

Introduction

Obstructive sleep apnea (OSA) is recognized as one of the major causes of morbidity and mortality, and is associated with a wide range of cardiovascular, metabolic, neurological, physiological changes, as well as patient cognitive impairments, and has been considered as one of the major problems of public health.[1–6] A recent study of adults performed in the metropolitan area of the city of São Paulo showed that the prevalence of Obstructive Sleep Apnea Syndrome (OSAS) is high and increasing, currently around 33%.[5]

The possibility of OSA interfering with the process of generation and transmission of nerve impulses in the auditory system is reported by previous studies, but this association is not well established, and there is doubt as to the actual effect of OSA on hearing.[7,8] In addition, individuals with OSA could have serious changes in the mechanisms described above, due to the hyperviscosity of blood plasma[9] and the hypoxic cycles present in OSA.[10]

This study aimed to compare the findings of the evaluation of the peripheral auditory pathways and of the brainstem among individuals with and without OSA.

Methods

This study was approved by the Institutional Ethics Committee under protocol number 1.437.604, and all volunteers agreed to participate in the study by signing the Informed Consent before undergoing evaluation.